Proceedings of the 2022 Australasian Road Safety Conference

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Proceedings Editors

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Preface

Welcome to the 2022 Australasian Road Safety Conference, being held in conjunction with Trafinz NZ. With the restrictions of the COVID-19 pandemic mainly behind, we are pleased to present the proceedings for the first hybrid format for this conference. Conference attendees were able to attend in person (at the Te Pae conference centre in Ōtautahi Christchurch) or virtually, including live streamed plenary sessions. This is the seventh conference in the series that commenced with amalgamation of the Road Safety Research and Education Conference and the Australasian College of Road Safety Conference. It is the first time the combined conference has been in New Zealand. This conference is a unique opportunity for everyone involved in road safety including researchers, practitioners, policymakers, police, educators, advocates and community groups to meet, present and discuss their work.

These proceedings describe research, educational and policing program implementation and policy and management strategies related to all aspects of road safety and especially related to the conference theme of Changing Today for Tomorrow. Over 600 delegates from 18 countries will be attending the hybrid conference.

This year's conference covers a comprehensive range of topics including speed, infrastructure and road design, education, licensing, vehicle design, impairment due to alcohol, drugs and mobile phones. The conference plenaries also covered the impacts of climate change on future transport systems and how this might impact on road safety. There was also a special plenary session on safety issues for Indigenous people groups across New Zealand and Australia and how we can work with these communities to achieve vision zero.

The conference also presents both face-to-face and virtual symposium sessions including the following important topics: Integrating road safety into local Government, Automated Enforcement, Implementing Speed Management in Victoria and New Zealand, Gig economy road safety, Changing the way we think about older Australian drivers, Managing the safety of ageing heavy vehicle drivers, How safe is your dinner and Redeveloping Bike Education.

Authors of accepted Extended Abstracts and Full Papers represent international and local institutions from all aspects of their respective communities including research centres, private companies, government agencies and community groups. These Extended Abstracts provide an indication of the important work being done in Australia, New Zealand and internationally as part of the United Nations, One UN Vision for Road Safety to reduce the number of crashes on the road by 50 percent by 2030.

The Conference Organising Committee allowed two manuscript types for the conference: 'Extended Abstracts' and peer-reviewed 'Full Papers'. Using a similar format to the previous successful conference in 2021, the Conference Scientific sub-Committee initially called for submissions in the form of Extended Abstracts (approx. 1 to 3 pages). Each Extended Abstract was reviewed by two independent expert peer reviewers on the following selection criteria: content consistent with the conference theme, novelty of information or data, clarity, relevance to practice or policy, scientific merit, and interest to audience. Over 200 Extended Abstract manuscripts were accepted for face-to-face (F2F), virtual (around 80) and poster sessions. To accommodate more presentations into the four F2F conference streams some authors were offered a rapid-fire presentation slot of 4 minutes, with the option to provide a longer virtual presentation or poster.

Authors were also provided the option of submitting a Full Paper, which is HERDC* compliant. Based on the outcome of the peer review of their Extended Abstract, some authors who requested extension of their submissions into Full Papers for a run on into the Journal of Road Safety, were provided that opportunity by the two peer reviewers. The submitted Full Paper subsequently underwent a further review by three independent peer reviewers for inclusion into the Journal of Road Safety (JRS). There were a record number of Full Paper submissions of which nine of twenty four submitted have so far been fully peer-reviewed and accepted as 'In-Press' submissions for publication in the JRS**. These full papers are included into these proceedings but are subject to minor editorial changes prior to publication in the JRS.

For the second time in the conference series the ACRS2022 partnered with Monash University's Monash Art, Design and Architecture (MADA) to link Poster authors with final year graphic design students and alumni. Like at the ARSC2021 this gave authors an opportunity to develop high quality visual communications of their poster content. The ten Authors who chose this option that were matched with a MADA graphic design student and successfully completed the Poster, have had their Poster attached to their Extended Abstract pdfs in these proceedings. The Poster authors were also provided a 4 minute oral rapid-fire presentation slot in a concurrent podium session, followed by a 30 minute poster session, where attendees could ask questions.

Additional incentive provided potential authors from Lower and Middle Income Countries (LMICs) an opportunity to submit an Extended Abstract and attend the conference via the establishment of a LMIC Scholarship provided through a grant from the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. The scholarships assisted three LMIC presenter delegates to attend the conference and the remainder to attend virtually. Scholarships were allocated to authors of 13 Extended Abstract submissions across 7 countries: Botswana, India, Indonesia, Iran, Philippines, Thailand and Vietnam.

Putting together such a high-quality F2F and virtual program requires a contribution from many people. We thank the peer reviewers for their help in reviewing over 240 Extended Abstract submissions. The high calibre of the conference proceedings is only achieved with their assistance and we thank them all for contributing their valuable time. We also warmly thank all the keynote speakers, symposium organisers and presenters, the Conference Organising Committee, the Scientific sub-Committee, the International sub-Committee, the Social Activity sub-Committee, the Sponsorship sub-Committee, the judging panel, the conference sponsors, and the session Chairs. The valuable input and enthusiasm from each person and group has helped to ensure the 2022 Australasian Road Safety Conference meets the needs of the diverse range of participants and contributes to the overall success of the event. Most importantly, we trust that the work described in these proceedings Extended Abstracts and the Full Papers that will be published in the Journal of Road Safety**, will contribute to the reduction in road trauma in Australia, New Zealand and internationally.

These proceedings include the list of the: conference committees and members; Conference Peer-Reviewers; Judges; a copy of the conference program; and, a list of all the Extended Abstracts. All Extended Abstract will be available post conference on the Australasian College of Road Safety publication search engine***.

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[*] https://www.education.gov.au/research-block-grants/higher-education-research-data-collection-herdc

[**] https://journalofroadsafety.org/

[***] https://archive.acrs.org.au/article/search/?type=Conference

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Dr.	Tom Whyte	Neuroscience Research Australia, UNSW, Sydney
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2022 Australasian Road Safety Conference

28-30 SEPTEMBER · ŌTAUTAHI CHRISTCHURCH, NZ + ONLINE

Changing today for tomorrow.

Conference Programme

ARSC 2022 Conference Programme

All times are in New Zealand Daylight Time

Virtual: Analysis and Evaluation	Virtual: Safer Roads and Roadsides	Virtual: Human Factors	Virtual Safer Vehicle and Community Programs	Vehicle: Vision Zero, Safe System and Speed Management
Dr Trevor Allen **Monash University Accident Research Centre** *Survey of off-road motorcycle riders in Victoria, Australia*	**Dr Richard Amoh-Gyimah** **Main Roads Western Australia** *Understanding and improving temporary road signage stability*	**Dr Guneet Singh Assi** **Postgraduate Institute of Medical Education And Research** *Do women have heads of steel? A road safety paradox*	**Dr.-Ing Masria Mustafa** **Universiti Teknologi MARA** *Eyes on the wall: Mural art for road safety advocacy*	**Ms Kathy Doukouris** **Safe System Solutions Pty Ltd** *Safe System capability building during Covid in Aotearoa*
Dr Richard Amoh-Gyimah **Main Roads Western Australia** *Macroscopic Road Safety Modelling: How non-road related features influence crashes*	**Mr Ryszard Gorell** **Road SafetyGHD** *Low-Cost Urban Road Safety Program, Western Australia*	**Ms Joanne Baker** **Transport for NSW** *Participant experiences of the NSW Mandatory Alcohol Interlock Program*	**Mr Jerome Carslake** **NRSPP** *The Art of Building Engaging Heavy Vehicle Tool Box Talks*	**Dr Jaqueline Haupt** **Main Roads Western Australia** *Estimating injury reduction associated with speed limit changes in WA*
Dr Venkatesh Balasubramanian **Indian Institute of Technology Madras** *Elderly Pedestrian Crash Contributing factors in Tamilnadu, India: IML Approach*	**Mr Jamie Minchington** **Beca** *Temporary Roundabouts – Safe System Solution?*	**Ms Joanne Baker** **Transport for NSW** *The NSW Mandatory Alcohol Interlock Program and drink driving re-offending*	**Ms Olivia Dobson** **Monash University Accident Research Centre** *Evaluation of the National Road Safety Partnership Program*	**Lena Huda** **30please.org** *Changing the narrative around 30km/h speed limits*
Dr Glen Koorey **ViaStrada** *How Do We Measure Harm in Land Transport?*	**Mr Wayne Moon** **Consultant** *Modernising Intersection Investment Decisions*	**Mrs Jennifer Branch-Allen** **Kidsafe Tasmania Inc** *When services close due to COVID, what do you do?*	**Taylor Hedges** **Education and Engagement** **Transport for NSW** *Road Safety Communications for Food Delivery Platforms and Riders*	**Mr Krzysztof Jurewicz** **SafeMobility** *Effect of speed limit compliance on severe injury crash risk*
Dr Venkatesh Balasubramanian **Indian Institute of Technology Madras** *Understanding Patterns of Pedestrian – Motor-Vehicle Crashes at Signalized Intersections*	**Dr Robbie Napper** **Mobility Design Lab** **Monash University** *Mobility Kit: the toolkit to help improve road safety*	**Dr Marilyn Di Stefano** **Road Safety Victoria, Dept. of Transport** *Facilitating change: Road safety benefits of online medical report systems*	**Dr Marilyn Johnson** **Monash University** *How to successfully engage a community in road safety*	**Miss Rhiannon Kelly** **Transport for NSW** **Roslyn Bruce** *Reframing low level speeding - Casual speeding, every K counts*
Ms Estiara Ellizar **Ministry of Transportation, Indonesia** *Youth Participation in School Safety Zones Assessment (Case Study: Indonesia)*	**Mr Noel Peters** **ITS Technologies** **Queensland Department of Transport and Main Roads** *Reducing Road Trauma in Slip Base Lighting Pole Crashes*	**Dr Cassandra Gauld** **The University of Newcastle** *Normative influences on illegal smartphone use among young drivers*	**Dr Sherrie-Anne Kaye** **QUT, CARRS-Q** *Drivers' knowledge of Advanced Driver Assistance Systems*	**Mr Mark Keulen** **Transport for NSW** *Applying the Safe System Assessment Framework to Movement and Place*
			Mr Maatla Energy Otsogile **Society of Road Safety Ambassadors** *Tsela Tshweu*	

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Virtual: Analysis and Evaluation	Virtual: Safer Roads and Roadsides	Virtual: Human Factors	Virtual Safer Vehicle and Community Programs	Vehicle: Vision Zero, Safe System and Speed Management
Mrs Melissa Gunasena **Traffic And Transport** **GHD** *Strategic Road Safety Analysis, in the context of the Great Ocean Road*	**Dr Paul Roberts** **UWA** *Sharrow marking in roundabouts: A simulator study*	**Miss Rhiannon Kelly, Nadine Veerhuis & Prof. Victoria Traynor** **Transport for NSW** *Supporting older drivers with decisions about driving*	**Mrs Melanie Peterssen** **City of Casey** *Safe Around Schools – a collaborative approach to road safety*	**Mrs Erin Miller** **Western Australian Local Government Association** *Demonstrating the development of Local Government road safety management systems.*
Mr Hongyu Guo **University of Canterbury** *Modeling Drivers' Evasive Behavior with Deep Reinforcement Learning*	**Mr Wayne Moon** **Consultant** *Pathway to Zero by 2050 – Wide Median Intersection Treatments*	**Ms. Daphne Marcelo** **Road Safety** **Imaginelaw** *Advocating for a Child Restraint Systems Law in the Philippines*	**Jennifer Rivera-Gonzalez** **Monash University** *Road Transport Suicide Prevention – Transferable Learnings for Road Safety*	**Mr Wayne Moon** **Consultant** *A Step Change - Network Speed Intelligence*
Mr Edwin Hidayat **The University of Queensland** *Variables Affecting Vehicle Collisions in Australian Road Tunnels*		**Dr Andrew Mcintosh** **McIntosh Consultancy and Research** *Assessing the Safety Impact of Attachments on Motorcycle Helmets*	**Ms Kerry Shaz** **Transport for NSW** *Visualising In-Vehicle Data from the CITI Light Vehicle Study*	**Mr Wayne Moon** **Consultant** *Speed Change & Community Sentiment*
Mrs Elizabeth Hovenden **State Government of Victoria** *Identifying and Explaining Changes in Motorway Crash*		**Ms Laura Mills** **University of The Sunshine Coast** **Road Safety Research Collaboration** *Motorists' Use of Facebook to Avoid Roadside Drug Testing Locations*	**Mrs Christine Smith** **Recovery Support** **Injury Matters** *Development of Media Guidelines for Reporting Road Incidents*	**Jennifer Rivera-Gonzalez** **Monash University** *The Role of Safe Mobility in the Creation of Liveability*
Dr Nopadon Kronprasert **Chiang Mai University** *Using Video-Based Surrogate Measures for Rural Road Safety Assessment*		**Mr Johan O'Leary** **Undergraduate Student** **UNSW** *Effectiveness of anti-speeding messages on young drivers' speed management behaviour*	**Ms Melanie Suitor** **Forbes and Lachlan Shire Councils** *Collaborating for success - the Load Restraint Education Project*	**Dr Kayla Stefanidis** **University of The Sunshine Coast** *Speeding varies as a function of exposure to the behaviour*
Mr Justin Lu **Real Time Traffic Pty Ltd** *Sustainable Surrogate Safety Measures Collection in practice*		**Mr Christopher Poulter** **Department of Transport (Victoria)** *A Graduated Approach for Validating Roadside Fatigue Detection Technologies*	**Ms Lesley Tipping, Hornsby Shire Council & Susan Lewis,** **Department of Transport Wurundjeri Country** *Developing Cross-sectoral Partnerships between Local and State Governments. Motorcycle Initiative*	**Mr Michael Town** **Beca** *Long Term Speed Management Prioritisation*
Ms María Victoria Moragues **Fred Engineering** *Comprehensive approach on road safety assessment*		**Anvay Parab** **George institute** *Can simple metrics define safe transition to adult seat belts?*		
		Mohsen Ramezani **University of Sydney** *Optimal Scheduling of Random Breath and Mobile Drug Testing*		**Ms Stacey Van der Putten** **Auckland Transport** *Advocating for an equitable road safety fines and penalties framework*

Virtual: Analysis and Evaluation		Virtual: Human Factors		
Ms Suzanne Hartshorn **Department of Infrastructure, Transport, Regional Development,** *Communications and the Arts* *Development of a 'National Definition of Categorising Accidents' code*		**Prof Paul Salmon** **University of The Sunshine Coast** *What influences gig economy delivery rider behaviour and safety?*		
Dr Prasannah Prabhakharan **Transport for NSW** ***Evaluation of the NSW Pedestrian Protection Program***		**Dr Amanda Stephens** **Monash University Accident Research Centre** *The Reducing Aggressive Driving (RAD) program*		
Dr Chris Stokes **Centre for Automotive Safety Research, University of Adelaide** *RJAWS Lite: A Low-cost, Technology-based Intersection Safety Treatment*		**Mrs Susan Teerds** **Kidsafe Qld Inc** *4 out of 5 child car restraints fitted incorrectly?*		
Mr Dennis Tran **Transurban** *Implications of Safety Performance Functions on predicting high-speed highways' crashes*		**Ms Kellie Templar** **Victoria Police** *A new level of intelligence to optimise enforcement*		
Dr Long Truong **La Trobe University** *Bridge strikes in Victoria and NSW: trends and factors*		**Dr Steve Trawley** **Cairnmillar Institute** *Real-world evidence supporting road safety guidance for insulin-treated drivers*		
Mr Craig Wooldridge **Main Roads Western Australia** *Use of Automated Video Surveys on Shared Paths*		**Dr Natalie Watson-Brown** **QUT, CARRS-Q** *A Higher-Order Instruction Framework for Learner Driver Training*		
		Dr Natalie Watson-Brown **QUT, CARRS-Q** *Influencing self-regulation of speeding and phone use while driving*		

ARSC 2022 Conference Programme

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Tuesday 27 September 2022

Pre-conference workshops and meetings

7:00am	Exhibition Build		
9:00am	Exhibitors and sponsors pack in		
12:00pm	**Registration desk opens**		
	Te Pae foyer		
	Preconference workshops		
1:00pm	**Women in Road Safety Networking**	**International Outreach Chapter (IOC) meeting**	**Early Career Professionals**
	Dobson Room 1	**Dobson Room 3**	**Dobson Room 4**
			ACT Government
3:00pm	Workshop concludes	Meeting concludes	Meeting concludes
3:00pm	**Field Trip: E-bikes and e-scooters**	**Field Trip: Walking trip**	**Field Trip: Bus tour**
	Meeting point: Look for red and blue flags **Outside main entrance to Te Pae**	**Meeting point: Look for green flag** **Inside venue near the Waka Kotahi car in Dobson Foyer**	**Meeting point: Look for orange flag** **Armagh Street at the bus loading place**
	lime		
4:30pm	**Field trips conclude**	**Field trips conclude**	**Field trips conclude**
4:30pm	Registration counter closes. Name badges will be available at the Welcome function if you haven't registered prior to this.		
5:30pm - 7:30pm	**Welcome Function** **Christchurch Art Gallery Te Puna O Waiwhetū**		

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Wednesday 28 September 2022: Defining Tomorrow

7:30am	**Registration desk opens; arrival tea and coffee**
	Te Pae Foyer
8:30am	**Mihi Whakatau & Welcome to ARSC 2022**
	Auditorium
8:30am	**Mihi Whakatau**
8:45am	**Kay Gregory, Conference MC** *MC Housekeeping*
9:00am	**Dr Ingrid Johnston, CEO, ACRS** *Welcome from the Australasian College of Road Safety*
9:05am	**Geoff Allan, CEO, Austroads** *Implementing change in government*
9:10am	**Andy Foster, President, Trafinz (virtually)** *Welcome from Trafinz*
9:15am	**Dr Rebecca McLean, University of Otago, Otago Medical School & Paul Durdin, Abley** *Conference Welcome by Co-Convenors*
9:20am	**Cr Mike Davidson, Christchurch City Council** *Welcome to Ōtautahi Christchurch*
9:30am	**Road to Zero (Safety and Sustainability)**
	Auditorium
9:30am	**Prof. Claes Tingvall, AFRY and MUARC** *Traffic safety and the 2030 Agenda (presenting virtually)*
10:00am	**Bryan Sherritt, Te Manatu Waka** *The opportunity of Road to Zero*
10:10am	**Fabian Marsh, Waka Kotahi NZ Transport Agency** *Vision Zero - Towards a Sustainable Future*
10:25am	**Questions & Answers**
10:30am	**Morning break**
	Exhibition & Catering, Exhibition Hall

ARSC 2022 Conference Programme

All times are in New Zealand Daylight Time

Wednesday 28 September 2022: Defining Tomorrow

11:00am-12:30pm	Session 1: Safe Road Design	Session 2: Safety Capacity Building	Session 3: Integrating road safety into Local Government: NZ and Australian experiences	Session 4: Child restraints & disabilities	Session 5: Redeveloping Bike Ed
	Te Pae Auditorium	Dobson Room 1	Dobson rooms 2 and 3	Dobson room 4	Virtual symposium
11:00am	**William Frith,** **WSP Research & Innovation** *SH22-Safety impact of LED Lighting on a previously unlit Section*	**Brett Harman,** **Global Road Safety Partnership** *Strengthening speed and child restraint enforcement capacity in the Philippines*	**David Rowland, Facilitator** **Waka Kotahi NZ Transport Agency** **Panel 1** **Kate McDougall,** **Eurobodalla Shire Council** **Gemma Dioni,** **Christchurch City Council** **Tracey Norberg,** **Goulburn Mulwaree Council** **Panel 2** **Greg Balind,** **Griffith City Council** **Tracey Norberg,** **Goulburn Mulwaree Council** **Shane Binder,** **Waimakariri District Council**	**Bianca Albanese,** **Neuroscience Research Australia** *CREP Ease of Use Rating: Field Study Comparing Real-World Misuse*	**Juliet Bartels,** **Department of Transport**
11:18am	**Kenn Beer, Safe System Solutions** *Compact Roundabouts for Rural High-Speed Environments*	**Dr Shane Turner, Abley** *Indonesian Road Safety Priorities and Analysis Tools*		**Emma Clarkson & Helen Lindner, Mobility and Accessibility for Children in Australia Ltd** *Redefining tomorrow for children with disabilities as road users*	
11:36am	**Karl Crittenden, Viotel** *Smart Routine Real-Time Monitoring of Wire Rope Barriers*	**Martin Small,** **Martin Small Consulting** *Developing road safety strategies in low and middle income countries*		**Bianca Albanese,** **Neuroscience Research Australia** *Child restraint practices in Sydney: Misuse is still a problem*	
11:54am	**Axel Downard-Wilke, ViaStrada** *Why don't we build safe roundabouts?*	**Jimmy Tang, AIP Foundation** *An Evidence-Based approach to reduce speed in school zones: Vietnam*		**Stacie Powell & Wennie Dai, The George Institute for Global Health** *Co-presenting: Insights into parental decision making about transition to adult belt*	
12:12pm	**Dr Emily Moylan, School of Civil Engineering, University of Sydney** *Interplay between intersection design, risky behaviours and pedestrian safety*	**Brett Harman,** **Global Road Safety Partnership** *Crash investigation capacity building in Samoa, Solomon Islands and Vanuatu*			
12:16pm		**David Wanty,** **Wanty Transportation Consultancy** *Opportunities to improve road safety in developing South Pacific nations*			
12:20pm		**Questions & Answers**			

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Wednesday 28 September 2022: Defining Tomorrow

12:30pm **Lunch**
Exhibition & Catering, Exhibition Hall

1:30pm-3:00pm	Session 6: Regional Road Safety	Session 7: Vehicle Technology	Session 8: Safety Assessments	Session 9: Safer People	Session 10: Managing the safety of ageing heavy vehicle drivers
	Te Pae Auditorium	Dobson Room 1	Dobson rooms 2 and 3	Dobson room 4	Virtual Symposium
1:30pm	**Jo McLean, The Association of Independent Schools of NSW** *Regional road safety education: Towards independence, skills and safety*	**Dr Mohammed Elhenawy, Queensland University of Technology** *Estimating Crash Reductions at Signalised Intersections in Connected-Vehicle Environment & The ICVP: A longitudinal study of C-ITS in Australia*	**Dr Lisa Wundersitz, Centre for Automotive Safety Research, University of Adelaide** *System Failures and Extreme Behaviour in Fatal & Injury Crashes*	**Helen Nguyen, University of NSW** *Associations of vision impairment on crash involvement and driving cessation*	**Prof. Sharon Newnam Queensland University of Technology**
1:48pm	**Peter Kortegast, WSP NZ Ltd** *Improving Rural School Bus Safety*	**Dr Kyle Wilson, Seeing Machines** *Examining Euro NCAP distraction behaviours in a naturalistic driving dataset*	**Marcus Brown, Beca Ltd** *Influencing projects for safe system outcomes -Safe system framework assessments*	**Dr James Thompson, Centre for Automotive Safety Research, The University of Adelaide** *Collisions involving older pedestrians and motor vehicles in South Australia*	
2:06pm	**Emily Brown, Ozhelp Foundation** *Health in Gear: Improving Health and Wellbeing for Truckies*	**Dr Ritwik Swain, Road Safety Research Collaboration, University of The Sunshine Coast** *Sharing AV intended pathway may help during silent failures*	**Paul Durdin, Abley** *Simplifying and Improving Road Safety Benefit Calculations*	**Jodi Page-Smith, Transport Accident Commission** *Seeking Sensation: A segmentation study of Victorian Drivers*	
2:24pm	**Kenn Beer, Safe System Solutions Pty Ltd** *Practical Safety Interventions for Regional and Remote Road Safety*	**Martin Elsegood, Centre for Automotive Safety Research** *Development of a process to audit vehicle safety technology prevalence*	**Gavin Jeter, Abley** *Potential applications of SafeView: A forward visibility model*	**Dr Lyndel Bates, Griffith University** *Exploring the Relationship between Gender, Sensation Seeking and Traffic Offending*	
2:42pm	**Dr Lisa Wundersitz, Centre for Automotive Safety Research, University of Adelaide** *Prevention and Mitigation of Fatal Crashes in Regional/Remote Areas*	**Angus McKerral, University of Newcastle** *AVs & Anxiety: Resuming Control from a Simulated Automated Vehicle*	**Dr Mario Mongiardini, Centre for Automotive Safety Research - The University of Adelaide** *Evaluation of Centreline ATLM along Curves in Mountainous Roads*	**Karen Schoots, QUT, Centre for Accident Research and Road Safety- (CARRS-Q)** *Learner Driver Mentoring Programs: positive outcomes for disadvantaged novice drivers*	

Wednesday 28 September 2022: Defining Tomorrow

3:00pm	Afternoon break
	Exhibition & Catering, Exhibition Hall
3:30pm	Achieving vision zero outcomes for Indigenous Peoples
	Auditorium
3:30pm	**Dulcie Tauri, Waka Kotahi NZ Transport Agency** *Understanding how a Crown agency can better support Māori road safety outcomes and focussing on Te Ara Haepapa AT - Korero: the journey to pave a better future for Māori on our roads*
4:05pm	**Ping Sim, Auckland Transport** *Katoa, Ka Ora – a journey to deliver on Māori road safety outcomes through speed management planning*
4:15pm	**Tara McCarthy, Transport for NSW** *Driving Road Safety Improvements for Aboriginal People*
4:30pm	**Prof. Juanita Sherwood, Jumbunna, UTS** *The unspoken determinants of Indigenous Australians Road Safety*
4:45pm	**Questions & Answers**
5:00pm	End of day one
5:15pm– 6:15pm	NZ Chapter ACRS Networking The Canterbury Club, 129 Cambridge Terrace
6:00pm– 7:00pm	Networking Reception Fat Eddies, 1st floor, Cnr Hereford St and The Terrace Self-paying event
7:00pm	Dine Around Dinner • Amazonita • Botanics • Castros • Christchurch Tram • King of Snake • Original Sin

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Thursday 29 September 2022: Innovation and Transformation

8:00am **Registration desk opens; arrival tea and coffee**
Te Pae Foyer

8:30am – 10:00am	Session 11: Safe System & Vision Zero	Session 12: Posters Rapid Fire	Session 13: Active and emerging modes	Session 14: Automated Enforcement Symposium	Session 15: Gig economy road safety
	Te Pae Auditorium	Dobson Room 1	Dobson rooms 2 and 3	Dobson room 4	Virtual Symposium
8:30am	**Dr Lori Mooren,** **Road Safety Consultant** *Road Safety Epidemiology for the Safe System Approach*	*4-minute rapid fire presentations* **Dr Sareh Bahrololoom** **Juliet Bartels** **Ashley Beaton & Georgia Greene** **Gemma Dioni** **Gemma Dioni & Charlotte French** **Dale Harris** **Robert Jaske** **Ben Jassin** **Dr Marilyn Johnson** **Dr Steven Love** **Angela McDonnell** **Helen Nguyen** **Nikki Palmbachs** **Dr Jun Park** **Irene Tse**	**Jeremy Wolter, National Transport Commission** *Establishing micromobility national laws in multi-jurisdiction context*	**Alexander Jannink &** **Peter Kolesnik,** **Acusensus** *Queensland Automated Enforcement: Changing Behaviour Today, Saving Lives Tomorrow*	**Assoc. Prof. Gemma Read,** **Dr Oscar Oviedo Trespalacios &** **Dr Michael Blewden,** **University of The Sunshine Coast**
8:48am	**Carl O'Neil, Waka Kotahi NZ Transport Agency** *Lessons from Implementing Road to Zero Infrastructure in New Zealand*		**Dr Hafez Alavi, HA Consulting &** **Keisha Mayuga, World Bank** *Historic Rollout of Bicycle Infrastructure in the Philippines*		
9:06am	**Paul Durdin, Abley** *Transforming the NSW Road Network through Vision Zero Modelling*		**Prof. Narelle Haworth, CARRS-Q, QUT** *Rider and non-rider knowledge of e-scooter rules in Brisbane*		
9:24am	**Jeanette Ward, Abley** *Prioritising pedestrians in a safe system*		**Prof. Paul Salmon, University of The Sunshine Coast** *The Cyclists Reporting of Incidents Tool (CRIT)*		
9:42am	**Dr Hafez Alavi, HA Consulting** *A Vision Zero Pedestrian Network Safety Planning Approach*		**Prof. Sandra Mandic, Auckland University of Technology** *Adolescents' perceptions of long-term effects of cycle skills training*		

10:00am **Interactive Poster session**
Exhibition & Catering, Exhibition Hall

10:30am **Morning break**
Exhibition & Catering, Exhibition Hall

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Thursday 29 September 2022: Innovation and Transformation

11:00am	Climate Change & Carbon Zero
	Auditorium
11:00am	**Steve Abley, Abley** *Introduction as sponsors of the Climate Change & Carbon Zero session*
11:01am	**Prof. Simon Kingham, University of Canterbury** *Developing a safe transport system that also reduces carbon emissions: adopting a co-benefits approach to transport planning*
11:30am	**Dr Oscar Oviedo-Trespalacios, CARRS-Q** *Climate Change & Road Safety*
11:40am	**Dr Rod Carr, Climate Commission** *Recent advice on climate policy and action from the New Zealand Climate Change Commission*
12:00pm	**Questions & Answers**
12:15pm	**Michael Nieuwesteeg, Austroads** *Austroads, using collective wisdom to shape road transport*
12:30pm	Lunch Exhibition & Catering, Exhibition Hall

1:30pm – 3:00pm	Session 16: Safety Treatments & Evaluations	Session 17: Workplace and vehicle safety	Session 18: Distraction, Fatigue and Stress	Field Trips	Session 25: How safe is your dinner?
	Te Pae Auditorium	Dobson Room 1	Dobson rooms 2 and 3		Virtual symposium
1:30pm	**Dr Jamie Mackenzie, Centre for Automotive Safety Research, The University of Adelaide** *Evaluation of Smart School Zone infrastructure in South Australia*	**Dr Hamish Mackie and Ali Raja, Mackie Research** *Driving for work crashes - A systems analysis*	**Dr Xiaomeng Li, Queensland University of Technology** *Impact of phone use position on drivers' collision avoidance performance*	**Cycling/e scooter trip** *Outside main entrance to Te Pae* *Look for red and blue flags* **Walking Trip** *Inside Te Pae at Waka Kotahi decepta car* *Look for green flag* **Bus Trip** *Inside Te Pae at Waka Kotahi decepta car* *Look for green flag*	**Dr Marilyn Johnson, Monash University**
1:48pm	**Matt Allan, Victoria DoT** **Andrew Backman, SMEC** *Short-term Evaluation of Side Road Activated Speeds (SRAS)*	**Christine Harrison, Amber Community & Prof. Louise Harms, The University of Melbourne** *Facilitating lived experience story-telling in road trauma education programs*	**Dr James Thompson, Centre for Automotive Safety Research, The University Of Adelaide** *Prevalence and role of fatigue in South Australian crashes*		
2:06pm	**Alex Jeffcoat, Beca** *Wide Centrelines, the Road to a Safer System*	**Prof. Raphael Grzebieta, TARS University of New South Wales & Victorian Institute of Forensic Medicine, Monash University** *Vehicle rollover crashworthiness Australian Design Rule – it's time!*	**Dr Rachael Wynne, University of Newcastle** *Designing out driver distraction: A sociotechnical systems approach to distraction*		

Thursday 29 September 2022: Innovation and Transformation

2:24pm	**Dr Rebecca Luther & Dr Hamish Mackie Mackie Research** *Dragons Teeth - Useful perceptual countermeasure or distraction?*	**Dr Jamie Mackenzie, Centre for Automotive Safety Research, The University of Adelaide** *A review and comparison of light vehicle brake testing methods*	**Dr Verity Truelove, Road Safety Research Collaboration, University of the Sunshine Coast** *Rural vs urban enforcement of phone use road rules*
2:42pm	**Bruno Royce, Traffic Engineering Solutions Ltd** *'Fix crash corner' - a roundabout story*	**Prof. Raphael Grzebieta, TARS University of New South Wales & Victorian Institute of Forensic Medicine, Monash University** *Hydroplaning: preparing today for tomorrow's downpours*	**Adam Wilmot, GHD** *Safer placement of digital billboards*
2:46pm	**Assoc. Prof. Gemma Read, University of The Sunshine Coast** *Learnings from a trial of an automated shuttle in Queensland*		
2:50pm	**Questions & Answers**		
3:00pm	**Afternoon Break**		
	Exhibition & Catering, Exhibition Hall		
3:30pm	**Achieving Transformation Change & Innovation**		
	Auditorium		
3:30pm	**Lisa La Rance, Department of Infrastructure** *Policy—Innovation: What's driving road safety?*		
3:45pm	**Prof. Susan Krumdieck, Heriot-Watt University** *Engineering the Future*		
4:15pm	**Future of Transport Panel, chaired by Prof. Simon Kingham, University of Canterbury**		
	Auditorium		
4:15pm	**Martin Matthews, Ohmio Automation:** *Driverless Vehicles* **Prof. Mark Stevenson, University of Melbourne:** *Designing Streets for People* **Prof. Narelle Haworth, CARRS-Q, QUT:** *PT and scooters* **Nicole Rosie, Waka Kotahi NZ Transport Agency:** *NZ Road to Zero* **Prof. Susan Krumdieck, Heriot-Watt University:** *Transition Engineering*		
5:00pm	**End of day two**		

5:15pm – 5:45pm	Virtual Q&A: Analysis and Evaluation	Virtual Q&A: Safer Roads and Roadsides	Virtual Q&A: Human Factors	Virtual Q&A: Safer Vehicle and Community Programs	Virtual Q&A: Vision Zero, Safe System and Speed Management
	Dr Trevor Allen	Mr Ryszard Gorell	Dr Guneet Singh Assi	Mr Jerome Carslake	Ms Kathy Doukouris
	Mr Hongyu Guo	Mr Noel Peters	Ms Joanne Baker	Dr Marilyn Johnson	Dr Jaqueline Haupt
	Ms Suzanne Hartshorn		Mrs Jennifer Branch-Allen	Dr Sherrie-Anne Kaye	Lena Huda
	Mr Edwin Hidayat		Dr Cassandra Gauld	Mrs Melanie Peterssen	Mr Krzysztof Jurewicz
	Dr Glen Koorey		Ms. Daphne Marcelo	Mrs Christine Smith	Miss Rhiannon Kelly
	Dr Nopadon Kronprasert		Dr Andrew Mcintosh	Ms Melanie Suitor	Mrs Erin Miller
	Mr Justin Lu		Mr Johan O'Leary	Ms Lesley Tipping	Mr Michael Town
	Dr Prasannah Prabhakharan		Prof Paul Salmon		
	Mr Craig Wooldridge		Mrs Susan Teerds		
			Ms Kellie Templar		
			Dr Marilyn Di Stefano		
7:00pm – 11:30pm	Stantec Conference dinner with ACRS and Trafinz Awards Rivers Room, 1st Floor, Te Pae				

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Friday 30 September 2022: Implementing Change

8:00am	Registration desk opens; arrival tea and coffee			
8:30am – 10:00am	**Session 21: Impaired and Dangerous/Risky Driving**	**Session 22: Crash Analysis Studies**	**Session 23: Implementing Speed Management in Victoria and New Zealand Symposium**	**Session 24: Safer Roads**
	Te Pae Auditorium	**Dobson Room 1**	**Dobson rooms 2 and 3**	**Dobson room 4**
8:30am	**Levi Anderson, University of The Sunshine Coast** *A Real-World Examination of Targeted and Randomised Roadside Drug Testing*	**Martin Elsegood Centre for Automotive Safety Research, University of Adelaide** *Profiling head-on crashes using mass data and in-depth crash investigations*	**Dr Amir Sobhani, Symposium Chair Victoria Department of Transport** **Session 1: Insights on MPSC Speed Limit Reduction – Results of Community Sentiment Study** **Ben Bishop, Director Wallis** **Panel discussion with 5 members** **Session 2: Safety effect of speed limit reduction** **Lewis Martin, Abley & Michael Brown, Auckland Transport** *Auckland Transport Safe Speed Programme - A Step Towards Zero* **Dr Shane Turner, Abley** *Mornington Peninsula Speed Management Evaluation* **Matt Allan, Victoria DoT** *Evaluation of Phillip Island Speed Limit Reductions** **NB: A full presentation will be given in the speed management session*	**Ryan Cooney, Waka Kotahi NZ Transport Agency & Rachel Bowen, Work Safe** *Working on or near the road – making sure all road workers and road users*
8:48am	**Dr Hayley McDonald, Monash University Accident Research Centre** *Personality, Perceptions and Driving Behaviour: a study of speeding*	**Chamroeun SE, Suranaree University of Technology** *Fatal motorcycle crashes analysis in Thailand: Accounting for unobserved heterogeneity*		**Kenn Beer, Safe System Solutions Pty Ltd** *Star rating for road safety audits*
9:06am	**Alex Dawber & Kilisitina Dawber, Harmony Trust** *Changing the Drink-Driving Culture: Evaluating the OFTR group intervention*	**Dr Trevor Allen, Monash University Accident Research Centre** *Road environment factors associated with motorcycle crashes in Victoria, Australia*		**Mike Smith, Stantec New Zealand** *The last line of defence*
9:24am	**Dr Bevan Rowland, University of The Sunshine Coast** *Medicinal Cannabis and Driving: Managing Usage and Enforcement Avoidance Behaviours*	**Questions and Answers**		**Michael Woodward, WSP NZ Ltd** *Bridge Crash Risk Screening*
9:42am	**Andrew Stevens, Auckland Systems Management - Waka Kotahi NZ Transport Agency** *Suicide resilience and our road transport network*			**George Lane, WSP NZ Ltd** *NZ TCD Manual: Getting it Right so Road Users Understand*

Friday 30 September 2022: Implementing Change

10:00am	**Morning break: Exhibition & Catering, Exhibition Hall**
10:30am	**Designing Streets for People**
	Auditorium
10:30am	**Mike Smith, Stantec NZ** *Introduction as sponsors of the Designing Streets for People session*
10:35am	**Michael Wood, NZ Government** *Ministerial Presentation*
11:00am	**Kelly Larson, Bloomberg Philanthropies Initiative for Global Road Safety** *Designing cities for people not cars in low-and middle-income countries: presenting virtually*
11:30am	**Prof. Mark Stevenson, University of Melbourne** *Future Cities and Vision Zero*
11:55am	**Beth Robrahn, City of Sydney** *Streets for people: Building safe, connected bicycle networks*
12:15pm	**Questions & Answers**
12:30pm	**Lunch** **Exhibition & Catering, Exhibition Hall**

1:30pm – 3:00pm	**Session 26: Speed Management**	**Session 27: Licensing and Young Drivers**	**Session 28: Applying Safe Systems**	**Session 29: Safe System and safety analysis**	**Session 30: Changing the way we think about older Australian drivers**
	Te Pae Auditorium	**Dobson Room 1**	**Dobson rooms 2 and 3**	**Dobson room 4**	**Virtual symposium**
1:30pm	**Matt Allan, Victoria DoT** *Evaluation of Phillip Island Speed Limit Reductions*	**Emily Morrison, Department of State Growth & Natalie Watson-Brown CARRS-Q QUT** *Tasmania's New Graduated Licensing System: Introduction & Preliminary Findings*	**Nicki Williams, Christchurch City Council** *Applying a Gender Lens to Transport*	**Dr Hafez Alavi, HA Consulting** *Embedding Safe System in Victoria: Blockers, Enablers and Upcoming Activities*	**Prof. Emerita Judith Charlton,** **Monash University Accident Research Centre**
1:48pm	**Hayden Trumper, Beca Limited** *Saving lives through safer speed*	**Emily Morrison, Department of State Growth & Natalie Watson-Brown CARRS-Q QUT** *Community Engagement Regarding Graduated Licensing System Revisions: Tasmania's Experience*	**Dr Rebecca McLean, University of Otago, Otago Medical School** *Analysing media representation of bike lanes in Aotearoa New Zealand*	**Michael Green, Monash University Accident Research Centre** *Safe System awareness and knowledge - A Victorian practitioners' perspective*	

Friday 30 September 2022: Implementing Change

2:06pm	**Aini Fayaz Mansoor, Abley** *Urban street speed prediction*	**Prof. Teresa Senserrick, CARRS-Q QUT** *Upskilling professional young driver instructors: what are we waiting for?*	**Robynann Dixon, Northern Beaches Council** *Sharing the road safely with bicycles - campaign*	**Geoffrey Haines, Waka Kotahi NZ Transport Agency &** **Ali Raja, Mackie Research** *Streets for Tomorrow...Today*
2:24pm	**David Soole, Department of Transport and Main Roads – Queensland** *Perceptions of crash risk associated with speeding: a qualitative study*	**Rachel Harrison** **Clutha District Council** *What vulnerable people? Drive My Life-a community mentoring driving programme*	**Waldo Posthumus, Aurecon** *Using Virtual Reality to Guide Vulnerable Road Users Stakeholder Engagement*	**Dr Jamie Mackenzie, Centre for Automotive Safety Research, The University of Adelaide** *Using geospatial data to identify and prioritise locations of interest*
2:42pm	**Dr Sandra Mandic, Wellington City Council** *Approaches To Managing Speed in New Zealand's Capital*	**Maria Lovelock, Road Safety Education Ltd** *Evaluating RYDA's whole school approach to road safety education*		**Dr Jamie Mackenzie, Centre for Automotive Safety Research, The University of Adelaide** *Trial of a method to capture cyclist's use of infrastructure*
2:46pm-2:50pm		**Dr Ray Shuey, International Safety Foundation** *Coaching novice drivers to sustainable road safety*		
3:00pm	**Afternoon Break**			
	Exhibition & Catering, Exhibition Hall			

3:30pm	Policing & Speed, Conference Awards & Poroporoaki Farewell
	Auditorium
3:30pm	**Commissioner Andrew Coster, NZ Police** *Policing our Road to Zero*
3:50pm	**Anna Bray Sharpin, Waka Kotahi NZ Transport Agency** *A new approach to speed management for Aotearoa New Zealand*
4:10pm	**Questions & Answers**
4:15pm	**Conference Awards** **Presented by Dr Shane Turner, Scientific Chair, ARSC Conference** Best Extended Abstract/Paper by a New Practitioner Best Extended Abstract/Paper by a New Researcher Best Extended Abstract/Paper with Implications for Improving Workplace Road Safety Award • **Presented by: Prof. Judith Charlton** sponsored by NRSPP National Road Safety Partnership Program Policing Practitioner's Award sponsored by Alcolizer technology TRUSTED ALWAYS Road Safety Practitioners Award Peter Vulcan Award for Best Research Paper People's Choice Awards • Presentation that best met the conference theme • Best poster overall ○ presented by: **Assoc. Prof. David Logan** • Best Monash designed poster MONASH University ACCIDENT RESEARCH CENTRE
4:45pm	**Andy Foster, President, Trafinz (virtually)** *Farewell from Trafinz and Trafinz 2023 conference announcement*
4:50pm	**Dr Natalie Watson-Brown, ACRS** *Announcement of ARSC 2023 conference venue*
4:55pm	**Prof. Emeritus Ann Williamson, President Australasian College of Road Safety** *Closing words*
5:00pm	**Close of conference**

Extended Abstract Number	Author(s)	Topic	Title	Abstract
1	Johnson, M. Napper, R. Johnston, V. Corser, J.	Bicyclists Community Programs Road Safety Programs	How to successfully engage a community in road safety	Lack of community engagement in road safety issues has been a stubborn hurdle to achieving greater road safety outcomes. In this paper, we breakdown the four steps used to provide a detailed guide on how to develop and implement a successful road safety campaign that engages the community and achieves positive outcomes. The four steps were: 1) key stakeholder engagement, 2) community consultation, 3) campaign creation and delivery and, 4) evaluation. As this project was conducted in 2020/2021, we include how we managed disruptions caused by COVID-19. Key findings show the campaign successfully achieved the goal (humanise cyclists), increased understanding of safe behaviours and positive influence on attitudes about cyclists. While this project focused on cyclists, the insights can be used to improve community engagement in any area of road safety.
3 also Full Paper	Royce, B.	Intersections and Roundabouts Road environment	'Fix Crash Corner' – A Roundabout Story	In 2020, a new roundabout was constructed at the intersection of Church and Victoria Streets, Auckland. It replaced a 'Stop' controlled cross-roads junction with adverse crash history, nicknamed 'crash corner' by locals, with 54 reported crashes over 5 years. The constructed roundabout was the first 'Safe Systems – Vision Zero' design of its kind in New Zealand, being a fully raised roundabout with 4 pedestrian crossings. Independent crash analysis determined that the new roundabout had reduced reported crashes to ZERO. The 'lifetime' crash cost savings of the new roundabout were estimated at a Present Value of over $NZ10m. The roundabout also improved pedestrian amenity, upgraded access to public transport and local shops, encouraged modal shift, improved social well-being, and reduced carbon emissions. The project progressed from scheme to constructed within 6 months, and was selected as a finalist in the IPWEA NZ 'Asset Management Excellence Awards' (2022). https://doi.org/10.33492/JRS-D-22-00020
5 Oral & Poster also Full Paper	Alavi, H. Jones, C. Hunter, C.	Policy Development And Implementation Road Safety Strategy	Embedding Safe System in Victoria: Blockers, Enablers and Upcoming Activities	The Safe System approach was adopted in Victoria in 2004, and since has been the cornerstone of every road safety strategy and action plan, most recently the Victoria Road Safety Strategy 2021-2030. However, there is vast evidence that its insufficient embedment in our road and transport management system has stymied its potentials to save serious road trauma on our roads. To diagnose why the Safe System implementation gap exists and how road safety management system and stakeholders could be enabled to do so, five workshops were delivered by HA consulting and Road Safety Victoria (RSV) with over 60 representatives from several stakeholders. Survey participants identified a high personal alignment to the Safe System principles but identified a range of practical day-to-day blockers, and suggestions for what could enable better decision making. By understanding why the gap exists, a reform roadmap of project level concepts has been developed to address gaps. https://doi.org/10.33492/JRS-D-22-00022

6	Se, C. Champahom, T. Jomnonkwao, S. Ratanavaraha, V.	Motorcyclists	Fatal motorcycle crashes analysis in Thailand: Accounting for unobserved heterogeneity	In 2016, motorcyclists were about 74% of the total deaths due to road crashes in Thailand. Using motorcycle-crash data in Thailand from 2016 to 2019, this study explored the effects of wide ranges factors including rider actions and characteristics, roadway characteristics, environmental and temporal characteristics and crash characteristics on fatal motorcycle-crashes using random parameter binary probit with heterogeneity in means and variances. The results show that fatal-motorcycle crashes were highly associated with factors such as male riders, riding with pillion, speeding, improper overtaking, fatigue, flush/raised/depressed median road, grade road, U-turn, bridge, wet road surface, nighttime, lit/unlit road, weekend crash, hitting large truck and head-on crashes. These findings could be used as guideline for policies formulation to mitigate or reduce motorcyclist fatality rate.
9	Kaye, S. Nandavar, S. Oviedo-Trespalacios, O. Yasmin, S. Lewis, I.	Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Drivers’ knowledge of Advanced Driver Assistance Systems	This study examined a sample of Australian drivers’ knowledge of Advanced Driver Assistance Systems (ADAS). The study also assessed what information drivers sought about ADAS prior to purchase, and how drivers learned about these systems after purchase. Drivers (N=217) who had purchased a vehicle with ADAS within the past five years were invited to complete a 20-minute online questionnaire. The findings revealed that over half of respondents (56.0%) did not seek out information about ADAS prior to purchase. After purchase, learning about ADAS via the owner’s manual and trial-and-error were the most reported approaches. Car manufacturers were ranked first most often by participants as to who should be responsible for delivering information about ADAS in Australia. Further, and on average, participants reported that they would be unlikely to engage in risky driving behaviours (e.g., removing hands from steering wheel, taking eyes off road) when using ADAS.
10	Swain, R. Kaye, S. Rakotonirainy, A.	Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Sharing AV intended pathway may help during silent failures	Drivers of conditional (SAE Level 3) automated vehicles (AVs) are expected to stay alert at all times when driving in case of system failure. However, little information is provided to the operator as to what the intended maneouvres are of conditional AVs. An online experiment was conducted to observe whether participants (N=394) would be able to ancitipate safe and unsafe manoeuvres if a pathway heads-up display were overlayed in an image. This shared pathway showed the intended manoeuvre of the conditional AV. The results showed that participants anticipated both safe and unsafe manoeuvres correctly 87% of the time. Self-report ratings of trust in the conditional AV were significantly lower when participants obversed unsafe projections compared to when obversing safe projections, showing evidence of trust calibration. These findings highlight the potential of shared pathway heads-up displays (HUDs) to calibrate trust and help AV drivers anticipate silent failures.

11	Gauld, C. Bartlett, A. Reeves, C.	Young Drivers Distraction & Inattention	Normative influences on illegal smartphone use among young drivers	Illegal smartphone use among young drivers contributes to a substantial number of road crashes. Studies have suggested that norms (e.g., descriptive, injunctive) influence this behaviour; however, the relative influence of the various norms is unexplored. The current survey study (*N* = 137) utilised an extended Theory of Planned Behaviour which included four distinct types of norms: subjective, injunctive, descriptive, and moral. The aim was to identify which norms are most influential on illegal smartphone use (both intention and behaviour) among young drivers aged 18 to 25 years. Hierarchical regression analyses found that, overall, the extended model accounted for 70.3% of variance in intention. Of the normative constructs, injunctive norm and descriptive norm were significant predictors of intention. Injunctive norm and intention were significant predictors of behaviour. These findings suggest that injunctive and descriptive norms be the foci of social norms interventions aimed reducing illegal smartphone use among young drivers.
12	Beer, K. Smith, G. Rogers, L.	IRAP, AusRAP, etc. Road Safety Audit and Road Safety Review Road Environment	Star rating for road safety audits	Road Safety Audits (RSAs) and the International Road Assessment Programme (iRAP) methodology both have the same overall objective: to reduce road trauma, yet the two approaches are different. RSAs are a formal, systematic and detailed examination of road safety concerns by an independent and qualified team of auditors. RSAs leverage the knowledge and experience of these auditors and only present issues the auditors believe present risks to the travelling public. The iRAP methodology is a highly standardized, data and evidence driven process that produces quantifiable safety metrics such as star ratings and investment plans. By combining the RSA methodology and the iRAP methodology, the advantages of each approach can be amplified, and the limitations of each can be minimized. We refer to such a syncretic combination as Star Rating for Road Safety Audits (SR4RSA).
13 Poster	Love, S. Kannis-Dymand, L. Davey, J. Freeman, J.	Driver Psychology Hazard Perception Driver Risk	Metacognitive Rumination and Road Rage: Driver Anger Progression and Expression	This study investigated the relationships between metacognitive beliefs, anger rumination, trait driver anger, and driver aggression in a sample of Australian drivers (N = 246). Firstly, frequencies indicated that nearly all drivers engaged in verbal driver aggression (94%), approximately half of the drivers engaged in vehicle aggression (53%), and a quarter of the drivers engaged in physical aggression (27%). Driver aggression was more common among males, open licensed, and middle-aged drivers. Path analysis indicated that that metacognitive beliefs influenced cognitive constructs such as anger rumination and constructive expression. Additionally, such factors were shown to more prominently influence trait driver anger, and the degree to which it was expressed. Bivariate correlations also demonstrated that the relationships carried forward to more specific dimensions of anger rumination and driver aggression styles. The findings of this study may assist to identify the origins of psychological mechanisms involved with anger progression and expression.

15	Miller, E. Russell-Weisz, L. Pettet, T. Smithson, A.	Road Safety Strategy Road Safety Programs	Demonstrating the development of Local Government road safety management systems.	The role of Local Government in road safety has never been more crucial. As new guiding strategies come into effect both nationally and in Western Australia, it is acknowledged that the sector needs to be better engaged and resourced to achieve the vision of zero deaths and serious injuries. WALGA's RoadWise Program has developed a demonstration project to assist Local Government on this journey. Based on current international best practice in road safety management, in particular the International Standard for Road Traffic Safety (RTS) Management (ISO 39001) and associated materials, this project sought to work with a pilot Local Government to create a tailored road safety management system. Having such a system in place would show that the Local Government leading this demonstration is prioritising efforts and resources to guide their road safety actions, in working towards the elimination of harm from use of the road system.
16	Tran, D. Dong, H. Carpenter, L. Santoboni, G. Spissu, E.	Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Implications of Safety Performance Functions on predicting high-speed highways' crashes	Hot spots and crash trends can be monitored through the Road Injury Crash Index (RICI); the ratio of severe crashes to vehicle miles travelled (VMT). Although RICI is widely accepted as an effective measure of road safety performance, it cannot explain "why" crashes are occurring. We investigate the contributing factors to severe crashes through the application of the Safety Performance Function (SPF). In particular, we developed alternative SPF models with linear and non-linear kernels to estimate severe crashes for a subset of highway segments within Northern Virginia. Overall, our results align with prior findings that annual average daily traffic (AADT) and segment length contribute to severe crashes. We also identify behavioural factors, such as driver distraction, alcohol usage, and speeding, as the most significant causal factors for severe crashes. Our findings have methodological and strategic implications on the way local and municipal road operators can monitor and reduce severe crashes.
17	Moon, W. Maliki, R. Sobhani, A.	Speed, Speeding & Travel Speeds Road Safety Strategy Road Environment	A Step Change - Network Speed Intelligence	In order to achieve our 'Zero by 2050' target, a step change is required; this paper proposes that network wide speed intelligence, on a point to point basis, is that step change. The implementation of this concept will deliver Victoria with a world-first capability to understand and manage mobility across an integrated road transport system, as well as numerous significant benefits beyond safety, such as rural freight movement logistics, network operation improvements, urban livability, and meeting transport sector emission targets. The approach is to provide access to reliable, current, and readily accessible network wide speed data on a flexible point to point basis. Closing the gap towards zero deaths and serious injuries by 2050 necessitates today's innovation for tomorrow. Once established, Australia can become a global leader in Safe System network system design.
20	Otsogile, M. Motlhajoe, G.	Safer Transport & Mobility Vulnerable Road User Safety Road Safety in Developing Countries Driver Risk	Tsela Tshweu	Despite increasing motorisation in Botswana, the donkey cart and bicycle are still the main means of transport in the rural areas and is used on a daily basis for transporting children to and from schools, community members to work, clinics and farms as well as for basic livelihoods such as access to access water, fuel wood. However, Increasing motorisation, combined with some inadequately maintained infrastructure, has made these transport modes unsafe, in both urban and rural areas, and worse, the needs of these road users are routinely omitted from the designs of road improvements as most of the roads have no special provision for donkey carts and bicycles ,making their users vulnerable. In the last four years, about 299 road crashes involving donkey carts were registered because the donkey carts were not visible .SORSA hence implemented a project dubbed Tsela Tshweu which attempted to redress this problem.

22	Soole, D.W. Anderson, W.	Speed, Speeding & Travel Speeds	Perceptions of crash risk associated with speeding: a qualitative study	While the relationship between speed and crashes is well established, there remains considerable public and political debate regarding these risks, particularly in relation to low-level speeding. This study involved focus groups (n = 39) with Queensland motorists to examine the determinants of risk perceptions associated with speeding. Results showed that while the speed-crash risk relationship is well understood, many continue to perceive the risks associated with low-level speeding as “manageable” and crashes to be more contingent on other factors. Decision-making processes regarding risk perceptions were influential on subsequent behaviour, such that participants who focused primarily on the probability of a negative consequence occurring (risk susceptibility) were more likely to report lower risk perceptions and greater speeding, compared to those who focused primarily on the severity of the negative outcome (risk severity). Cognitive biases were regularly used to justify speeding and manage paradoxes between perceptions and behaviour. The research highlights the difficulty of effectively conveying information about the risk of speeding to motorists and provides recommendations for enhancing this message.
23	Napper, R. Johnston, V. Johnson, M.	Intersections and Roundabouts Road design	Mobility Kit: the toolkit to help improve road safety	All road safety work involves talking about complex interactions on the road but as road safety professionals, we do not have a toolkit to help us clearly communicate and engage with stakeholders. Our typical workaround is a scribbled drawing or using pens and mobile phones to represent different road users and ‘drive’ or ‘ride’ them across the table. While these approaches help clarify scenarios in a meeting, it assumes everything magically fits imaginary roads. It fails to communicate the specifics of three-dimensional road interactions, time, or the road rules. In response to this, we have developed the Mobility Kit using scaled LEGO elements to represent roads and people across different modes. Also included is a deck of road rule cards, created to explain Australian road rules related to common scenarios. The coherent, cost effective kit is currently being tested with plans for release to road safety professionals and the community.
24 Poster	Johston, V. Napper, R. Taylor, W. Johnson, M.	Bicyclists Communication and Media Education – general and other	Making the road rules clear and simple: turning left	There is a high level of confusion and misunderstanding among drivers and cyclists in Australia about road rules that relate to cycling. The negotiation of left turns, that is when a driver is turning left and a cyclist is continuing straight, has been identified as particularly complex and confusing. We explain how taking an interdisciplinary approach– from law, design, and road safety – has enabled us to create key road safety messages that are clear and simple about the negotiation of left turns. Legal, road safety and design research was combined in an iterative development process which resulted in the production of an infographic poster, ‘This is Turning Left’. The infographic accurately presents road rules applicable to left turn negotiations in the context of design and road safety issues that affects how drivers and cyclists experience this negotiation in practice.

25 Oral & Poster	Alavi, H. Mayuga, K. Gorris, T. Xu, F. Paala, M. Gerochi, H. Ponce de Leon Valdes, M.	Bicyclists Road design	Historic Rollout of Bicycle Infrastructure in the Philippines	Several hundred kilometers of bicycle lanes and infrastructure have been built in the metropolitan areas across the Philippines as a part of this unprecedented action to promote active transport. A good part of the implemented bicycle lanes have road and pavement marking and are separated from traffic by temporary or permanent devices. This exciting, nationwide active transport program was led by key governmental bodies as a part of the Government of the Philippines (GOP) active transport legislation, i.e., the Bayanihan to Recover as One Act (Bayanihan II). To support the GOP implementing the active transport program, the World Bank (WB) provided Technical Assistance to ensure the program outcomes were aligned with international best practice and the Safe System approach. The WB took up this engagement to support the Philippines' Government amid COVID-19 and public transport disruption, to facilitate post-COVID-19 recovery through green, safe, and inclusive active transport as the preferred way of mobility.
26	Hidayat, E. Lange, D. Karlovsek, J. Kim, J.	Crash Data Analysis Road Design Crash Data Collection Statistical, Epidemiology and Other Road Safety Research	Variables Affecting Vehicle Collisions in Australian Road Tunnels	In the existing literature, studies about road tunnel safety appear only in particular countries and discuss particular topics with limited information on Australian road tunnels. This paper aims to elaborate on the characteristics of vehicle collisions and investigate affecting variables on casualties and types of vehicle collisions. Data was obtained from Transport Main Road (TMR) Queensland and Center for Road Safety (CRS) New South Wales for seven road tunnels with lengths greater than one-kilometre. The analysis method includes statistical descriptive, cross-tabulation, and logistic regression. It found the most common type of collision in Australian road tunnels is a rear-end collision. The variable of speeding has a significant impact on the number of casualties. While vehicle types, vehicles involved, and speeding are variables affecting types of vehicle collisions. This paper supports tunnel designers and tunnel operators in developing a prevention strategy and policy development to make safer road tunnels.
27 Oral & Poster	Alavi, H.	Pedestrians	A Vision Zero Pedestrian Network Safety Planning Approach	Australia's National Road Safety Strategy 2021-30 has set national actions to develop network safety plans to prioritise most impactful road safety treatments.No rigorous method is available to develop pedestrian network safety plans in Australia or New Zealand. This stops us from developing effective pedestrian safety infrastructure and speed management action plans to chieve zero pedestrian serious road trauma. We have developed a thorough pedestrian network safety planning method, which currently being applied in a couple of jurisdictions. This paper is to introduce the method and its development process, and the findings and results of its application in national and international jurisdictions will be discussed in future road safety events.
29	Stephens, A.N. Newman, S. Young, K.L.	Driver Psychology Hazard Perception Driver Risk Community Programs Road Safety Programs	The Reducing Aggressive Driving (RAD) program	Aggressive driving is a road safety issue, with angry or aggressive drivers having similar odds of crashing as when they are impaired or distracted (Dingus et al., 2016). The Reducing Aggressive Driving (RAD) program was designed to support drivers to avoid anger or aggressive driving. The RAD is a two-hour online group-based program that helps drivers to understand what makes them angry and the risks associated with anger and aggression. Facilitated group-led discussion, provides a forum for each participant to develop personal, realistic strategies to deal with their own anger before it turns into aggression. Evaluation of the RAD has demonstrated the effectiveness of this approach in reducing self-reported anger tendencies while driving, as well as lowered frequencies of self-reported aggressive driving. In addition, benefits of the RAD have been observed beyond the driving context. Thus, the RAD program has demonstrated potential to improve road safety through the reduction of dangerous aggressive driving.

30	Mooren, L. Grzebieta, R. Dinh-Zarr, B. Shuey, R. Williamson, A.	Road Safety Strategy Statistical, Epidemiology and Other Road Safety Research Methods	Road Safety Epidemiology for the Safe System Approach	Australia and many other jurisdictions have been served well with the Haddon Matrix. Using this method to analyse crash data has enabled effective strategies since the 1970's resulting in a steady downturn of road fatalities. However, because it relies on injury and fatality data it must be questioned whether it is sufficient for a strategy underpinned by the Safe System Approach. As the name suggests road safety advancement is increasingly calling for a more systemic and dynamic analysis of road trauma risk factors. Psychologists like James Reason and many others have developed injury factor analysis tools that have been applied in occupational and aviation safety. These approaches support the analysis of latent root causes – methods that have generally not been applied in road safety. Apart from work-related road safety, this kind of systemic analysis has largely been absent. This paper aims to make a case for taking a deeper analysis of road trauma data through the adaptation of practices being used in other injury sectors.
31 also Full Paper	Mandic, S. Hewitt, J. McMorran, R. Bruckner, A.	Speed, Speeding & Travel Speeds	Approaches To Managing Speed In New Zealand's Capital	Unsafe speed limits and high numbers of road crashes with injuries make Wellington roads unsafe, have high social cost, present a barrier to active transport, and limit mode choice for Wellingtonians. Nine speed management options were assessed using cost benefit analysis. Area-level permanent speed reduction was most effective for reducing road crash-related injuries. The best performing option had the 30 km/h speed limit for local streets and 40 km/h for arterial roads, with substantial crash reduction benefits (over $500 million, discounted over 40 years), albeit with high cost and relatively high vehicle travel time disbenefits. Incremental cost benefit calculations indicated that, depending on the total budget available, the most efficient options were permanent speed reductions at schools and the 40/30 km/h mix. Implementing variable speed limits around schools provided the lowest benefits and very low value for money compared to area-wide speed management approaches or permanently reduced speed around schools. https://doi.org/10.33492/JRS-D-22-00047
32	Truong, I.	Road Environment Road Safety Barriers Road Design Crash Data Collection	Bridge strikes in Victoria and NSW: trends and factors	Bridge strikes are costly, which can cause fatalities and injuries and incur substantial repair costs and traffic disruptions. This paper investigates bridge strikes in Victoria and New South Wales (NSW) using historical traffic crash data. Results show that, on average, there are 16.8 and 56 bridge strikes with casualties per year in Victoria and NSW, respectively. Fatal bridge strikes are much more frequent in NSW than in Victoria (i.e., 13 during the 2016-2020 period in NSW compared to 9 during the 2006-2020 period in Victoria). Results of the Chi-squared test show that bridge strikes tend to be associated with more severe outcomes, regional areas, high speed roads, heavy vehicles, and poor lighting conditions compared to other traffic crashes. While declining trends in bridge strikes in both Victoria and NSW are encouraging, future research should explore these issues in more depth and for more jurisdictions.

33	Sweeney, R. Meade, R. Smith, C. Kostecki, A.	Communications and Media Crash Data Collection	Development of Media Guidelines for Reporting Road Incidents	Road trauma happens unexpectedly and can impact how we view the world. It is normal for individuals involved to experience a range of upsetting thoughts, feelings and reactions following a road incident. This recovery process can be impacted by the way in which road incidents are reported in the media. Following a comprehensive literature review and consultations with key media and road safety stakeholders, Injury Matters developed Media Guidelines to empower media personnel to report road incidents in a manner that has a positive effect on road safety and supports those affected by road trauma. The Guidelines include eight core elements to consider when reporting road trauma; describing the road incident, language, interviews and consent, comments from experts, imagery, help-seeking information and looking after yourself.
34	Gaffney, J. Hovenden, E.	Crash Data Collection Crash Data Analysis	Identifying and Explaining Changes in Motorway Crash	Changes in context in how the road network is used over recent decades has altered the quantity, types and causes of crashes on all roads, especially on roads with high traffic demand such as motorways. Vehicles now drive closer together and often the required reaction is now less than the average headway between vehicles. Vehicles are now heavier, wider, and taller, and in heavy traffic, drivers' forward vision is greatly reduced. Dynamic traffic (nucleations, shockwaves) and environmental factors are of greater influence due to the changing context, making driver tasks more complex and elevating crash risk. These result in conditions beyond human and vehicle capacity. In light of this, new questions were asked of the crash data which identified changes in crash types over time, especially in multi vehicle crashes. There are opportunities for road safety strategies to be expanded to address this changing context.
35	Anderson, L. Love, S. Freeman, J. Davey, J.	Drug Driving Drug Testing	A Real-World Examination of Targeted and Randomised Roadside Drug Testing	This research examined the effectiveness of randomised and targeted roadside drug testing (RDT) operations to identify potential drug driving offenders. A total of 8 random operations and 8 targeted operations were conducted by Queensland Police officers in 2021. When operationalized randomly, 3.4% of drivers tested returned a positive drug result compared to the targeted testing which resulted in 25.5% of RDTs returning a positive result. The most effective indicators used to detect offenders are police intelligence (such as previous histories) and visual observations (e.g., tradesperson or indicators of drug use). The results highlight that targeted testing is an efficient use of a scarce resource. However, it is important to consider that this approach does not allow for the achievement and maintenance of a general deterrent effects.
37	Salmon, P. McLean, S. Coventon, L. Hulme, A.	Bicyclists Crash Data Collection	The Cyclists Reporting of Incidents Tool (CRIT)	Cyclist crashes and near miss incidents remain poorly understood. Further, anecdotal evidence suggests that cycling incidents are underreported and there is a lack data to support effective prevention. The aim of this study is to introduce and report on the initial dataset from a novel cycling incident reporting and learning system, the Cyclists Reporting of Incidents Tool (CRIT) app. Data reported from the first three months of the CRIT app by 319 registered users across Australia were analysed. In total, 59 incidents from 493 hours cycled were reported to the CRIT app. The overall incident rate was 120 incidents/1000hrs cycled, and reported contributory factors included the immediate road environment, driver behaviour, through to local councils. The findings demonstrate the utility of the CRIT app as an incident reporting tool and provide insight into the frequency and nature of cyclist crashes and near misses in Australia.

38	Woodward, M. Waldin, J.	Road Environment Road Safety Barriers Road Design Crash Data Collection	Bridge Crash Risk Screening	The risk of a serious or fatal crash is significantly greater at or near a bridge than on a typical road section. However, there has not been a standardised process to quantify the crash risk at structures on New Zealand roads. To achieve the safe system goal of a road system free of serious injuries and death, we must fully understand the factors that influence crash likelihood and severity. Through crash data analysis, reviews of past studies, and discussions with industry experts, WSP and Waka Kotahi have developed assessment criteria and an innovative methodology for screening networks of bridges. This standardised methodology identified hazardous structures on State Highway and local authority networks to prioritise safety improvements. Regional reviews with Structures Management Consultants determined that the tool provides accurate assessments of bridge crash risk and enables targeted spending to save lives and transform existing road safety approaches.
39	Moon, W. Taylor, F. Bishop, B. Corben, B.	Speed, Speeding & Travel Speeds Road Safety Strategy	Speed Change & Community Sentiment	Speed limit changes are often complex and contentious among stakeholders; yet Safe Speeds are a key component of the Safe System and a critical lever to achieve a harm-free road transport system. Community perception is often cited as a key factor impeding changes, however, gaining an accurate picture of community views is difficult with traditional engagement-led approaches. Under these approaches, communities are invited to provide feedback on proposed changes, potentially leading to a biased sample and, therefore, results. This paper expands on an approach used to support the Mornington Peninsula Shire Council's Safer Speed Trial of reductions in speed limits on 33 high speed roads. For the first time in Victoria, a representative sample of over 1,000 residents of the trial area were approached to understand their perceptions and views of the trial. This reduced survey bias, and provided unique and enlightening results that can guide future speed changes.
40	Le, J. Durdin, P. Keulen, M. Tang, J. Baththana, J. Ford, S.	Speed, Speeding & Travel Speeds Road Safety Strategy Road Environment	Transforming the NSW Road Network through Vision Zero Modelling	NSW has an aspirational road safety target of zero fatalities and serious injuries on its road network by 2056. To understand the implications of this target, a Vision Zero backcasting methodology was employed to define a Safe System future state for every corridor and intersection across the entire State and Regional road network. Sophisticated safety modelling showed that implementation of a complete Safe System future state under the Safe Roads and Safe Speeds pillars could prevent around 1,600 (42%) deaths and serious injuries per annum. Several shorter term strategic programs of interventions were developed to show what could be achieved within specified budgets through to 2030. The scenarios applied the latest techniques in road safety infrastructure program development using combinations of top-down and bottom-up approaches. The scenarios showed that 30 - 40% of the full benefits could be achieved for 10% of the total implementation cost.
41	Kortegast, P. High, A.	School Safety Heavy Verhicles - Trucks, Buses, Hazardous Materials	Improving Rural School Bus Safety	Over the last 5 years there have been 84 reported crashes related to rural school bus service in New Zealand. Yet little recent research has been undertaken on this activity on our high speed rural road network. New Zealand has significantly improved the safety of workers on our rural network through improved traffic management practices but provides little more than a small yellow school sign on the rear of a bus to protect our most vulnerable children in this same environment. This paper will cover recent research into school bus safety using a safe system approach and detail safety improvement options. With the rapid raise in peri-urban housing in New Zealand this safety issue needs addressing. This research supports the conference theme of 'Changing Today for Tomorrow' and will not accept the common response that this issue is too hard to solve.

42	Stefanidis, K. Truelove, V. Nicolls, M. Freeman, J.	Speed, Speeding & Travel Speeds	Speeding Varies as a Function of Exposure to the Behaviour	Speeding remains a major road safety issue, despite widespread efforts to combat the behaviour. An emerging body of research suggests that repeated exposure to speeding (e.g., via one’s peers or social and mass media platforms) can increase the likelihood of someone speeding themselves. However, the extent to which motorists believe that they are exposed to speeding across these sources, and whether this differs between speeders and non-speeders is yet to be investigated. This exploratory study examined: (a) perceptions regarding how often a sample of Queensland motorists (n = 628) were exposed to speeding behaviour via social media, mass media and their peers, and (b) whether their self-reported speeding behaviours varied as a function of exposure to this content. The findings revealed that participants believed they were exposed to speeding behaviour at least one-third of the time via these mediums, with exposure levels being significantly higher in speeders compared to non-speeders.
43	Haworth, N.	Scooters Personal Protection - Helmets, Cloything, etc.	Rider and non-rider knowledge of e-scooter rules in Brisbane	The Queensland Government introduced rules governing the use of shared and private e-scooters and other rideables in late 2018 but there has been public concern about compliance levels and observational evidence of low rates of helmet use by riders of shared e-scooters. This paper analyses online survey responses by 329 “riders” (who reported riding at least once per month in the last year) and 157 “non-riders” (who reported never having ridden an e-scooter) to measure knowledge of the rules by both groups. Riders and non-riders differed in their knowledge of rules regarding speeds and locations for riding e-scooters. Knowledge was high for rules related to mobile device use and drink riding. Despite low observed helmet wearing rates, knowledge of this rule was high.
44	Doecke, S. Elsegood, M.	Crash Reconstruction - including computer simulation Crash Data Collection Crash Data Analysis	Profiling head-on crashes using mass data and in-depth crash investigations	The aim of this paper was to provide a profile of head-on crashes in South Australia. Two complementary data sources were used: mass data, and data from in-depth crash investigations. The mass data showed head-on crashes are different to other crashes, in their severity, the characteristics of the locations where they occur, and the types of vehicles they involve. The in-depth crash investigations revealed that there were two distinct modes of head-on crashes; drift off path, and loss of control. Most involved a frontal impact, but some involved side impacts, or a side swipe. The majority of frontal impacts had a low overlap. The main contributing factors were a medical condition, fatigue, drugs, and speed. To prevent head-on crashes, uptake of lane keep assist could be encouraged, and wide medians or centre barriers installed wherever possible. The introduction of low overlap crash tests should be considered.
45	Moon, W. Jones, C. Corben, B.	Road Safety Strategy Policy Development and Implimentation	Pathway to Zero by 2050 – Wide Median Intersection Treatments	In 2004, Victoria adopted the Safe System approach. Victoria’s Road Safety Strategy 2021 – 2030 continues the State’s commitment to the Safe System to achieve zero road deaths by 2050. Wide Median Treatments (WMTs) were first used in Victoria during the 1980s as a means of controlling side-road traffic movements at intersections with high-speed, divided rural roads. Understandably, WMTs were not originally designed to align with the principles of the Safe System. To eliminate the risks of severe injuries and deaths at WMTs, the Victorian Department of Transport (DoT) has recently implemented a policy prohibiting new WMTs and seeking to transform existing WMTs with Safe System-aligned designs, using kinetic energy management as the principal design philosophy. This new policy, which aims to transform at-grade intersections on divided rural network, illustrates the concept of ultimate Safe System end-states that help to define the pathways to Zero by 2050 – changing Today for Tomorrow.

47	Dawber, A. Dawber, K. Kanongata'a, I.	Drink Driving Drug Driving Driver Psychology	Changing the Drink-Driving Culture: Evaluating the OFTR group intervention.	Impaired (Drink/Drug) driving remains a serious problem in New Zealand (NZ). In 2019 alcohol/drugs were a factor in 37% of road deaths (NZTA, 2021), with 47% being repeat offenders (Waters, 2013). Preventing recidivists from re-offending is likely to have the greatest impact on alcohol-related crashes (Roadsafe Auckland, 2001). One for the Road (OFTR) is a New Zealand (NZ) based group therapy intervention for repeat drink/drug drivers. Since 2008 this programme has been developed to achieve a best practice approach unique to NZ. Recently an online component has been developed to assist access. Attendees through the justice or licensing system. A rigorous matched control group evaluation (Waters, 2019) supported programme effectiveness with a 20.2% reduction in reoffending over 3 years, providing validation and an opportunity for and programme development. This presentation offers an overview of the OFTR group content and process, highlighting learnings regarding best practice in Drink Driver Rehabilitation.
48	Morrison, E. Watson-Brown, N. Rodwell, D. Kaye, S. Senserrick, T.	Novice Driver/Rider licensing Driver/Rider Training	Tasmania's New Graduated Licensing System: Introduction & Preliminary Findings	Graduated licensing systems (GLS) for new car drivers are known to be effective in reducing the high crash rate experienced by young novice drivers. Tasmania introduced a revised GLS in December 2020 with the aim to further decrease novice driver road crashes and related trauma. This presentation details the key changes and preliminary survey results from young people of eligible licence age (N=510) and parents (N=120) across Tasmania regarding their perceptions of the changes following their announcement but prior to full implementation. Most changes were well received, notwithstanding concerns that some young people would struggle to achieve the increased learner logbook hours requirement. Additional surveys are being conducted at 12 months following the changes to particularly capture the first year of the new learner stage and at 24 months for the first year of the new provisional stage, with longer term evaluations planned.
49	Beck, D. Dikranian, G. Mcintosh, A. Muniswamy, D. Suratno, B.	Motorcyclists Personal Protection - Helmets, Cloything, etc.	Assessing the Safety Impact of Attachments on Motorcycle Helmets	Transport for NSW (TfNSW) commissioned research to assess the safety impacts of aftermarket camera and communications devices attached to motorcycle helmets, after finding that conventional impact (drop) test method specified in UNECE22.05 were not ideal to replicate head and neck injury risk likely to occur in a real world motorcycle crash. Testing was conducted at TfNSW's Crashlab using an oblique impact test, where test helmets hit a moving striker plate, which created a more biofidelic test. The use of an instrumented headform, rather than an external anvil, provided results that better reflected impact injury risk. This method was used to assess and compare injury risk across 220 different scenarios with selected helmets and attachments. The study found that attaching a device to a motorcycle helmet does not typically increase the risk of head or neck injury to the person wearing the helmet in a crash.

50	Morrison, E. Watson-Brown, N. Nhi Lam, G. Nguyen, T. Senserrick, T.	Novice Driver/Rider licensing Driver/Rider Training Community Programs	Community Engagement Regarding Graduated Licensing System Revisions: Tasmania's Experience	Tasmania introduced a revised graduated licensing system in December 2020. This presentation details the forward planning and steps taken to engage with the community in the lead up to the changes. A public education campaign was rolled out across social media, radio, and television. Correspondence was sent to affected licensees and other stakeholders and detailed webpages and fact sheets were developed. A dedicated email address was set up for comments and inquiries. While prepared for a large response, only 138 messages were received. Thematic analysis identified that most sought clarifications only, with few perceived as aggressive (n=12). Additional themes focused on communications and perceived contradictions, including financial concerns, accessibility concerns, particularly relating to employment, and perceived safety concerns (n=2). Evaluation of the outcomes of the changes is ongoing. This presentation will share Tasmania's overall positive experience and lessons learned regarding community engagement leading up to major policy changes.
51 also Full Paper	Thompson, J. Baldock, M.	Pedestrians Crash Data Analysis	Collisions involving older pedestrians and motor vehicles in South Australia	This study examines collisions between motor vehicles and older pedestrians in South Australia. Police-reported data between 2008 and 2017 were analysed, along with data from the state's major trauma hospital on admissions between January 2008 and November 2010 and June 2014 and August 2017. Fewer older pedestrians (65 and over) were hit by motor vehicles between 2008 and 2017 than pedestrians aged 18 to 64. However, they had higher rates of being seriously or fatally injured and those aged 75 and over had higher rates of being hit per 100,000 population. Older pedestrians were less likely than younger adult pedestrians to have consumed alcohol and be responsible for the crash. They were also more commonly walking on the footpath when hit. The two age groups of seriously injured pedestrians did not differ in injury severity, but older pedestrians were more likely to spend longer than 10 days in hospital. https://doi.org/10.33492/JRS-D-22-00039
52	Thompson, J.	Fatigue Crash Data Analysis Crash Reconstruction - including computer simulations	Prevalence and role of fatigue in South Australian crashes	This study explores the prevalence and role of fatigue in casualty and fatal crashes in South Australia. Data from two sources were examined: in-depth at-the-scene investigations of casualty crashes (2014 to 2019) by the Centre for Automotive Safety Research and coroner reports on fatal crashes (2014 to 2015). Fatigue-related crashes were identified through clear evidence (e.g., from crash participant/witness interviews, events preceding the crash). Fatigue contributed to 4.3% of casualty crashes and 11.5% of fatal crashes. Most fatigue crashes occurred during daylight hours, on high-speed roads, and midblock and most involved the driver falling asleep, departing their lane, and either rolling or colliding with a roadside object or oncoming vehicles. The most common risk factors for fatigue were long distance driving, no/reduced/broken sleep, illicit drug use, and abnormal work/sleep routines. Vehicle technologies (lane keep assist, lane departure warnings, drowsiness detection/warnings) could have prevented up to 79.3% of these crashes.

54 also Full Paper	Senserrick, T. Watson-Brown, N. Kaye, S. Oviedo-Trespalacios, O.	Young Drivers Novice Driver/Rider Training	Upskilling professional young driver instructors: what are we waiting for?	Decades of research and development to address the over-involvement of young drivers in road crashes has led to critical improvements in understanding and interventions, yet mostly focused on young drivers themselves or also parents. Driving instructors have a key role in the young driver safety system yet substantially less attention has been paid to their accreditation and professional development. This presentation showcases a series of research studies that show: (a) instructors seek and are willing and able to be upskilled in young driver specific training needs; (b) adept higher-order professional instruction improves young driver safety behaviour; and (c) young drivers currently lack adequate training in new vehicle features that can enhance their safety. This presentation will argue we know how to innovate and transform the driver training industry to improve young driver safety, yet current trends are working against rather than towards this. Now is the time to implement change. https://doi.org/10.33492/JRS-D-22-00054
55	Tan, T. Wundersitz, L. Stokes, C. Beer, K. Kloeden, C. Zlatkovic, P.	Community Programs Road Safety Programs	Practical Safety Interventions for Regional and Remote Road Safety	Approximately one third of Australians live in regional and remote areas but these areas account for two thirds of fatal crashes. Austroads commissioned a project to provide practitioners with guidance on evidence-based road safety interventions that can prevent fatal and serious injury crashes in regional and remote areas. A literature review was conducted to identify effective evidence-based road safety countermeasures for regional and remote areas, based on the Safe System pillars. Findings from this review and a series of workshops with stakeholders guided the development of a framework for prioritising these interventions and practitioner advice for implementation. An evaluation framework was also developed for evaluating implemented countermeasure effectiveness. Importantly, the project delivered factsheets designed for practitioners based on key road safety interventions/issues in regional and remote areas. Each factsheet contained a summary of the intervention, target behaviour and/or road user, application tips, implementation considerations, and intervention effectiveness.
56	Page-Smith, J. Bishop, B. Roffey-Mitchell, T.	Driver Psychology Driver Risk	Seeking Sensation: A segmentation study of Victorian Drivers	Traditional demographic data strata – age, gender, and location, have been used to inform and predict likelihood of specific road safety related behaviours among different groups. While this may give a broad picture of the person most likely to engage in these behaviours, it does not allow room for any nuanced understanding of behaviour. This study investigates segmentation of Victorian drivers using a psychometric sensation seeking scale, coupled with a set of attitudinal positions, to classify Victorian drivers into five segments (three law-abiding, two less so). Results from this study will be used to inform segmentation of Victorian drivers in other studies, and to inform and design interventions such as targeted communications for different segments.
57	Roberts, P. Meuleners, L. Fraser, M.	Cyclists Intersections and Roundabouts Road Design	Sharrow marking in roundabouts: A simulator study	Sharrows have been suggested as having the potential to improve cyclist safety within roundabouts. Sharrows are an advisory lane marking that consists of two white arrows with a bike logo below, located in the centre of a lane. The aim of sharrow marking is to reinforce that cyclists have the right to ride in that lane and to signal to cyclists that they should position themselves within the centre of the lane and claim the lane. This study utilized a bicycle simulator to compare roundabouts with and without sharrows to investigate if the presence of sharrows lead to such lane positioning by cyclists. The study failed to find evidence that sharrows induce cyclists to ride further towards the centre of the road than would otherwise be the case.

58	Elsegood, M. Mackenzie, J.	NCAP and Consurmer Testing Vehicle Crashworthiness	Development of a process to audit vehicle safety technology prevalence	To determine the prevalence of vehicle safety technologies in the active vehicle fleet, a process was developed and trialled in a small area of South Australia. In-vehicle cameras were used to capture number plates of passing vehicles while driving in different areas. The captured number plates were matched to vehicle makes, models, and manufacture years, then matched to ANCAP listed safety technologies. A preliminary mapping analysis showed the prevalence of vehicle safety features seemed to decrease as the distance from the city centre increased, based only on the limited sample. ANCAP 5-star-rated vehicle proportions detected in metropolitan areas and rural areas were 72% and 73% respectively, and as the vehicle manufacture year increased, so did the proportions of ANCAP 5-star ratings. A large potential exists for this process to be scaled to a statewide or national level.
59	Branch-Allen, J. Gillon, P.	Early Childhood Road Safety Road Safety Programs	When services close due to COVID, what do you do?	We have many vulnerable communities in Tasmania. We often see low literacy levels and hesitance to ask professionals for advice and or help. We also have many parents and carers who rely on child and family case services to look after their children while they work or participate in learning. In 2020, many services in Tasmania stopped. This submission discussed what to do when such services close.
62	Hedges, T. MacNeil, K. Smith, N. Beck, D.	Cyclist Motorcyclists Communication and Media	Road Safety Communications for Food Delivery Platforms and Riders	Food delivery riders provide many goods and services to the community, but can face risks when working on our roads. From 2019-2020, there were 74 food delivery rider casualty crashes on NSW roads, resulting in five food delivery rider fatalities (Transport for NSW, 2022). Of these fatalities, three were cyclists and two were motorcyclists. In December 2020 the Joint Taskforce: Food Delivery Rider Safety was established to address the increase in food delivery rider casualties in NSW and improve food delivery rider safety. Transport for NSW led the development of communications targeting both riders and food delivery platforms to educate and encourage the uptake of safer equipment and practices.
63	Jeter, G.	Road Environment Road Design Crash Reconstruction - including computer simulation	Potential applications of SafeView: A forward visibility model	A safe road system is one that allows users to clearly see and be seen by others. Unfortunately, some drivers may attempt to overtake other vehicles without a safe view ahead. This can result in high-speed crashes with a chance of serious injury and death. Intermediate Sight Distance (ISD) is the minimum sight distance required for an overtaking manoeuvre to be performed safely. The availability of ISD can be limited due to road curvature. Higher traffic volumes, especially heavy vehicles, increase the demand for overtaking and reduce the ability to do so. SafeView is a forward visibility model developed by Abley that uses geospatially-referenced data to classify where ISD is available along a road section. It could help to assess whether adequate overtaking opportunities are provided and to prioritise high-risk areas for treatment. This could reduce crash occurrence and severity, aligning with the Safe Systems approach and decreasing travel times.

64	Turner, S. Ariphien, H. Tanan, N. Shiddiqi, A. Martin, L.	Road Safety in Developing Countries Road Safety Across Cultures IRAP, AusRAP, etc.	Indonesian Road Safety Priorities and Analysis Tools	The road safety challenges in Indonesia are significant, given the large population, the high prevalence of vulnerable 2 and 3 wheelers, the poor state of many roads and the rapid motorisation. As with many LMICs the full extent of the road safety problem is difficult to measure from the historical crash data due to incomplete crash reporting. The new national road safety strategy 2021-2035 adopts the safe system approach and the United Nations road safety targets - in this second decade of action in road safety. This presentation will discuss the key road safety issues facing Indonesia in lowering the number of fatal and serious injury crashes. It will also discuss several road safety analysis tools and processes, including InaRAP, a blackspot analysis tool and a predictive analysis tool, that are now available to assist the agency in charge of the national highway network to effectively target road safety treatments.
65	Kelly, R. Filardo, L. Graham, R. Bruce, R. Ibsen, P.	Speed, Speeding & Travel Speeds	Reframing low level speeding - Casual speeding, every K counts	Speeding remains the biggest contributor to road trauma in NSW, contributing to around 41 per cent of fatalities and 24 per cent of serious injuries each year. However, despite acknowledging speed as a crash risk, few NSW motorists view their own speeding as a problem. There was therefore a need to develop a behavioural campaign to highlight the risks and consequences of speeding, even at lower levels. Research into NSW motorists' attitudes towards speeding, and NSW crash data, were used to inform campaign development and provide new, impactful key messages. The campaign – 'Casual Speeding: Every K Counts' – launched on 31 October 2021 – aims to reframe how drivers view 'everyday' speeding and encourage them not to speed, even at lower levels. Initial results show the campaign message is clear, believable and resonating with the audience, and is positively impacting attitudes and risk perceptions of lower-level speeding amongst campaign viewers.
66	Stranks, E. Harris, D. Turner, S.	Drink Driving Enforcement policy Development and Implementation	Alcohol-Related Crash Trends in New Zealand	The consumption of alcohol impairs driving abilities, increasing the risk and severity of crashes. Good quality data on alcohol-related crashes and interventions is essential for policy makers and researchers to inform decision making, and to refine strategies and tactics aimed at reducing alcohol-related road trauma. This research examined how 'fit for purpose' alcohol-related crash data and other associated data are in New Zealand, and studied trends in these crashes and their connection with contributing factors. The research focused on the period between 2010 and 2020, which spans several changes in drink driving policy and enforcement including the introduction of legislation in December 2014 to reduce the blood alcohol concentration limit for drivers aged 20 years and over from 80 mg/dl to 50 mg/dl. The research yielded several recommendations for improving the collection and reporting of alcohol-related crash and enforcement data and identifies areas for further research.

67	Veerhuis, N. Traynor, V. Kelly, R. Andrew, C. Coleman, M. Harada, T. Mundy, T. Murray, K. Pond, D. Randle, M. Rhee, J. Waitt, G.	Older Drivers & Road Users	Supporting older drivers with decisions about driving	Driving is important for both practical and psychosocial reasons, such as reinforcing feelings of independence and sense of identity (Sanford et al., 2018). Therefore, retiring from driving can lead to psychosocial declines, especially if it happens suddenly. Navigating conversations about driving with older adults to ensure the safety of themselves and others is often complex and emotive. Guided by co-design principles, a decision aid was developed to engage older drivers early and inform and support decisions about whether to continue driving, modify driving routines, or retire from driving. The aid was informed by multiple stages comprising academic review; consultation with expert advisory groups; piloting; and reiterative revision based on feedback. The majority of older adults found the aid 'useful' and would recommend it to others. The resulting aid offers a person-centred solution to support older drivers with decisions about driving, and contribute to enhanced psychosocial and road safety outcomes.
68	Turner, S. Sobhani, A. Wood, G. Allan, M. Baththana, J.	Speed, Speeding & Travel Speeds	Mornington Peninsula Speed Management Evaluation	The Mornington Peninsula Shire Council (MPSC) adopted safer speed limits across the Council's higher speed road network in early 2020, as part of their speed management program. This included reducing speed limits on the majority of their 100km/h and 90km/h roads to 80km/h. A before and after assessment has been undertaken on the effectiveness of this program using quasi-experimental methods. Before data was collected in November/December 2019. For both 'after' survey periods (in May 2020 and November 2020) there was a significant drop in mean speeds and an increase in the number of drivers travelling below the safe system speed of 80km/h. However, the compliance with the new speed limit was worse than with the old speed limit, indicating that further speed management interventions are required to encourage drivers to comply with the lower limits. The expected savings in FSI crashes were estimated using Elvik et al. (2004) speed-power curves.
69	Manoury, S. Templar, K. Irwin, R.	General Enforcement Enforcement Programs	A new level of intelligence to optimise enforcement	Optimising the efficiency of finite road policing resources requires sophisticated, high-quality intelligence. Victoria Police seeks to influence road user behaviour through a combination of specific and general deterrence. Victoria Police developed a strategically focussed Tasking & Coordination (T&C) model to inform a general deterrence response plan that incorporates best practice and active engagement with key Road Safety Partners. To support T&C initiatives, a sophisticated, multi-layered intelligence process has been developed to identify the state's highest risk areas. The analysis incorporates a people behaviour centric approach. This enables T&C to leverage local resources with state resources within high risk areas. The deployment methodology generates a highly visible policing presence focused on strategic policing priorities.

70	Brown, E. Black, D. Baker, L.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Workplace and Work Related Road Safety	Health in Gear: Improving Health and Wellbeing for Truckies	Truck driving is one of the most challenging jobs in the country. Not surprisingly, heavy vehicle drivers carry a higher burden of chronic disease, injury, and poor mental health, in comparison to other occupations. Truck drivers represent the second highest occupational group, after construction workers, at risk of suicide. The Health in Gear program is a health and wellness initiative for truck drivers, developed in collaboration with drivers, for the driving community. Health in Gear is an initiative of the OzHelp Foundation, a national suicide prevention organisation and has been funded by the National Heavy Vehicle Regulator's (NHVR) Heavy Vehicle Safety Initiative (HVSI). The program supports drivers in achieving optimal wellness through access to key information in accessible health tips. The program also includes the 'Truckies Tune Up' (TTU) - a physical roadside health check with follow up support, counselling, and referrals to other services as required.
71	Gunasena, M. Cipriano, F.	Crash Data Collection Crash Data Analysis Road Environment	Strategic Road Safety Analysis, in the context of the Great Ocean Road	The Great Ocean Road and Inland Routes in southwest Victoria, Australia serve as major corridors connecting several townships in the state. In the past five years, over 400 crashes were recorded along these corridors. In light of the Department of Transport's (DoT) commitments to the Victorian Road Safety Strategy and Road Safety Action Plan, there is a need to strategically assess these crashes to determine and prioritise road safety treatments and ensure federal funding is realised. Recorded crashes were mapped to determine where 'crash clusters' occurred. These clusters have three or more crashes with similar crash types where common treatments may apply. Site inspections were undertaken, and stakeholders engaged to determine areas of concern within their jurisdiction. Upon finalising the cluster locations, road safety improvements were conceptualised. Multi-Criteria Analysis was conducted for the treatments of each cluster to determine which treatment packages would be prioritised in the next 10 years.
73	Rahman, S. Baker, J. Jerrems, R.	Drink Driving Enforcement Technologies	The NSW Mandatory Alcohol Interlock Program and drink driving re-offending	Alcohol interlock systems have increasingly been introduced as a measure to address drink driving and alcohol related road trauma, which remain at stubbornly high levels. A growing body of evidence suggests that interlocks are effective in reducing drink driving reoffending while installed in the vehicle, but there is less evidence of their longer-term effectiveness, once the device is removed (Blais et al., 2013). This evaluation examines the effectiveness of the Mandatory Alcohol Interlock Program (MAIP), introduced in NSW in 2015, for high-range and repeat drink drive offenders. It considers the take up and completion rates for the program and its impact on drink driving reoffending, involvement in alcohol related crashes and drive whilst disqualified offences. The evaluation draws on a linked data set comprising licensing, crash and program data from Transport for NSW (TfNSW) and reoffending data from the NSW Bureau of Crime Statistics and Research.

74	Baker, J. Jacob, C. Rose, V.	Drink Driving Enforcement Technologies	Participant experiences of the NSW Mandatory Alcohol Interlock Program	Alcohol interlock systems have increasingly been introduced as a measure to address drink driving and alcohol related road trauma, which remain at stubbornly high levels. Evidence suggests that interlocks are effective in reducing drink driving reoffending while installed, but there is less evidence of their longer term effectiveness (Blais et al., 2013), or among Aboriginal people. Low participation rates in interlock programs are not uncommon. This evaluation will examine the Mandatory Alcohol Interlock Program (MAIP), introduced in NSW in 2015, for high-range and repeat drink drive offenders. It will explore participant and stakeholder experiences with the program, including Aboriginal participants, and aims to identify areas where the program can be improved to better achieve its objectives of making NSW road safer, while minimising negative impact on participants. The evaluation will draw on surveys, focus groups and interviews with key stakeholders and program participants, as well as program data.
75	Tang, J. Nguyen, L. Bui, H. Nguyen, Q.L. Sidik, M.	Speed, Speeding & Travel Speeds Road Safety Across Cultures	An Evidence-Based Approach to Reduce Speed in School Zones: Vietnam	Speed is a major contributor to road crashes in Vietnam – with particular risks posed to students in their daily commutes to school. This abstract aims to explore the impact of the Slow Zones, Safe Zones program – which utilizes a multi-faceted, evidence-based set of speed-reduction interventions to improve the safety of student journeys to school. Phase 1 of the Slow Zones, Safe Zones program was implemented by the AIP Foundation in Pleiku, Vietnam from 2018-2020 with broad support from a coalition of public-private stakeholders, including Fondation Botnar, Global Road Safety Partnership, Fédération Internationale de l'Automobile, and Vietnamese government agencies at the local and national levels. The program incorporates community and school-based education and awareness raising activities, road modifications, stakeholder engagement and capacity-building, and strategic policy advocacy – which has resulted in substantial improvements to the status of road safety at target school sites and across Vietnam.
76	Hartshorn, S. Wallace, C. Johnston, P.	Crash Data Analysis Crash Data Collection	Development of a ‘National Definition of Categorising Accidents’ code	Road crashes in Australia are classified differently depending on jurisdiction. While translatable across jurisdictions, having different crash codes makes national reporting of crashes more confusing than it needs to be. We therefore developed a new, standard set of crash types for analysing national crash statistics: the 'National Definitions of Categorising Accidents (N-DCA)' code. The new N-DCA code was developed from a review of the existing jurisdictional crash type codes, and incorporates 87 individual crash types, with an associated chart of descriptive images. We started with the Austroads 2015 DCA chart and added/removed codes to account for additional or duplicate codes between jurisdictions to produce the N-DCA. The N-DCA will be used as a consistent national standard for analysing national road safety data. This will support the implementation of the National Road Safety Strategy 2021-30 (NRSS 2021-30) and associated safety performance indicators and enable evidence-based investment decision on road safety infrastructure.

79	Byaruhanga, C. Evdorides, H.	iRAP, AusRAP, etc.	Analysis of crash/casualty unit costs used in investment appraisal models	The importance of crash/casualty unit costs in the economic appraisal of road safety countermeasures cannot be overemphasized. Accordingly, their computation has largely created debates and arguments among scholars. This paper analyses published unit costs in the most widely used road safety investment appraisal models. The results show that casualty unit costs computed using International Road Assessment Programme (iRAP) methodology are comparable to those recommended by the Economic Efficiency Evaluation (E3). However, the crash unit costs in SafetyAnalyst and E3 models are incomparable due to methodological differences in computing human costs. There are no differences regarding cost components in all models except iRAP model that does not include economic costs in their estimation and thus appears to be unrealistic and more so the methodology for computing the value of a serious injury. This paper recommends a more detailed methodological review of the iRAP approach to improve the accuracy of the results.
80	Beer, K. Yates, S. Moon, W.	Intersections & Roundabouts	Compact Roundabouts for Rural High-Speed Environments	Compact roundabouts for rural high-speed environments are a new form of treatment that present an opportunity to achieve high levels of Safe System alignment at lower costs. As a result, definitive design standards and values have yet to be produced. To support innovation, help ensure a coherent design approach and assist in understanding emerging best practice by using the specific example of the Lance Creek compact roundabout, we discuss the development of guidelines for compact roundabouts.
81 also Full Paper	Mandic, S. Flaherty, C. Mindell, J. García Bengoechea, E.	Bicyclists Road User Training - General (Bicylists, Workplace, OHS, etc.)	Adolescents' perceptions of long-term effects of cycle skills training	Cycle skills training (CST) courses have been designed to help young people develop the skills and confidence to cycle safely in traffic, but long-term effects of such programmes remain unknown. This study examined adolescents' perceptions of the effects of CST in primary and/or intermediate school on their confidence to cycle to school. Among CST participants, 32% reported that CST increased their confidence to cycle to school whereas 63% reported no effects. In a multivariate analysis, adolescents' perceptions that CST increased their cycling confidence were positively associated with cycling frequently with friends (odds ratio (OR) (95% confidence interval (CI)): 1.77 (1.24, 2.53)) and self-efficacy for cycling to school (1.25 (1.08, 1.44)). Adolescents who perceived increased cycling confidence from CST also had more favourable attitudes towards CST compared with their counterparts ('CST could make me safer in traffic': 70% vs. 32%; p<0.001). Further research needs to ascertain the long-term effects of CST. https://doi.org/10.33492/JRS-D-22-00031
82 Poster	Jaske, R.	Ambulance and Emergency Services	Introducing the new Collaboration for Ambulance Driver Development Australasia (CADDA)	When driving lights and sirens, ambulances present a significant and uncommon hazard for drivers. Therefore, paramedic driving educators have a central role in minimising paramedic-related road incidents, through proactive, accurate, timely and evidence-based training and review processes. Traditionally, such training and processes have been governed and implemented by each ambulance service individually; however, it is recognised that similar challenges and solutions may be evident across each ambulance service, and an opportunity exists to approach these challenges collaboratively. In response to opportunity, educators from across Australia and New Zealand have formed the Collaboration for Ambulance Driver Development Australasia (CADDA), to share resources and explore the development of an Australasian common standard approach to education of paramedic drivers, towards increased safety of paramedics and all road users in the Australiasian region.

83	Lindner, H. Clarkson, E. Vale, L.	Safer Transport & Mobility Community Programs	Redefining tomorrow for children with disabilities as road users	Over the last twenty years, we have seen little improvement in the way children with disabilities are transported in vehicles on our roads, with a literature review concluding they continue to be inappropriately restrained in vehicles. The vision of not-for-profit, Mobility and Accessibility for Children in Australia Ltd (MACA), is to change this. By applying a holistic, social model approach, MACA's aim is to advance the rights of children with disabilities and medical conditions to safe and accessible transport. This presentation will focus on how MACA is redefining tomorrow for this vulnerable and neglected road user group, by taking a cross-agency, collaborative approach to strengthening all parts of the system. The presentation will highlight advancements made to-date in research, standards, legislation/regulations, products and evidence-based information and training, and MACA's plans for a future where safe vehicle transport is accessible to all.
84	Ramezani, M. Bambach, M. Levinson, D. Moylan, E.	Drug Driving Drug Testing	Optimal Scheduling of Random Breath and Mobile Drug Testing	This paper proposes a strategic day-to-day RBT and MDT scheduling method to improve drink- driving and DUI general deterrence. The RBT and MDT scheduling is formulated as a constrained optimisation program that addresses where and when the tests should start and end. The objective goal reflects the perceived omnipresence of RBT and MDT and improvement in road safety. The constraints account for location capacity and equipment workforce requirements. In addition, the method ensures the tests are unpredictable, unavoidable and ubiquitous. The method results in a cost- effective deployment of RBT and MDT tailored for different locations and times. The paper draws out the implications for operations guidelines of RBT and MDT in Australia. The paper contributes to the data-driven development of a unified and systematic framework that efficiently connects high- level road safety goals to operations of RBT and MDT with limited enforcement resources to reduce road trauma and DUI-related accidents on roads.
85	Doukouris, K. Drinkwater, M. Marsh, F.	Road Safety Strategy Education – general and other	Safe System capability building during Covid in Aotearoa	Building capability and capacity in Safe System implementation is a key element of Road to Zero – New Zealand's Road Safety Strategy. Just as Waka Kotahi – New Zealand Transport Agency embarked on their biggest ever capacity and capacity building venture in road safety, Covid-19 was limiting in-person training. Safe System Solutions Pty Ltd worked with Waka Kotahi to develop interactive training courses that could be delivered via online formats, but still included fieldwork, collaboration, competency assurance and coaching/mentoring. While further evaluation is needed to determine the magnitude of capability improvement of this format compared to face-to-face, the reach and lower cost of the education rollout has meant that it will form an ongoing part of the capability and capacity-building program. This paper explores the design, application, and results from online Safe System capability and capacity building in New Zealand.

88	McKerral, A. Pammera, K. Gaulda, C.	Autonomous Vehicles	AVs & Anxiety: Resuming Control from a Simulated Automated Vehicle	Highly automated vehicles (AVs) offer an enormous potential benefit to the road safety environment. However, their impact is conditional on efficient human-system interactions during transitions of control when vehicle system boundaries are reached (takeover scenarios). We assessed situation awareness during takeover scenarios pre- and post-fatigue, and the relationship between the change in situation awareness and driver anxiety. Drivers required to monitor the AV during the fatiguing drive were shown to have significantly lower driving-specific post-drive anxiety, while drivers permitted to disengage from monitoring (and engage with non-driving tasks) showed no change in driving anxiety. Drivers' post-fatigue state-anxiety was found to predict change in situation awareness regardless of non-driving task engagement/supervising requirements. The results demonstrate the role of anxiety in critical takeover capacity and emphasise the importance of tailoring human-machine interactions to individuals. Finally, exposure to AV driving scenarios may reduce driving anxiety, but only in specific contexts.
90	Allan, M. Sobhani, A. Backman, A.	Intersections and Roundabouts Road Environment Road Design	Short-term Evaluation of Side Road Activated Speeds (SRAS)	Side Road Activated Speeds (SRAS) have been implemented across Victoria by the Department of Transport (DoT) as part of the Safe System Road Infrastructure Program (SSRIP) Investment Plan (IP) No 18 – Safe System Transformation of Intersections. An evaluation was commissioned to understand change in speed, reduction in conflicts and change in driver behaviour as a result of the treatment. The evaluation of these treatments was undertaken with a controlled before after (CBA) approach, using data collected at six treatment sites and at an additional six selected control sites. The evaluations outcomes will inform further decisions on the use or development of the treatment within Victoria. If these treatments are considered effective, then this may lead to additional rural intersections receiving the same treatment in the future.
91	Allan, M. Sobhani, A.	Speed, Speeding & Travel Speeds Road Environment	Evaluation of Phillip Island Speed Limit Reductions	The purpose of this evaluation was to determine the effectiveness of safer speed treatments on reducing speeds and lowering fatal and serious injury crashes in the Phillip Island locality. In November 2021, DoT implemented safer speed limits of 80km/h or less to replace the existing 100km/h speed limits on high speed rural sealed arterial and municipal roads across Phillip Island. The evaluation aims to collect speed data cross these treated sites and a subset of non-treated sites (to be used as controls) to assess the treatments effectiveness with the following measures: Speed reduction at each site (spot speed); Speed reduction along each route section (journey speed); Change in speed compliance along each route; Estimated reduction in FSI crashes for each route, using the above speed data collected as well as historic crash data.
93 Poster also Full Paper	Tse, I. Patel, A. McDonald, A. Blewden, M.	Pedestrians Road Environment Road Design	Auckland Transport's Mass Action Pedestrian Improvement Programme 2019	Auckland's road safety performance deteriorated significantly with death and serious injury crashes increased by more than 70% between 2014 – 2017. A crash trend of 20% of all pedestrian related crashes in Auckland occurred at existing zebra crossings at the time. Many of these at grade zebra crossings are on arterial roads. Under the Mass Action Pedestrian Improvement programme, safe system interventions of raised safety platforms were proposed. Significant concerns were raised about the appropriateness of such devices on our arterial and freight network corridors. Auckland Transport have undertaken both literature and field studies to determine the optimal profile and proceeded to upgrade more than 50 pedestrian crossings in 2018/19. This paper presents the results on speed and crash analysis at treated sites after 24 months. The results show a significant reduction in speed and zero death and serious crashes have been recorded at all the upgraded crossings. https://doi.org/10.33492/JRS-D-22-00057

96	Di Stefano, M. Zandegu, S. Kaysal, B. Mestroni, K.	Crash Data Collection Data Linkage Crash Data Analysis	Facilitating change: Road safety benefits of online medical report systems	A proportion of the Australasian driving community includes drivers with medical conditions and disabilities. During 2016, a major internal reform project identified that significant road safety data and process benefits could be achieved by introducing an online form into the medical review process. A multi-disciplinary working group adopted a modified co-design process supported by investigations of existing online systems to map user stories and end-to-end processes for establishing design specifications. Product development was shaped by agile, user-centred and action research methods. User group engagement (including medical practitioners/optometrists) contributed to prioritising prototype criteria, usability testing and post implementation feedback. In the last 12 months, the online medical report (OMR) has regularly exceeded 60 percent of all medical reports submitted. Data generated is supporting policy, program and service review to improve road safety: key considerations to support optimal project delivery are highlighted.
97	Guo, H. Keyvan-Ekbatani, M. Xie, K.	Crash Investigation – including investigation methods & technology Crash Reconstruction – including computer	Modeling Drivers' Evasive Behaviour with Deep Reinforcement Learning	It is critical to understand drivers' evasive behavior in safety-critical situations to develop advanced driving assistance systems for crash prevention and safety-aware microscopic simulation models. This study proposes a framework to learn both the longitudinal and lateral evasive behaviors simultaneously using deep reinforcement learning. A derivative of time to collision (TTC) in a 2-dimensional space is proposed and used to extract near-crash events from real-world connected vehicle data. A deep deterministic policy gradient (DDPG) model is developed to infer the underlying strategies of evasive behaviors and imitate them. The results demonstrate high accuracy of trajectory reconstruction and a great potential for practical use.
98 Poster	Vasisht, P. Silcock, S. Park, J. Amos, F. Singh, R.	Speed, Speeding & Travel Speeds	The journey of Auckland's proactive and innovative Residential Speed Management	Auckland's Residential Speed Management programme proactively prioritised 2380km (31%) of Auckland's residential roads for speed-related improvements. The network was divided into 446 areas, and analysed for quantitative (crashes, speeds, risk, land use, customer feedback) and qualitative elements specific to each area. The outcome clearly identified those communities in most need of intervention and those low-ranking areas where different approaches can be taken. It includes an accompanying GIS heat-map, and a model to automate prioritisation is also underway. A key element is the innovative monitoring regime covering crashes, speeds, volume, community perception, and active mode use. To date, speeds have reduced 20-30%, people feeling roads are safer has increased 68-76%, and increases seen in local walking and cycling. The programme realises three key benefits: a) proactive prioritisation b) robust prioritisation criteria, and c) area-wide speed-calming benefits. It provides a template for developing speed management plans in other regions.
99	Mackenzie, J. Ponte, G. Kloeden, C.	School Safety Speed, Speeding & Travel Speeds	Evaluation of Smart School Zone infrastructure in South Australia	This study presents an analysis into the effectiveness of a smart school zone system, installed outside a high school in Adelaide, South Australia. The system detects the presence of pedestrians within the school zone and then alerts any motorists who are approaching the zone at a speed greater than 25 km/h to 'CHECK SPEED' with a flashing message sign. The analysis compares vehicle speeds during periods when the message sign was not active to periods when the sign was active. Speeds were compared for three daily periods of interest; a morning pedestrian activity peak (prior to school), an afternoon pedestrian activity peak (after school) and an inter-peak (during school hours). The results indicated that the activation of the message sign was associated with speeds being reduced during the morning peak by up to 1.8 km/h along with more minor reductions during the inter-peak and afternoon peak periods.

100	Mackenzie, J. Kloeden, C. Elsegood, M.	Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Using geospatial data to identify and prioritise locations of interest	A literature review was conducted investigating how geospatial data can be used to identify and prioritise locations of interest in the context of road safety. The project then explored the practicalities of applying the identified geospatial techniques to real-world data from the Australian Capital Territory (ACT). Two common methods of applying geospatial analyses to crash data were identified, along with their advantages and disadvantages. An example of the practicalities of applying these methods to the ACT is presented, which includes details of how to adapt geospatial methods when data is not available in the necessary format. Geospatial analyses are shown to be powerful tools for road safety for identifying and prioritising locations of interest in large and complex road networks. However, to make use of the full potential of geospatial analyses, data must be made available in suitable formats.
101	Moon, W. Mihailidis, P.	Intersections and Roundabouts Road design	Modernising Intersection Investment Decisions	Innovative and transformational change is required to modernise intersection decision-making processes – it is critical that these processes include both efficiency and Safe System principles. Today's intersection decision-making software does not provide any guidance in accordance with Safe System principles, for example, at signalised intersections where death and serious injury are highly concentrated. Intersection efficiency software, however, is a highly valued tool used by every Australasian jurisdiction and most local government authorities. This paper argues that modernising intersection decision-making processes can be achieved by developing protocols that integrate Safe System principles, specifically using kinetic energy analysis, with intersection efficiency software used by practitioners, everyday, to significantly improve critical intersection type and design decision-making. Once established, Australia can become a global leader in safe intersection design and in the prevention of tens of thousands of avoidable deaths and serious injuries at Australia's urban and regional intersections over coming decades.
102	Mackenzie, J. van den Berg, A. Elsegood, M.	Crash Avoidance and Crash Severity Reduction	A review and comparison of light vehicle brake testing methods	Brake testing machines provide a rapid method of investigating the performance of a vehicle's brakes and assessing whether they meet roadworthiness criteria. However, it is important to have confidence in the results they provide. This study presents an investigation of the ability of four brake testing methods to detect mechanical or hydraulic faults on light vehicles. A test vehicle was professionally fitted with equipment to enable the control and measurement of the brake pressure applied to individual wheels. A brake pedal robot that could supply a repeatable and consistent brake application force was also installed. Data was collected during a series of tests in which brake fault conditions in the test vehicle were simulated. For each condition the vehicle was tested three times with a plate brake tester, a roller brake tester, a portable decelerometer, and during a high-speed stopping distance test. Results were compared to minimum brake performance criteria.
104 Poster	Bartels, J. Leckel, J. Garrard, J.	Bicyclists Early Childhood Road Safety Road User Training – General (Bicyclists, Workplace, OHS, Etc.)	Bike Ed pilots in Victorian schools - key learnings	The Department of Transport redeveloped the Bike Ed program to modernise the curriculum and extend Bike Ed to cover a wider Victorian audience. The redeveloped program now includes Years 1 to Years 8 students and an adult program. Pilots were conducted and evaluated at 10 schools across Victoria. Parents reported improvements in their children's riding knowledge and skills, and indicated high levels of support for the program. Parents indicated learning to ride was an important life skill and appreciated that it was being delivered by schools. Students reported high levels of enjoyment of the program, especially the practical cycling components. Teachers enjoyed conducting the program and reported substantial benefits for those who participated in the program.

105 Poster	Nguyen, H. di Tanna, G. Coxon, K. Brown, J. Keay, L.	Older Drivers & Road Users Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Older drivers and advanced vehicle technologies: what are their opinions?	Driving is the main means of transport for most adults in Australia and other high income countries. However, visual, physical and cognitive function needed for driving can decline with age. Advanced vehicle technologies (AVTs) have been developed to assist safe driving and may have particular application for older drivers. Unfortunately, there is little research on the opinions older Australian drivers have about AVTs available in the current vehicle fleet. Semi-structured interviews were completed on 13 older drivers living in NSW, Australia, with thematic analysis completed on all transcripts. Overall, an individual’s driving ability was regarded as more important for safe driving than AVTs despite an understanding and appreciation of their safety benefits. This sentiment, however, was limited to features deemed simple to use, with all participants voicing their hestiations about more complicated features. Additional costs associated with purchasing a car with AVTs was a barrier for their use.
106	Grzebieta, R. Rechnitzer, G.	Road Environment Crash Avoidance and Crash Severity Reduction	Hydroplaning: preparing today for tomorrow’s downpours	Hydroplaning is a phenomenon that can occur on wet roads where a motorised vehicle’s speed is such that tyres begin to rise up over the water film similar to water skis, resulting in the loss of frictional forces between the tyres and road and hence loss of vehicle control. Given Australia’s east coast recent large rain downpours and flooding and New Zealand’s expected future extreme rainfalls, it may now be timely to review Australia’s and New Zealand’s vehicle roadworthy laws concerning minimum tyre tread depth of 1.5 mm and the need for in-vehicle tyre pressure monitoring systems. This article discusses the relationship between tread depth and critical speed identifying when hydroplaning occurs. Two fatal injury vehicle crash case examples are discussed to illustrate the concern. Increasing minimum tread depth for roadworthiness compliance and automatic tyre pressure monitoring are recommended based on this study.
108	Nguyen, H. di Tanna, G. Coxon, K. Brown, J. Ren, K. Ramke, J. Burton, M. Gordon, I. Zhang, J. Furtado, J. Mdala, S. Kitema, G. Keay, L.	Community Programs Statistical, Epidemiology and Other Road Safety Research Methods Hazard Perception	Associations of vision impairment on crash involvement and driving cessation	Driving is a visually demanding task. Declines in vision can result in motor vehicle crashes (MVCs) and driving cessation. However, the global impact of vision on MVCs and driving cessation has not been comprehensively reviewed. This review aimed to investigate the associations between vision impairment and risk of MVC involvement and driving cessation and evaluate vision-related interventions to reduce MVCs and prolong safe driving. Searching Medline (Ovid), EMBASE and Global Health (inception to March 2020) identified 90 studies for inclusion after screening, data extraction and appraisals by two investigators independently. Visual field impairments increase the risk of crashing by 66% but cataract surgery can halve these risks. AMD, glaucoma or contrast sensitivity impairment increase the risk of driving cessation with anti-VEGF injections at high doses able to prolong driving in persons with AMD. Current literature, however, is heterogeneous and more high-quality studies from low- and middle-income settings is needed.

109	Stokes, C. Mongiardini, M.	Intersections and Roundabouts Road design	RJAWS Lite: A Low-cost, Technology-based Intersection Safety Treatment	Crashes at intersections contribute a substantial number of fatal and serious injuries in Australia. Regional and remote intersections are particularly dangerous for road users, due to high speeds and a widespread lack of safety measures beyond the minimum control and sight distance requirements. The high cost of additional safety treatments means they are often not employed, leaving a gap in road safety at many intersections. The rural junction active warning system (RJAWS) Lite has been developed as a low-cost, technology-driven treatment that will fill a need for evidence-based treatments at lower-volume regional intersections. RJAWS Lite is currently being trialled at six intersections across regional South Australia. Through this trial, we will demonstrate RJAWS Lite as a viable road safety tool that state and local government can employ from their toolbox of road safety treatments.
110	Wilson-Ridley, J. Norberg, T. Thompson, D. De Jongh, A. Brandeth, K. Proctor, T. Smart, P.	Road Safety Programs IRAP, AusRAP, etc. Crash Data Analysis	Applying road safety assessments in local government: proactive risk approach	Between 2015-2019 QPRC had 545 casualty crashes resulting in 699 road casualties, including 13 fatalities and 47 serious injuries.[1] QPRC identified safety of the road network as a key community priority in Council's Community Strategic Plan[2] where a community outcome for the transport network was to take safe system approach that allowed for safe ease of movement through QPRC. While reactive Federal and State programs[3] continue to provide QPRC with funding for addressing crash locations with countermeasure treatments, Council has three case studies to demonstrate efforts of applying proactive road safety assessments to identify crash risks, confirm treatment alignment with safe systems and utilizing results to inform proactive options analysis for funding applications. To achieve ambitious trauma reduction targets Local Governments are being encouraged to proactively manage their road networks[4]. Efforts to adopt a proactive approach of managing QPRC's road network, and the results, will be examined in this presentation.
113	Assi, G.	Personal Protection – Helmets, Clothing, etc.	Do women have heads of steel? A road safety paradox	A mixed methods study was conducted among women drivers in Chandigarh on wearing helmets while riding a two-wheeler vehicle. Theory of planned behaviour was referred for the theoretical framework. For data collection, triangulation of data was achieved through on road observations, semi-structured questionnaire and in-depth interviews (IDI). The questionnaire assessed behavioural intention, attitude, subjective norm, and perceived behavioural control. Observational study showed huge proportion of female riders as not wearing helmets while riding on a two-wheeled vehicle. Questionnaire revealed behavioural intention as a key factor for helmet usage while IDI's documented their reasons behind voluntary endorsing safety gear while riding a two-wheeler. The research draws to attention the much needed realization by female drivers on the significance of wearing helmets.
114	Elhenawy, M. Pascale, M. Lewis, I. Wood, M. Pinnow, J. Alderson, D. Rakotonirainy, A.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	The ICVP: A longitudinal study of C-ITS in Australia	Connected (or cooperative) intelligent transport systems (C-ITS) have the potential to increase safety by boosting awareness of the driving environment. In short, C-ITS delivers messages to the driver to alert them to potentially unsafe road conditions or unsafe vehicles within the immediate, or forthcoming driving context, via an in-vehicle display, the human-machine interface (HMI). The Ipswich Connected Vehicle Pilot (ICVP) was a field operational test (FOT) that tested the effects of C-ITS retrofitted into 350 participants' vehicles over a 9 month period. The ICVP explored safety impacts in terms of participants' driving behaviour as well as their subjective experiences via four questoinnaires, short interviews, and post-pilot focus groups. The C-ITS in the ICVP had several functions (use cases) that provided information related to intersections, congestion, road-hazards, road-works zones, and speed monitoring. The data indicated that there were positive and negative aspects associated with the C-ITS deployed.

116	Jeffcoat, A.	Road Safety Barriers Road Environment Road Design	Wide Centrelines, the Road to a Safer System	The Road to Zero, NZ’s Road Safety Strategy, targets a 40% reduction in Deaths and Serious Injuries by 2030. Within the context of a high-speed rural highway, head-on crashes account for a disproportionate number of deaths. median barrier is often the go to treatment and rightly so, with an expected reduction of 65% of high severity crashes (even as much as 90% reduction in head-on crashes) it is easy to see how this is the case. But how do we get to Median Barrier? Topography, narrow sealed pavements and frequent accesses often mean that it’s difficult and expensive to implement median barrier. Wide centrelines are an alternative to median barrier but are less effective and can result in projects having lower priority although they could be a considerable step towards a safe system environment.. So how does wide centreline fit into a Towards Zero environment?
119	Grapes, B. Durdin, P.	Road Design Road Safety Strategy	Simplifying and Improving Road Safety Benefit Calculations	Waka Kotahi, NZ Transport Agency has developed a tool for practitioners to consistently and accurately estimate death and serious injury reductions from road safety projects as projects progress from concept to construction. The tool is intended to reflect the true nature of road safety projects, which are rarely stereotypical in nature, and typically comprise multiple infrastructure components. The tool takes account of multiple infrastructure component, including those that overlap, those that are continuous or intermittent along a project length, such as roadside barrier at high-risk location, and those only at discrete locations only e.g. intersection treatments. Waka Kotahi promulgated guidance on the tool in September 2021 and instructed that it be used on all projects in the Road to Zero Speed and Improvement programme (SIP). The tool is helping practitioners, project sponsors and funders better understand the contribution of different infrastructure components and gain more confidence in safety benefit calculations.
124	Watson-Brown, N. Senserrick, T.	Young Drivers Novice Driver/Rider Licensing	A Higher-Order Instruction Framework for Learner Driver Training	Developing higher-order skills during the learner phase of driving is critical to safer outcomes for novice drivers. Higher-order skills are safety-critical driving skills that compensate for young age and driving inexperience known to contribute to young drivers’ overrepresentation in road trauma. There are no guidelines for professional instructors and parents to teach higher-order skills during the learner phase that are theoretically informed and empirically grounded. Based on naturalistic observation of learner driver lessons (n=110) and a survey of adolescent drivers (n=1,627), a framework was developed integrating Self-Determination theory and the Goals for Driver Education whilst considering systems thinking, i.e., the young learner driver does not learn to drive in isolation of the young novice driver road safety system. In a three-part framework, the relationship between trainer and learner, the content and strategies of higher-order instruction, and the context that influences learning are considered as interactive elements important to driver training.

125	Watson-Brown, N. Truelove, V. Senserrick, T.	Speed, Speeding & Travel Speeds Distraction & Inattention Driver Risk	Influencing self-regulation of speeding and phone use while driving	Self-regulation is critical to reduced engagement in deliberate and unintentional risky driving behaviours. This study examined what constructs influence self-regulation to better understand how to improve self-regulation of speeding and phone use while driving. Theoretically informed by self-determination theory, internal/self-regulation is important to sustain safe driving behaviours in the long term while external regulation impacts short term behaviour change. An online survey of Queensland drivers (n = 1,146) examined regulatory processes informed by self-determination theory in addition to variables theoretically suggested to be associated with regulatory processes such as risk perception, certainty of apprehension, and perceived legitimacy. Internal regulation was found to be influenced by a higher risk perception and lesser engagement in speeding and phone use while driving, while external regulation was influenced by a higher perceived certainty of apprehension. Nuances and similarities between speeding and phone use while driving inform generalised and specialised countermeasures.
126	Trawley, S. Stephens, A. McAuley, S. Speight, J. Hendrieckx, C. Vogrin, S. Lee, M. Paldus, B. Bach, L. Burt, M. Cohen, N. Colman, P. Davis, E. Holmes-Walker, J. Jenkins, A. Kaye, J. Keech, A. Kumareswaran, K. MacIsaac, R. McCallum, R. Sims, C. Stranks. S. Sundararajan, V. Ward, G. Jones, T. O'Neal, D.	Statistical, Epidemiology and Other Road Safety Research Methods Driver Risk	Real-world evidence supporting road safety guidance for insulin-treated drivers	Drivers with type 1 diabetes are advised to start journeys with glucose >5 mmol/L and to recheck after two hours. There is limited evidence supporting these recommendations. Glucose levels of drivers with type 1 diabetes were monitored for three weeks using masked continuous glucose monitoring. Eighteen drivers (median [IQR] age 40 [35, 51] years; 11 men) undertook 475 trips (duration 15 [13, 21] minutes). Hypoglycaemia (low blood glucose) did not occur in any trip starting with glucose >5mmol/L (92%; n=436). Thirteen drivers recorded at least one trip (total n=39) starting with glucose <5 mmol/L. Among these, driving glucose was <3.9 mmol/L in 5 drivers (38%) during 10 trips (28%). A >2 mmol/L drop was observed in 5 drivers (28%) within 20 minutes of trip start. These findings support current guidelines to start driving with glucose >5 mmol/L, and highlight that glucose levels may change significantly within 20 minutes.

127	Satz, A. Le, J. Ivens, P.	Road Environment Land Use & Urban Planning	Applying the Safe System Assessment Framework to	The Safe System Assessment Framework for Movement and Place Practitioners Guide has been prepared to provide guidance on physical design and management of treatments to improve movement, place and safety outcomes concurrently. It recognises that places designed through the single lens of
	Kohan, R. Lee, M. Schmid, C. Farrell, J. Cebuliak, B. Haasler, J. Keulen, M.	Safer Transport & Mobility	Movement and Place	capacity, or indeed road safety, may have unintended impacts for the liveability and enjoyment of a road or street. Integrating the NSW Movement and Place Framework with the Safe Systems Assessment Framework, the Guide provides planning practitioners with direction on improving place outcomes, to achieve a safe road and street environment for all customers.
128	Lu, J. Velde, F.	Hazard Perception Road Safety Strategy Intersections and Roundabouts	Sustainable Surrogate Safety Measures Collection in practice	The aspirational target of zero fatalities and serious injuries on our roads (Towards Zero strategy) cannot be achieved if we continue our reliance on historical accident rates to drive transport safety investment. Proactive surrogate safety measures that describe driver behaviour indicating safety risks play an increasing role in road trauma prevention. By applying computer vision (CV) and artificial intelligence (AI) techniques over high-resolution video, we could extract these metrics. We have successfully applied this method, at a commercial level, to evaluate the safety of cost-effective compact roundabouts, the safety of school crossings and the Perceptive Countermeasure (PCM) for motorcycles in rural roads. Road agencies have a role to play in enabling such data to be shared and the learnings to inform a coherent national strategy. A public data set and coherent industry-wide policy will support practitioners working in road trauma prevention.
129	Norberg, T. Hinton, M. Radford, I. Waugh, P.	Community Programs Road Safety Programs	Creating a positive road safety culture through community partnerships.	GMC is committed to implementing road safety into the Local Government Areas (LGA) through multi-sectorial partnerships. GMC Road Safety and Traffic Officer (RSTO) produced GMC Road Safety Action Plan 2021-2025¹, which was endorsed by Council, after researching local crash statistics², engaging with community on local issues and inspecting local road network. The Action Plan was designed to create a positive road safety culture in the community and to foster successful, multi-sectorial partnerships functioning across community. GMC is working towards this achievement by collaborating with Police, local community groups, local businesses and the community. Working together in cross sector partnerships has proven an innovative approach to road safety challenges, aiming to impregnate road safety into everyday life and ensuring the community take ownership. Programs were developed out of these relationships addressing numerous behavioral issues as well as network infrastructure problems and the presentation will cover examples of these programs.

131	Shaz, K. Storey, O. Bodzan, J.	(ITS - vehicles) Intelligent Transport Systems in Vehicles	Visualising In-Vehicle Data from the CITI Light Vehicle Study	Connected vehicle technologies have the potential to deliver road safety benefits by providing vehicles with mutual ‘awareness’ of other vehicles’ position and movement as well as exchange information with transport infrastructure. Transport for NSW’s Cooperative Intelligent Transport Initiative (CITI) conducted a
	Wright, C. Wall, J.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure		ten-month trial, where 45 community-based light vehicles were fitted with Cooperative Intelligent Transport Systems (C-ITS) and telematics devices to better understand the benefits and challenges of this technology. Each device collected millions of datapoints, including basic safety messages transmitted and received. Given the large dataset, researchers aimed to visualise and explore the relationship between driver ‘alerts’ and ‘events’ with driver behaviour and geospatial location data, focusing on the three different audio-visual alert types explored during the trial: Intersection Collision Warnings, Red Light Warnings, and Harsh Braking Ahead Warnings. Some limitations, such as data inconsistencies from the trial were able to be identified and visualised.
132	Van der Putten, S.	General Enforcement Enforcement Programs Penalty Systems	Advocating for an equitable road safety fines and penalties framework	Safety on the transport network is a high priority for Auckland Transport (AT) as expressed through its Vision Zero for Tāmaki MakaurauTransport Safety Strategy and Action Plan to 2030. Since 2018, AT has achieved positive results for its communities in reducing deaths and serious injuries. However, more remains to be done especially in the safety policy regulatory environment. For example, it has been more than 20 years since road safety fines and penalties framework was reviewed. Advocating for changes to the road safety fines and penalties framework (at central government level) is one of the recommendations made in the 2021 Report on Auckland 2018 Road Safety Business Improvement Review Implementation, written by international road safety expert, Eric Howard. With this in mind, AT has made advocating for changes to the road safety fines and penalties framework as one of its priorities for 2022.
133	Lewis, S. Tipping, L.	Motorcyclists Community Programs Road Safety Programs	Developing Cross-sectoral Partnerships between Local and State Governments. Motorcycle Initiative.	Multi-sectoral partnerships provide the opportunity to collaborate and share information, concepts, and resources. Developing and maintaining multi-sectoral partnerships across jurisdictions are especially important in road safety, particularly when developing new and untested initiatives, where there are complex road safety challenges, or when targeting a specific cohort of road users. The success of the Motorcycle CRASH Card is evidence of a collaborative and effective partnership between two jurisdictions attempting to resolve a complex road safety challenge for a cohort of road user which has traditionally been resistant to traditional safety messaging. This presentation will explain the development and implementation of the Crash Card by Hornsby Shire Council using extensive stakeholder engagement and outline the opportunities for collaboration between the Council and Victoria’s Department of Transport as it adopts the concept for a local audience.
134	Read, G. Wynne, R. Coventon, L. Sauer, P. Mitchell, T. Willems, G. Salmon, P.	Autonomous Vehicles	Learnings from a trial of an automated shuttle in Queensland	Automated vehicles are currently being introduced onto Australian roads. Automated shuttles are designed to provide short distance passenger services, including ‘last mile’ links between mass public transport hubs and user destinations. This study involved the evaluation of an automated shuttle being trialed on a public road in Queensland. Online surveys were used to collect shuttle user perceptions and shuttle dashcam footage was used to analyse traffic interactions. Overall, the findings suggest that while perceptions towards automated shuttles are generally positive, their presence, under trial conditions, may lead to undesirable behaviours from other road users and that behavioural adaptation may occur which may require changes to the road environments in which vehicles are implemented.

135	Frith, W.	Crash Data Analysis Road environment	SH22-Safety impact of LED Lighting on a previously unlit Section	In September 2011 a rural, 100km/h, 7 km section of SH22 was lit to V3 standard using LEDs. The lights dimmed after midnight to V4/V5 level. Previously, only some intersection flag lights existed. The study’s purpose was to detect any indications of a safety impact of the change. Injury crashes and rates were analysed five years before and after installation. All crashes and crashes not involving single vehicles losing control and crashes involving single vehicles losing control were analysed separately. The latter crashes tend not to reduce under lighting so may obscure positive changes in other crash categories. The study suggests a beneficial impact on road safety. being the sum of a positive impact on multi-vehicle crashes and a negative impact on loss of control single vehicle crashes. Multi-vehicle crashes, the main target group for lighting, were absent post-midnight before and after lighting. Lighting may not be required under such conditions.
136	Huda, L.	Speed, Speeding & Travel Speeds Community Programs	Changing the narrative around 30km/h speed limits	Lena Huda is founder of 30Please.org and safe-streets-to-school.org – these are grass-roots organisations that are campaigning for 30km/h speed limits in neighbourhoods. One key aim is to enable children to walk or ride to school without them having to worry to be hit by fast-moving cars. Lena will discuss a school pilot that took place in Wollongong in 2021/2022. It combined elements of a behaviour change programme to increase walking and riding to school with a social marketing campaign encouraging drivers to slow down to 30km/h voluntarily. Lena will give an overview of what strategies are used to engage with community and stakeholders to create a broader understanding of the importance of lower speed limits in urban areas. She will explore examples for partnerships, media and social media strategy.
137 Poster	Dioni, G.	Road Design Road environment	Should Apple Design our Streets for People?	Apple take an existing concept (computers, phones, music players) and make it user friendly. Their accessibility design guidelines promote the belief that everyone, regardless of their capabilities or situation, should have a great user experience. If this formula, which has worked pretty well for Apple, was applied to our public spaces and in particular our streets, would they not be more successful for people regardless of their capabilities, and be available to the widest audience? If everyone is so interested in the latest apple device, why are we as transport planners and designers not using best practice street design devices for our customers? If devices like raised priority crossings democratise our street space, help us to create walkable neighbourhoods, enable us to live locally, improve accessibility to opportunities, and allow people to engage in their communities for their social well-being, why are we not seeing more of them?
138	Suitor, M.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Other Vehicles - Tractors, Quad Bikes and SSVs, Machinery, etc. Workplace and Work Related Road Safety	Collaborating for success - the Load Restraint Education Project	The safe carriage of loads affects us all. Loose or incorrectly restrained loads become a growing area of concern in 2020, with a 49% increase in the number of load restraint breaches detected by NSW Police on local roads. The Load Restraint Education Project was developed to curb these figures. It focused on the safe transportation of hay bales, machinery and general freight. A multi-agency Project Steering Committee, comprised of members from the Councils along with NSW Police, NSW Farmers and Transport for NSW, oversaw the project's implementation. Strategies included; a pre and post online awareness quiz, how to videos and accompanying fact sheets, local case studies and a Load Restraint Village Tour. The project developed high quality collateral and saw grass roots community engagement. As a result, load restraint knowledge has increased, breaches have decreased by 69% and there were no load restraint incidents during 2021.

139	Smith, M. Muirson, M.	Road Design Road Environment	The last line of defence	Providing proper pavement markings, signs and delineation is the answer to lifting motorist's 'blindfolds'. Governments have taken large steps forward in the quest for the goals of a Vision Zero road safety strategy. The objectives identify targets for casualty reduction across a number of strategies, including infrastructure improvements, speed management, vehicle safety and road user choices. Recent trends in flat line budgets have resulted in a worrying development that is reducing the safety of the road user. The reduction in funds is impacting all elements of the road maintenance framework with serious consequences. Taking away the safety belts and braces (guide posts, signs and markings) needed by the motorist is like driving down the road with a blindfold on. Removing such essential information results in more crashes and trauma to our society. This paper explores how using the "belts and braces" approach can address road safety in the short term.
140	Dixon, R.	Bicycles Road Environment	Sharing the road safely with bicycles - campaign	Northern Beaches Council (Council) is experiencing high levels of traffic and parking congestion, with many complaints and requests from residents for Council to "fix it". With many residents living an active lifestyle, promoting bicycle riding as a feasible transport alternative to cars should be a reasonable option. However, the challenge is that there is not an adequate off-road connecting system of paths on the Northern Beaches, and many bike riders are reluctant to ride on roads for safety reasons. Council has introduced the 'Sharing the Road Safely with Bicycles' campaign to foster a respectful and safe sharing of the road, through raising awareness of road rules related to bicycles, and also to promote short local bicycle trips. This paper identifies the challenges for bicycle riders wanting to ride on the road, the basis of the campaign and the evaluation.
141	Grieve, F. Wild, K. McLean, R. Macmillan, A.	Bicycles Road Environment Road Design	Analysing media representation of bikelanes in Aotearoa New Zealand	Background and Method: Bikelanes are an important intervention for improving cyclist safety and community health. However, community opposition can be a barrier to implementing these projects. Media framing influences public perception of cycling projects, in turn influencing government policy. Our research aimed to examine the dominant themes in New Zealand newspaper coverage of bikelanes between January 1, 2018 and November 1, 2020. Results: There was a relatively even number of articles for and against bikelanes but, the anti-bikelane articles were more emotive and more strongly negative; while pro-bikelane articles tended to be more weakly positive. Bikelane opposition was primarily represented as being aimed at the government. Recommendations: Media reporting guidelines established, through legislation or industry self-regulation. Government and cycling advocates need to engage with the media about bikelanes in a way that reduces potential bikelash, shifting to advocating for bikelanes as a safety solution rather than as urban regeneration projects.
142	Thorne, R. Tedestedt George, C. Raja, A. Blewden, J. Mackie, E. Li, E. Mackie, H. Douglas, S.	Workplace and Work Related Road Safety Crash Data Analysis	Driving for work crashes - A systems analysis	Work related road safety is a government priority. A Safe System analysis of 300 driving for work (DFW) crashes was carried out, along with an exploratory socio-technical analysis of one significant case, to better understand the context around DFW crashes. The Safe System analysis showed three distinct crash types – 1) multiple vehicle crashes often involving work vans, utes, and SUVs in side impact crashes; 2) vulnerable road users often involving professional drivers; and 3) single vehicle crashes involving people driving vans or light trucks for work losing control on rural roads with fatigue, non-seat belt use, and speed often implicated. There were a range of unique characteristics of DFW crashes, in particular injuries to others who are implicated in DFW crashes but not DFW themselves. Socio-technical systems analyses show promise for understanding the context around DFW crashes, but arrangements for better data access, coordination and use are needed.

143	Wolter, J.	Other Mobility Transport - Scooters, Segways, Quad bikes and SSVs, Horses, etc.	Establishing micromobility national laws in multi-jurisdiction context	Australia has in place a ministerially approved national policy for the safe and legal use of Personal Mobility Devices (PMDs) on specific types of public infrastructure. Development of the national policy by Australia's land transport reform agency, the National Transport Commission, highlighted the challenge of achieving complete national consistency in a federal system of government where sovereign states each have exclusive responsibility for road use policy and regulation. The policy recognises the growing global popularity of PMDs as people look for more innovative, efficient and individualised ways to move around cities and communities. The increased public demand for PMDs had placed many Australian jurisdictions under pressure to introduce regulations that permit the legal use of these devices, which had previously been operating in an undefined and increasingly inconsistent regulatory environment, leading to increased safety risks.
144	Town, M. Beck, L. Lin, T. Brown, M. Brown, D.	Speed, Speeding & Travel Speeds Road Safety Programs	Long Term Speed Management Prioritisation	It is a challenging task to review the speed limits of more than a thousand roads over a wide-ranging transport network and to set up a long-term speed management programme in a consistent and efficient manner. By engaging with the community to understand their priorities and agreeing on criteria that is broader than just safety metrics, a prioritisation system can be developed to identify the roads that should have their speed limit reviewed first. These roads can then be reviewed spatially using a GIS portal to establish a speed management programme that can be used to implement change on a network-wide scale.
145	Harms, L. Harrison, C. Li, Y. Kennaugh, L. Pfisterer, U. Omoigui, A.	Community Programs Road Safety Programs	Facilitating lived experience story-telling in road trauma education programs	Working with people following traffic-related offences is an innovative part of Road Trauma Support Services Victoria's (RTSSV) community-based programs. Designed to promote awareness of the impacts of road crashes and behaviour change, RTSSV programs use trained volunteers to share their lived experience of road trauma with participants. However, there is little evidence to guide this lived experience engagement in such programs, and ongoing training and support. Using a mixed methods approach, we surveyed 42 RTSSV volunteers and of these, 23 participated in in-depth interviews. In this presentation, we highlight the key findings related to the motivation and benefits of sharing stories, along with the challenges of doing so and key areas identified for enhancing future training and support. Through describing the program and our research findings, we highlight the importance of lived experience in addressing future road safety.
146	Minchington, J. Grapes, B. Brown, M.	Intersections and Roundabouts	Temporary Roundabouts – Safe System Solution?	Temporary roundabouts are increasingly being used on the highway network and offer a low-cost traffic management solution to reduce the crash risk, reduce conflict points, lower intersection speeds, and improve the flow of turning traffic. This paper focusses on a temporary roundabout that was installed for a few months to facilitate the construction of a new bridge. The purpose of this project was to better understand the level of safety provided by a temporary roundabout through its operation, speed and geometry and refinements for potential application elsewhere.

147 Poster	Harris, D. Durdin, P. Stranks, E. Southey, J. Hughes, J.	Intersections and Roundabouts	A Proactive Methodology for Assessing Safety at Rural Priority Crossroads	In New Zealand, there have been several recent high-profile crashes at rural crossroads where a driver failed to observe a Stop or Give Way sign and travelled through the intersection at speed. This prompted Waka Kotahi NZ Transport Agency to analyse all rural priority crossroads in New Zealand to identify those intersections susceptible to this type of 'tunnel vision' crash. A literature review was undertaken to identify relevant intersection attributes which contribute to drivers mistakenly failing to detect a priority-controlled intersection. A geospatial methodology was then developed to identify and assess relevant intersection attributes for over 1,700 rural crossroads across New Zealand. Finally, statistical analysis was undertaken identify statistically significant attributes for 'tunnel vision' crashes and to develop a prediction equation to identify high-risk intersections. The results of this analysis are now being used to develop a treatment hierarchy for intersections within different risk profiles
148	Harris, D. Bunting, G. McAuley, I.	School Safety Road Safety Programs	Nationwide Assessment of Safety Around Schools in New Zealand	Currently, speed limits around many schools in New Zealand do not make walking and cycling an appealing mode of transport for travelling to school. To address this, an assessment of risk and operating speeds around schools was undertaken to help prioritise schools for speed limit reductions and supporting Safe System interventions. The first stage involved classifying schools as either 'urban' or 'rural'. Then school boundary risk, road network risk, and walk/cycle risk (for urban schools) were assessed. Current vehicle operating speeds around schools were then compared against 'desired' safe speeds. Finally the accessibility of urban schools was assessed by comparing actual walk/cycle mode share against theoretical walk/cycle mode share. A final prioritised list of 2,487 schools was generated by combining the different assessments. This information is now included in the guidance to help Road Controlling Authorities develop a programme of interventions to reduce speeds outside New Zealand schools.
149	Moylan, E. Ramezani, M. Kay, J. Levinson, D.	Pedestrians Intersections and Roundabouts	Interplay between intersection design, risky behaviours and pedestrian safety	Vehicle-pedestrian road trauma is a significant cause of concern with one in six road deaths being a pedestrian and about a quarter of pedestrian crashes occurring at intersections in New South Wales, Australia. Intersection design has historically favoured drivers over pedestrians. We explore how these design choices relate to risky behaviours and to pedestrian safety. The work makes use of historical crash data and video footage to analyse pedestrian and vehicle trajectories. Hypothetical designs are explored through microsimulation, and the safety risks are quantified with surrogate safety measures. Defining personas with distinctive behaviours supports a nuanced differentiation between road users. We preliminarily find connections between design choices and pedestrian behaviour, but unintended behaviours such as crossing against the light or outside the crosswalk are not significantly associated with increased safety risk. The results therefore suggest that designs favouring pedestrians best impact safety by increasing the number of pedestrians.

150	Dobson, O. Newnam, S. Carslake, J.	Road Safety Programs Policy Development And Implementation Road Safety Strategy	Evaluation of the National Road Safety Partnership Program	The National Road Safety Partnership Program (NRSPP) was created to bring together businesses, researchers, and government in a collaborative network and support organisations to improve road safety. This presentation will summarise findings from a program evaluation completed by the Monash University Accident Research Centre, measuring the program's activities, outputs and impact. The evaluation identified evidence that the NRSPP has increased its engagement in activities including knowledge production, advancement, and dissemination since its inception in 2013. Findings support the program's influence on key decision-makers, including government, external stakeholders, the research sector, and workplace organisations, as evidenced by reference to the NRSPP in policy papers, scientific reports, and stakeholder materials. Survey results additionally demonstrate the program's positive contribution to workplace health and safety outcomes (e.g. employee safety knowledge, workplace safety culture).
151	Mills, L. Truelove, V. Freeman, J.	Drug Driving Drug Testing	Motorists' Use of Facebook to Avoid Roadside Drug Testing Locations	This study explored the use of Facebook police location sites among a sample of 890 drug takers in Queensland, aged between 16 and 75 years (M = 27.41, SD = 13.32). One-quarter of the sample reported using Facebook police location sites, and 43% of these participants reported using them for the purpose of avoiding RDT. When comparing those who used the sites (for any reason) and those who did not use them, the former group reported significantly greater disordered drug use. Compared to those who used police location communities, but not for avoiding RDT, those who did use these sites to avoid RDT reported greater past offending and future offending intentions, greater disordered drug use and perceived the sites to be more accurate. The results suggest that how motorists use these sites is more important than whether they use them or not.
152	O'Neil, C. Grapes, B. Marsh, F.	Road Environment Speed, Speeding & Travel Speeds Road Design	Lessons from Implementing Road to Zero Infrastructure in New Zealand	Road to Zero (RtZ) is New Zealand's road safety strategy and aims to reduce Deaths and Serious Injuries (DSIs) by 40% by 2030, from 2018 levels. The RtZ Speed and Infrastructure Programme (SIP) was tasked to develop, design and deliver speed management and proven safety infrastructure interventions to help achieve approximately half of this target. Several challenges, successes and lessons have been learnt by SIP as part of the journey thus far including developing a deliverable programme, attaining funding for SIP projects and then implementing projects on a constrained network.
153	Posthumus, W. Hurley, J.	School Safety	Using Virtual Reality to Guide Vulnerable Road Users Stakeholder Engagement	The school engagements originated out of an existing partnership programme with Te Wharekura O Mauao. Tauranga City Council (TCC) Travel Safe Team valued the digital medium used to engage students and therefore wanted to extend the engagements to schools which will be impacted by the Cameron Road multimodel upgrade which is currently under construction. The target audience for these sessions are the school's local road safety team. These sessions will provide them with the opportunity to virtually 'walk' the upgraded environment which will allow them to understand the safety benefits they will experience, help convey the message, assist in preparing the school for the pattern changes and gain the most out of the improvements. Due to Covid constraints, the remainder of the sessions will be continued in Term 2. The value of these sessions can be further investigated during the opening weeks of the upgraded road.

157	Trumper, H. Crellin, S.	Speed, Speeding & Travel Speeds	Saving lives through safer speed	Waka Kotahi is seeking to reduce deaths and serious injury on its roads by reviewing speeds across the road network, as part of its Road to Zero policy. The programme divides the road network up into a number of corridors, which are individually assessed against technical criteria that support safe speeds.
				Outcomes from the safe speed assessments have been captured in feasibility assessments for these road corridors, and now the team are implementing detailed designs for many new safer speed locations in Northland and West Waikato. These corridors are to be consulted with local communities, and implementation is expected to commence once communities have had their say. This presentation looks at the process, lessons learned, and expected outcomes from this key safety programme.
159	Jannink, A.	General Enforcement Enforcement Technologies	Queensland Automated Enforcement: Changing Behaviour Today, Saving Lives Tomorrow	In July 2021, the Queensland Government and technology partner, Acusensus commenced the world's first automated seatbelt and mobile phone enforcement program utilising Artificial Intelligence. With more than 6,000 million vehicle images captured by the program per month, this whitepaper presents contemporary road safety data at a scale not previously available. Seatbelts represent a +50-year enforcement challenge, whereas mobile phones & smart watches are a more recent Road Safety issue. The data collected over the past 12 months through the Queensland program, and the capacity to change driver behaviour and compliance, represents one of the strongest cues to saving lives tomorrow. As an Australasian project with global implications for road safety, this program is an international first and is presented at the Australasian Road Safety Conference for the first time.
160	Gorell, R. Wilmot, A. Thompson, I. Ostoic, J.	Road Safety Programs Road Crash Analysis	Low-Cost Urban Road Safety Program, Western Australia	The goal of the Urban Road Safety Program (URSP) is to reduce road trauma on Perth's local road network, by implementing low-cost road safety treatments targeting high-casualty or high-risk locations on a whole of street or area-wide basis. Using higher order roads as boundaries, the Perth Metropolitan area was divided into 647 local neighbourhoods. Each was assigned two metrics; Casualty Crash Bias (a measure of whether an individual neighbourhood has more casualty crashes than expected given the layout of its roads and intersections) and Activity Attribute (based on amenities, providing a measure of Vulnerable Road User (VRU) interaction). These metrics were combined and the highest ranked neighbourhoods targeted for treatment. A geospatial data analytics platform, Low-Cost Treatment strategy and implementation Framework document have been developed to support the program. In collaboration with Local Government Authorities (LGAs), the program has progressed from a initial pilot to a multi-year fully-funded program.
161	Rowland, B. Davey, J. Stefanidis, K. Love, S. Mieran, T.	Drug Driving	Medicinal Cannabis and Driving: Managing Usage and Enforcement Avoidance Behaviours	A range of medicinal cannabis products are currently legally prescribed for various medical issues. There is considerable academic and political debate regarding the 'ethical' nature of current drug driving legislation for individuals prescribed medicinal cannabis in Australia. Exploratory qualitative research investigated medicinal cannabis users' knowledge and perceptions regarding managing cannabis usage and legislation associated with drug driving. Heavy users reported limited driving impairment compared to new/irregular users of medicinal cannabis. Users also managed consumption and driving, at times, minimizing potential impairing effects or police enforcement. Further, limited notification of the potential impairing effects of cannabis or related drug driving legislation were provided by doctors including the presence of warning labels on products. Further research is required to assess the level of impairment of various user groups, especially identifying factors associated with high-risk groups (i.e., new/irregular users) or driving situations, as well as inform future drug driving legislation.

162	O'Leary, J. Molloy, O.	Speed, Speeding & Travel Speeds Young Drivers	Effectiveness of anti-speeding messages on young drivers' speed management behaviour	This project aims to examine the effect of anti-speeding messages on young novice drivers' speed management behaviour. 30 provisionally licenced drivers, between 18 and 25 years of age will be randomly allocated to one of two groups (Control and Test Group). All participants will complete three drives in a computer-based driving simulator and two online surveys. The test group will complete simulation scenarios showing both speed limit signs and anti-speeding signs. While the control group will complete scenarios showing only speed limit signs. Quantitative data will be collected including mean speed, maximum speed, and percentage of time speeding. Different anti-speeding messages (performance, financial and safety implications of speeding) will be included to observe its effect in reducing young novice drivers' speeding behaviour. Qualitative data will be collected including the perceived effectiveness of anti-speeding messages, self-reported speeding behaviour and reasoning for drivers' speed choice.
163	Bunting, G. Dejong, S. Edwards, M. Lane, G. James, S.	Road Safety Audit and Road Safety Review Road Environment Road Design	NZ TCD Manual: Getting it Right so Road Users Understand	The policy and practice of today may not be suitable for tomorrow, address existing issues with our road networks, or present consistent appropriate messages to road users so that safety is optimised and decision-making demands on road users are minimised. While practitioners in New Zealand have applied a reasonably consistent approach with the application of traffic control devices, that approach is not necessarily suitable for tomorrow. Two of the most important parts of the Traffic Control Devices (TCD) Manual are now complete or very close to completion. The paper describes development of Parts 4 and 5 of the Manual, which are the tools to be used by practitioners to provide clear and consistent guidance to road users for and between intersections. The authors have prepared an informative overview regarding the new parts of the Manual, and the technical background and complex process followed for their development.
164	Fayaz Mansoor, A. Ward, J.	Road Design Speed, Speeding & Travel Speeds	Urban street speed prediction	This research explores how street design influences driver behaviour to evaluate the feasibility of developing a speed prediction model for urban streets. The literature review phase of this research showed that there is a gap in design guidance on how design elements affect operating speeds. Being able to predict the operating speed for a street design would be a very useful tool for transport practitioners to achieve safe and appropriate speeds through design. Findings from this research indicated that developing such a model will be challenging due to the significant impacts human behaviour has on speed choice. The behavioural aspect of speed choice is difficult to quantify and implement in a mathematical model. Additionally, combinations of design elements have different impacts on operating speed. Quantifying these also poses a major challenge. Therefore, more research is required to create a robust speed prediction model.
165	Brown, M. Jayawardhena, M.	Road Design Road Environment Road Safety Strategy	Influencing projects for safe system outcomes -Safe system framework assessments	Reviewing a project under a safe system lens is essential at the outset, and throughout a project lifecycle, to maximise the potential for road safety. Often projects are focused within the constraints of the current road corridor where there are competing requirements. Maintaining access to property and parking as well as serving the needs of walking, cycling, buses and freight can result in unintended consequences for road safety. While a setting a project philosophy up front can help with direction, as a project evolves through the design process, safety benefits can be eroded or reversed due to meeting other project objectives. It is important that the road safety consequences of project evolution are recognised and quantified to enable these to be mitigated. This paper explores the benefits and limitations of using the Safe System Assessment Framework gained over a range of projects.

166	Mulhall, M. Wilson, K. Yang, S. Lenne, M.	NCAP And Consumer Test Ratings Distraction & Inattention	Examining Euro NCAP distraction behaviours in a naturalistic driving dataset	New Car Assessment Program (NCAP) agencies are set to award points for driver monitoring technology that detects three types of distraction behaviours. The prevalence of these behaviours according to the NCAP definitions has not yet been closely examined in everyday driving. Therefore, a naturalistic dataset with 20 drivers who were monitored by a driver monitoring system was analysed. Single long glance events were the most frequent distraction behaviour (0.95 events per hour). More complex visual attention time-sharing events (repeated glances between the road and other areas) occurred at 0.47 events per hour. Time-sharing events to the driver lap region (often indicative of phone use) occurred once every 8.4 hours. Most events featured little or no head movement. Findings support the differential treatment of systems based on whether they perform well on both eye-dominant and head-dominant distraction. When in-vehicle alerts are provided, frequencies are likely to be lower than observed here.
167	Truelove, V.	Distraction & Inattention Driver Risk General Enforcement	Rural vs urban enforcement of phone use road rules	Preventing phone use while driving is critical for road safety. Research into enforcement of phone use while driving has primarily focused on urban areas, with limited attention given to rural areas, where most crashes occur. Therefore, this study explored differences in police enforcement of the phone use while driving law in rural compared to urban environments. Police officers (n = 26) with rural and/or urban experience enforcing the phone use while driving road rules in an Australian police jurisdiction were recruited to participate in an interview. Several different challenges emerged for enforcing the phone use while driving law in rural compared to urban environments, such as different types of phone offending behaviour, as well as different infrastructure, resources and management that can impact police enforcement. These results highlight the various factors that need to be considered for enforcing the phone use while driving law in different environments.
168	McDougall, K. Sharpe, W.	Road Safety Programs Road Safety Strategy	Creating and Implementing a Road Safety Strategy for Local Government	The Eurobodalla Road Safety Plan (RSP) 2019-2022¹ aims to drive road related trauma down for our community, our families and 1.5 million visitors who visit annually. Eurobodalla Shire Council (ESC) accepts the responsibility for local and regional road network whilst highlighting our high reliance on funding from Government agencies to deliver a whole of network approach including local road safety behavioural programs. Our strategic focus continues to be on progressive upgrades to deliver integrated whole of route solutions within the funding streams available. Acknowledging addressing road related trauma is a whole of Government and community challenge. The plan outlines specific measures Council requires to undertake to achieve reduced trauma for all road users travelling local and regional roads. The plan includes specific actions to build a safer road network, educate people to behave in a safe manner, transition to safer vehicles and work with NSW Government to ensure appropriate speeds.
169	Brown, J. Whyte, T. Albanese, B. Bilston, L. Koppel, S. Charlton, J. Olivier, J. Keay, L. Brown, J.	Restraints Child Restraints	Can simple metrics define safe transition to adult seat belts?	We aimed to examine the relationship between metrics used to define common thresholds for appropriate transition to adult belts, vehicle characteristics and seatbelt fit in children aged 7-12 years. Seat belt fit was assessed by observing 40 children in their own cars. The association between factors of interest and belt fit was examined using logistic regression. Sixteen (40%) children had a good overall seat belt fit. The odds of achieving good overall belt fit increased by 15% (OR 1.15, 95% CI 1.04–1.27) with every centimetre increase in height and by 5% (OR 1.045, 95% CI 1.001–1.10) with every 1-month increase in age. However, no metric could accurately predict good belt fit for all children in all cars. While older and taller children are more likely to achieve good belt fit, no single metric clearly defines appropriate transition due to variations in seat and seat belt geometry among vehicles.

170 Poster	Beaton, A. Greene, G.	School Safety	A holistic approach to improving our tamariki travel to school	The series of small actions we can take today will see greater safety gains for the school community tomorrow. School travel planning in Christchurch is a holistic approach encompassing a wide range of issues faced by the school community whilst travelling to school. Consulting with the school community through a school travel survey and creating a working group, allows us to work together to find locations of concern and create a clearer roadmap for the future. While Christchurch City Council provides the infrastructure on the ground, the key behaviour changes come from empowering the school and student leaders with a set of tools to improve road safety and encourage active modes of travel. Making active travel safer and more accessible, enables students to form new sustainable travel habits, safer neighbourhoods, and leads us in the direction of creating a more sustainable tomorrow.
171	Sloss, N. McLean, J.	School Safety Community Road Safety Indigenous Road Safety	Regional road safety education: Towards independence, skills and safety	School-based road safety education can develop independence and work-readiness in students and obtaining a licence is one of the ways in which they can significantly improve employment prospects. In addition, a licence can assist students to develop the social and emotional capabilities, and road safety skills and knowledge to use roads and vehicles safely. AISNSW Wellbeing and Personal Development, Health and Physical Education (PDHPE) Consultants supported Riverina Community School in Griffith, regional NSW Australia to achieve sustainable outcomes related to their road safety education project in 2020/2021. Through professional learning, support and connections to the NSW Advocate for Children and Young People, NSW Government and NSW Police, successful intersectoral collaboration has enabled two cohorts of students (40% of whom are Aboriginal and Torres Strait Islander students from considerable disadvantage) overcome a range of barriers experienced by students in regional and rural locations to attain their Learners Permit with a process enacted to gain Provisional Licences. The Griffith project became a case study that was discussed in a 2021 NSW Parliamentary Inquiry related to regional and remote drivers licence attainment.
172	Sivsankaran, S. Rangam, H. Balasubramanian, V.	Pedestrians Intersections and Roundabouts	Understanding Patterns of Pedestrian – Motor-Vehicle Crashes at Signalized Intersections	Pedestrians account for over a quarter (23%) of the 1.35 million deaths caused by road traffic crashes each year. Pedestrian traffic crashes are a major road safety issue worldwide, particularly in developing countries like India. According to the Ministry of Road Transport and Highways in India, around 28600 pedestrians were killed and 61900 were injured in 2018 (MoRTH,2020), and these figures have been historically high since 2010. In 2019, fatal pedestrian crashes increased by nearly 19 percent compared to 2018, while injuries increased by nearly 13 percent. Intersections are among the most dangerous road locations, with a high pedestrian flow and a mix of pedestrian and vehicle traffic. The safety of these locations necessitates special care, and the MoRTH has made it a primary goal. Researchers in developed countries such as the United States and Europe and emerging economies such as Brazil, China, Hong Kong, and Singapore have extensively examined pedestrian safety at signalized intersections. These studies have found that several risk factors are linked to the occurrence of crashes at signalized intersections, which can be classified as infrastructure planning and design factors, traffic-related factors, and driver and environmental factors. The purpose of this study is to answer two research questions: 1) is there a cluster or sub-group effect in pedestrian crashes at signalized intersections, and 2) what are the patterns of key contributing factors in pedestrian crashes at signalized junctions. This study will collect ten years of traffic crash data from police records in Tamilnadu, India, to answer these research questions.

174	Wynne, R. Read, G. Salmon, P.	Distraction & Inattention Road Safety Strategy	Designing out driver distraction: A sociotechnical systems approach to distraction	Recognising the role of contributory factors beyond the road user, their vehicle, and road environment in crash causation, research has called for a ‘whole of system approach’ to driver distraction (e.g., Bates et al. 2021; Young & Salmon, 2015). This study uses a systems thinking approach to develop prototype tools to support key transport system stakeholders in fulfilling their responsibilities around the management of driver distraction. This involved developing a systems thinking ‘control structure’ model of driver distraction in the Australian Road Transport System. Following this, fleet management, driver education and training, and government transport agency stakeholders participated in interviews and design workshops to develop prototype tools to support the management of driver distraction. All stakeholders identified that evidence-based resources could assist them in meeting responsibilities around distraction. Similar guidance needs amongst stakeholders suggests development of a core toolkit set could assist multiple stakeholders in managing and preventing driver distraction.
175	Sivsankaran, S. Rangam, H. Balasubramanian, V.	Older Drivers & Road Users	Elderly Pedestrian Crash Contributing factors in Tamilnadu, India: IML Approach	According to the National Statistical Office's (NSO) report in 2021, India's elderly population (aged 60 and more) is expected to reach 194 million in 2031, up 41% from 138 million in 2021. Living and working environments must be created to satisfy the aging population's needs as the population grows older. While vehicles are the primary form of transportation for the elderly, walking is the second most popular mode. In 2019, a total of 2454 males and 892 female elderly pedestrians (above 60 years) were killed, according to report by the Ministry of Road Transport and Highways (MoRTH, 2020). Crashes involving elderly pedestrians are becoming more common. They are more likely to be involved in fatal crashes due to their increased frailty, as well as factors such as reaction time and street confidence. The overrepresentation of older pedestrians in fatal crashes and issues linked with an ageing pedestrian population need examination in developing nations like India. As a result, more research is needed to understand the patterns of elderly pedestrian crashes better using newer data resources and analytical tools. This study has two major objectives: 1) to create a context for using machine learning models to categorize injury levels in elderly people, and 2) to use an interpretable machine learning (IML) framework to provide probability values for injury classification. This work examines a ten-year (2009-2018) elderly pedestrian crash dataset in Tamilnadu and classifies each crash according to crash injury levels using a random forest (RF) approach. The contributory factors and their relationships with the injury level classification were then explained using IML approaches applied to the crashes.
177	Li, X. Rakotonirainy, A. Oviedo-Trespalacios, O.	Distraction & Inattention Driver Risk	Impact of phone use position on drivers’ collision avoidance performance	Using mobile phones while driving is one of the most prevalent distraction activities, which causes safety concerns worldwide. Though hand-held phone use during driving has been forbidden in many countries, it is still commonly observed among drivers. This research aims to investigate whether and how different mobile phone use positions influence drivers’ collision avoidance performance. Forty-six drivers (19 females and 28 males) took part in a driving simulator experiment. A car-following scenario was designed, where the leading vehicle decelerated abruptly to trigger a rear-end risk. All drivers drove the scenario three times: one in baseline without distraction, one holding the phone above the steering wheel, and one under the steering wheel. The results showed that drivers in both mobile phone use positions reduced speed in the car-following process. Using a mobile phone under the steering wheel significantly extended drivers’ brake reaction time, and thus increased the rear-end collision likelihood.

178 Oral & Poster	Mackenzie, J. Ponte, G.	Bicyclists Road Environment	Trial of a method to capture cyclist’s use of infrastructure	This project trialled a method of using video surveillance, augmented with machine learning, to automate the detection of cyclists. The augmented surveillance video was then used to analyse cyclists using various transport network infrastructure in the Australian Capital Territory (ACT). Video cameras were deployed to four locations in the ACT, selected based on feedback made by cycling safety stakeholders, for a period of seven days to capture footage of cyclists using on-road infrastructure. This enabled the examination of the ways cyclists utilise transport network infrastructure and their interactions with traffic (including the highlighting of conflict events). The project demonstrated that short term video surveillance, coupled with machine learning algorithms, can be employed as useful tool to obtain a better understanding of cyclist behaviour at specific locations and identify ways to improve road safety.
179	Mongiardini, M. Stokes, C. Woolley, J.	Road Design Speed, Speeding & Travel Speeds	Evaluation of Centreline ATLM along Curves in Mountainous Roads	Centreline Audio Tactile Line Marking (ATLM) was installed on a popular narrow road in the Adelaide foothills. A before-after evaluation was conducted to assess the ATLM potential for influencing lane position/crossing and speed along four trial curves. Vehicle lane position and speed at those curves, and between-site travel times were analysed. Post treatment, all vehicle types tended to safely shift towards the edge line along right-hand curves. However, variability along left-hand curves existed amongst the four sites. Generally, the treatment did not appear to reduce lane crossing frequency on curves, except at one site. Centreline ATLM did not appear to induce a speed decrease along curves. Nonetheless, a slight reduction of the average travel speed along the treated route may indicate a generalised speed calming effect. The study suggests merit for centreline ATLM along curves regarding lane positioning, but a limited effect on voluntary lane crossing and speed.
180	Peterssen, M. Roberts, L.	School Safety Education - general and other	Safe Around Schools – a collaborative approach to road safety	City of Casey is currently home to 96 primary and secondary schools. Traffic congestion, parking issues, unsafe driver behaviour and pedestrian risk-taking at school pick-up and drop-off times have a large impact on our community and our resources. Safe Around Schools is built around shared responsibility for road safety - Council, schools, parents and students working collaboratively - with the key message that “getting children to school safely is everyone’s job”. The program uses a mix of improvements – engineering, education, engagement, encouragement and enforcement – to improve road safety around schools and increase levels of active travel to school. By bringing together key departments within Council and working collaboratively with schools, we are able to trial, prototype, reflect and re-design throughout delivery, to meet the varying needs and environments of our different schools. Having worked intensively with 6 schools, there have been many lessons learned and some promising outcomes so far.

181	O'Donnell, B. Elliott, J. Lovelock, M.	School Safety Education - general and other	Evaluating RYDA’s whole school approach to road safety education	Road Safety Education Limited’s (RSE) RYDA program for high school students has been operating since 2001. In 2020, after extensive review, RSE released RYDA 5.0 – the most significant update to date. RYDA 5.0 took the program from a one-day workshop, supported by additional learning materials to a true whole school approach to road safety learning. Embracing this approach, RSE developed an implementation guide for schools, a series of pre workshop discoveries, updated workshop materials which focused on inquiry learning and personal engagement and a suite of follow-up resources for teachers. A key to successfully implementing the whole school approach was the development and rollout of an ongoing communication plan and close relationships between RYDA program coordinators and school teachers. In 2021, extensive evaluation of RYDA 5.0 designed to measure knowledge retention, attitude shift and intended and practiced behaviour change across time highlighted positive trends relative to earlier iterations.
182	Peters, N.	Road Furniture (Poles, Signs, Etc)	Reducing Road Trauma in Slip Base Lighting Pole Crashes	Slip base steel lighting poles are used successfully in Australia and internationally to reduce the severity of vehicle/pole crashes. When a vehicle impacts the pole, the pole, which is held in place by three clamping bolts, slips on its base, moves with the vehicle in the direction of impact and also rotates about its centre of gravity, enabling the vehicle to pass under the pole's base. However, recent evidence indicates that there is inherent weakness in the design of the clamping system that has, in some instances, resulted in significant road trauma for people in the vicinity of the crash. This paper outlines Transport and Main Road's analysis of the phenomena and the development and evaluation of an effective counter measure to reduce serious injuries and fatalities.
183	Bates, L. McLean, R. Alexander, M. Seccombe, J.	Driver Psychology Driver Risk	Exploring the Relationship between Gender, Sensation Seeking and Traffic Offending	Males have higher rates of sensation seeking when compared with females and are also more likely to engage in traffic offending. This paper explores the relationship between these variables to identify if sensation seeking mediates the relationship between gender and traffic offending. Over 1,500 young drivers from Queensland and Victoria completed an online survey. The results indicate that sensation seeking fully mediates the relationship between gender and transient offending (e.g. speeding) and partially mediates the relationship between gender and fixed offending (e.g. drink driving). This suggests that, while gender is a contributing factor that can not be altered by road safety interventions, it may be possible to target interventions at sensation seeking in order to reduce road offending.
184	Harrison, R. Deuchrass, M. Brocks, D. McDowall, J.	Community Programs Education - general and other	What Vulnerable People? Drive My Life-a community mentoring driving programme	Drive My Life empowers referral based vulnerable and/or at-risk participants by providing a supportive environment to gain the necessary knowledge and skills essential to obtaining a drivers’ licence. There is a real opportunity to deliver a programme aimed at teaching those even with the most limited education, the necessary knowledge and skills to gain their correct licence. Participant goals include employment and educational opportunities, access to goods and services and the ability to connect with friends and family. The programme is not just about getting a licence, it is making safe drivers with a licence and the ripple effect is even more rewarding.

186	Wise, R. Suharto, S. Tilly, M.	Road Safety Programs Community Programs Road Safety Strategy	Gold Coast Road Safety Plan 2021-2026	The Gold Coast Road Safety Plan 2021-2026 (Plan) ‘defines the tomorrow’ of road safety for the City of Gold Coast (City). The Plan recognises that road safety is everyone’s responsibility and the Plan vision is to reduce crashes, save lives and prevent serious trauma on the Gold Coast transport network. The Plan builds on the successes of the Gold Coast Road Safety Plan 2015-2020. The localised Safe System framework of ‘Our people’, ‘Our transport system’, ‘Our places’ and ‘Our shared responsibility’ has fifty evidence-based actions delivered by the City’s dedicated Road Safety team in collaboration with the Gold Coast Road Safety Partnership Advisory Group (PAG). The Plan was endorsed in September 2021(1) and a suite of first year initiatives are currently being delivered in conjunction with a program of ‘business as usual’ road safety activities.
187	McDonald, H. Berecki-Gisolf, J. Stephan, K. Newstead, S.	Speed, Speeding & Travel Speeds Driver Psychology Driver Risk	Personality, Perceptions and Driving Behaviour: a study of speeding	Traffic infringements are the primary means for responding to illegal driving behavior, with their aim being that of deterrence. Research evidence, however, suggests that there are other factors beyond legal sanctions that may have a deterring influence. To examine factors that may influence the performance of illegal driving behaviours, a conceptual model was developed to consider relationships between personality, perceptions and driving behaviour. The model was applied to low-level speeding behaviour. Using survey data collected between July-August 2019, from over 5000 drivers in Victoria, Australia, this study found that perceptions of enforcement, crash risk, social norms and disapproval and negative personal/emotional affect in many instances mediated the relationship between personality and expectations to speed. The results of this study have value in highlighting factors that may see drivers successfully or unsuccessfully deterred from speeding behaviour. Ultimately, this knowledge has the potential to enhance safety on the roads.
189	Elhenawy, M. Pinnow, J. Wood, M. Alderson, D. Lewis, I. Haworth, N. Rakotonirainy, A.	Intersections and Roundabouts (ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	Estimating Crash Reductions at Signalised Intersections in Connected-Vehicle Environment	Crashes at signalised intersections caused by drivers disobeying red light signals increase the risk of serious injuries or fatalities. A Field Operational Test (FOT), known as the Ipswich Connected Vehicle Pilot (ICVP), sought to understand the capability and impact of connected vehicle technology including the estimated crash reductions of selected safety use cases. A methodology was proposed for estimating the crash reduction for the Advanced Red-Light Warning (ARLW) use case. The methodology was based on a well-known power model which assumes that changes in road trauma can be explained using the change in mean travel speed. This paper outlines the results of an application of this methodology to the FOT data collected over approximately 12 months. The results indicated potential reductions of 9.72%, 5.85% and 3.98% in fatal crashes, serious injury crashes, and slight injury crashes, respectively.

191	Rivera-Gonzalez, J. Coxon, S. Oxley, J. Kamruzzaman, L. Sobhani, A.	Safer Transport & Mobility Community Programs Road Safety Management	The Role of Safe Mobility in the Creation of Liveability	The Safe System (SS) approach to road safety can not only reduce road trauma risk but also, if coordinated with other professional areas, support the design and operation of streets that create liveable communities. In Victoria, the Movement and Place Framework (M&PF) has been adopted to plan a network that considers multiple community needs (Victoria State Government - Department of Transport, 2019). The research project described in this document is a PhD study that analyses the connection between the SS principles and the M&PF, and its potential contribution to the creation of liveability and the achievement of the Sustainable Development Goals (SDGs). The need for a mechanism to facilitate communication between road safety experts and non-expert audiences was identified as one of the main challenges in the SS comprehension and adoption. To close this gap, a digital tool was developed for users to interact with street design and operation parameters, and learn about the impact these decision can have on the how streets are experienced.
192	Carslake, J. Rivera-Gonzalez, J.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Workplace and Work Related Road Safety	The Art of Building Engaging Heavy Vehicle Tool Box Talks	Tool Box Talks (TBT) are a critical information tool in the transport industry, particularly in improving safety performance. TBT are typically kept to a small and manageable timeframe of 15- 20 minutes and are designed to convey important information and actively promote further discussion. A major issue though is many are developed internally resulting in them not being evidence based or engaging for the workers causing a ‘tick and flick’ approach. The NRSPP identified this issue and opted to develop 24 light vehicle focused topics. A leader in the heavy vehicle sector requested similar batches be developed for them. Recognising significant differences exist between the heavy and light sectors, the NRSPP took an industry collaboration and design approach to developing 22 topics for this sector. In particular, to resonate with truck drivers the TBT must be drivers talking with drivers, this paper explores the development process, industry buy-in and outputs.
193 also Full Paper	Haines, G. King, K. Blewden, M. Raja, A. Nord, A. Hawley, G. Barnes, M. Western, J. Perkins, C.	Road Design Road Environment	Streets for Tomorrow...Today	The Innovating Streets programme aimed to make it easier and quicker for streets throughout Aotearoa to be made safer, more accessible and liveable. The 2020-21 Innovating Streets Fund supported the delivery of 62 projects across Aotearoa, including 89km of interim street treatments, such as temporary cycleways, safe crossings, parklets, and traffic calming. A mixed-method evaluation showed that Innovating Streets projects can accelerate a range of benefits, including safety outcomes. A focus on continuous improvement, sector capability, and overcoming system constraints is needed to maximise the potential of an Innovating Streets approach. The learning from Innovating Streets – organisational, practice based, and through the evaluation - has been methodically integrated into the 2021-24 Streets for People Programme. This programme is focusing on a smaller cohort of councils, enabling them to become leaders, in partnership with communities, in the use of adaptive practices that accelerate street changes that enhance safety, mode shift, and accessibility. https://doi.org/10.33492/JRS-D-22-00041

194	Muirson, M. Annan, D. Smith, M.	Crash Data Analysis Road Design Road Environment	Developing Targeted Safety Performance Indicators for Rural Networks	To assist in the development of local road controlling authority (RCA) road safety strategies in NZ, interactive web maps have been developed to evaluate key road safety indicators for current and future years on the RCA's network. These tools provide a clear picture of existing and future safety performance of a network down to individual intersections and mid-blocks. It has been found that applying the same approach to say a predominantly higher volume urban network versus a lower volume rural network has resulted in lack of granularity in the results between the time periods for the more rural, remote networks. This paper will discuss the variability in the road safety metrics found and investigate how we can gain meaningful road safety outcomes for all RCA networks so they can can target deficient areas and reduce DSIs on their networks.
195	Mackie, H. Luther, R. Raja, A. Thorne, R. Edwards, M.	Signage & Signalisation Road Design Road Environment	Dragons Teeth - Useful perceptual countermeasure or distraction?	Dragons Teeth (DT) are painted markings intended to warn of an approaching speed limit change or crossing. A New Zealand wide DT trial is almost complete, with a focus on speed, driver compliance and awareness, and feasibility. For the interim findings, 85% speeds were 1-5 km/h slower following DT installation, with generally improved giving way behaviour by motorists, although compliance diminished at busier times when school patrols were present. There is also a possibility that DT diminish the conspicuity of the give way line at crossings. Road controlling authorities have provided a range of supporting feedback regarding design, maintenance, and performance. To date, results suggest there may need to be a nuanced approach to the possible use of DT, and the final evaluation will provide further evidence to inform guidance.
196 also Full Paper	Fleiter, J. Flieger, M. Susanj, R.	Child Restraints Speed, Speeding & Travel Speeds Road Safety in Developing Countries	Strengthening Speed and Child Restraint Enforcement Capacity in the Philippines	Recent legislative developments in the Philipppines provided opportunities to strengthen existing speed enforcement capacity and build competence in relation to enforcing child restraint use for the first time in this country. The Global Road Safety Partnership's (GRSP) Road Policing Capacity Building programme team worked closely with government and non-government agencies in the Philippines to develop and deliver a series of classroom and roadside theoretical and operational training sessions that resulted in the establishment of a core group of trainers from within local enforcement agencies in the country. This group received initial training as well as ongoing coaching and mentoring support from GRSP to establish a sustainable model of enforcement capability development. Various training methods and curriculum topics are described, noting the importance of supporting in-country partners to determine relevant, context-specific issues according to local needs in the country. https://doi.org/10.33492/JRS-D-22-00034
197	Rivera-Gonzalez, J. Carslake, J. Dobson, O.	Road Safety Programs Heavy Vehicles - Trucks, Buses, Hazardous Materials	Road Transport Suicide Prevention – Transferable Learnings for Road Safety	The Road Transport Suicide Prevention (RTSP) project was collaboratively delivered by the National Road Safety Partnership Program and Austroads. Suicides on the road system are relatively rare but, like all road trauma, have significant impacts on the system and other road users. Road traffic suicides are particularly problematic for the heavy vehicle industry with drivers placed at risk of death, injury, and trauma. The distress impacts many people, including drivers of other vehicles, passengers, first responders, witnesses and bereaved family members. The purpose of RTSP was to investigate and understand the scope of suicide in road transport and seek to reduce its impact. The project was delivered in four streams and made multiple recommendations, with safe language as a foundational component. Due to the sensitivity of the topic, communications was identified as a crucial element. Whilst focused on suicide, what emerged could be applied to road trauma more generally.

198 Poster	Rodgers, P. Dioni, G. French, C.	Speed, Speeding & Travel Speeds Road Safety Strategy	Slower speeds for healthy, liveable and inclusive neighbourhoods	Improving safety on local roads in Christchurch is a priority for Council and is also a national priority of the Road to Zero - New Zealand's road safety strategy for 2020-2030. Road to Zero sets an initial target to reduce deaths and serious injuries on New Zealand's roads, streets, cycleways, and footpaths by 40 percent over the next 10 years. A significant difference can be made through having safe and appropriate speeds on Christchurch's roads, particularly in our neighbourhoods. Slow speeds and safer streets is the centre piece of the puzzle to improve liveability and vibrancy in our neighbourhoods, increase transport options and accessibility, and decrease surface transport emissions by helping people to choose healthy lifestyle choices to walk, cycle, scoot and use the bus more. Changing travel behaviours today will lead to transformational changes in how we use our street space in our towns and cities in the future.
199	Balind, G.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Other Vehicles - Tractors, Quad Bikes and SSVs, Machinery, etc.	Heavy vehicle/agricultural machinery stakeholder engagement road safety strategy	Local councils in New South Wales have the ability to form strong collaborative partnerships within their community which allows road safety strategies targeting road trauma reduction to be implemented. As a road authority, the Griffith City Council (GCC) sustains a legal and moral obligation to reduce crashes on roads under its management. An analysis of crash data in the GCC area from 2010 – 2014[1] showed heavy/agricultural vehicle crashes climbed exponentially as a consequence of the region's increased freight task. Council resolved that reducing crashes in this sector was not achievable on their own therefore ongoing engagement with primary production stakeholders and the general community commenced in 2015 to establish and address causal factors associated with heavy/agricultural vehicle related crashes. The outcomes of this new alliance saw the development of educational and long term engineering strategies which significantly contributed to the reduction of heavy/agricultural vehicle crashes across the district.
200 Poster	Bahrololoom, S. Young, W. Logan, D.	Bicyclists Statistical, Epidemiology and Other Road Safety Research Methods Crash Investigation – including investigation methods & technology	Modelling injury severity of bicyclists in bicycle-car crashes at intersections	Although numerous studies have been conducted to understand the parameters contributed to bicyclist's injury severity, most of these studies focused on relationship of crash severity with road, environmental, vehicle and human demographic parameters rather than considering the dynamics of the crash. No study investigated the relationship of bicyclist's injury severity with speed and mass of both vehicles. This study developed a modelling framework to investigate the effect of crash dynamic variables such as speed, mass and crash angle on bicyclist's injury severity in bicycle-car crashes at intersections. A combination of Newtonian Mechanics and statistical analysis was utilised to develop this theory. Results of numerical models showed that, kinetic energy of the car before crash and kinetic energy of the bicycle after crash are important parameters affecting the injury severity of the cyclist in bicycle-vehicle crashes. Further, the analysis showed that older bicyclists were involved in higher severity crashes and wearing helmet reduced the injury severity of bicyclists.

202	Moragues, M.V. Barranco, F.R.	IRAP, AusRAP, etc. Road Safety Audit and Road Safety Review	Comprehensive approach on road safety assessment	This paper presents the methodology used in three case studies within the Safe System approach. The main objective of the three studies was to provide technical support in road safety by assessing the safety of selected road sections (in Vietnam, Ecuador and Mongolia), defining and applying a comprehensive approach. In particular, the consultancies provided capacity building, training and advisory services to improve the safety of road users, paying special attention to the safety of vulnerable road users (especially pedestrians). Road safety audits and inspections have been carried out in conjunction with the implementation of the International Road Assessment Programme (iRAP). The main novelty is that, alongside these studies, field surveys have been conducted in order to take into account the views of all road users. Finally, communication and awareness campaigns have been organized, taking into account the participation of the traffic police.
204	Stevens, A.	Road Safety Programs Community Programs	Suicide resilience and our road transport network	As road practitioners we rarely consider suicide risk or need to deal with its consequences as part of our typical roles in managing and designing our transport networks. Suicide is a taboo topic; but it has a very real impact on our transport networks and those who operate them – not to mention the wider social impacts. This topic will explore our experiences of the past decade on Auckland’s State highway network as we have worked to protect our most vulnerable people. Waka Kotahi’s Auckland Systems Management team does not profess to be the experts in this field, but we look forward to sharing our learnings and open discussion in the hope that one day suicide risk on our transport networks can also have a Vison Zero target in NZ with respect to road trauma.
206	Green, M. Muir, C. Oxley, J. Sobhani, A.	Road Safety Management Road Safety Strategy	Safe System awareness and knowledge - A Victorian practitioners' perspective	Safe System is the approach used to guide road safety in Victoria. Implementation of any road safety approach requires understanding and buy-in from all road safety actors. However, the degree to which practitioners are aware of Safe System has been under-researched. A survey was developed to better understand practitioners’ awareness and self-rated knowledge of Safe System. The findings of the survey indicate that whilst 76.2% of respondents reported awareness of Safe System, and rated their knowledge highly, 23.8% of the cohort was unaware of Safe System. The survey results also found that respondents who held a greater knowledge of Safe System were more likely to have applied it within their most recent work. Further, male respondents and those achieving higher education levels were more likely to report awareness of Safe System. The findings of this study will be of interest to policymakers and researchers who are examining the role and application of Safe System.

207 Poster	McCracken, A. Palmbachs, N. Chalder, B. Macaulay, S. DeLuca, P. Fontaine, B. van Vliet, C. Bautrenaute, P. Luykx, M. Yavari, M. Raman, P.	Distraction and Inattention Driver Psychology Driver Risk	Safer Driver app trial reducing phone use behind the wheel	Inattention is a significant cause of road trauma — it was reported as being the primary contributing factor in 17% of road fatalities in Western Australia in 2021 (Road Safety Commission, 2022). RAC, in partnership with Sentiance, an intelligence-driven data science and behaviour change company, developed and tested a Safer Driver mobile phone app. The Safer Driver app used evidence-based research and scientifically validated behavioural change techniques to coach participants to reduce their mobile phone use while driving. Evaluation of the trial showed that the Safer Driver app was an effective behavioural change tool, with users who received coaching demonstrating a statistically significant decrease in mobile phone use when compared to participants given a control version of the app. This trial demonstrates the potential for digital coaching apps to encourage safer driving habits, to help save lives and prevent serious injuries on our roads.
209	Sun, Y. Banchero, S. Pearse, J. Demiris, D. Wooldridge, C.	Bicyclists Pedestrians Road environment	Use of Automated Video Surveys on Shared Paths	Shared paths are commonly used to facilitate pedestrian and bicycle movements. Although they are generally safer than roads, crashes and near misses still happen. Different types of interventions have been applied to address conflicts between different path users but remains a lack of evidence regarding their effectiveness. Meanwhile, collecting pedestrian and cyclist data is technically challenging. While pneumatic tubes can measure the speeds and volumes of cyclists reliably, they pose a potential trip hazard to some path users and are not capable of accurately sensing pedestrians. Nor can they identify close interactions between path users. Our project is an attempt to address this by using automated video surveys. To achieve this, 14 videos (24hr each) from six sites were collected and analysed. The extracted data provides insights into areas such as volumes, OD matrices, spatial and temporal patterns, bicycle speeds, give-way compliance, conflict areas. Manual validation has shown that the program's accuracy is above 90%, with some exceptions.
210	Albanese, B. Whyte, T. Bilston, L. Koppel, S. Charlton, J. Olivier, J. Keay, L. Brown, J.	Child Restraints	CREP Ease of Use Rating: Field Study Comparing Real-World Misuse	Incorrect use of child restraints is a widespread and longstanding problem. Since its inception, the Australian Child Restraint Evaluation Program (CREP) has incorporated an 'ease of use' assessment (Suratno, Brown, & Job, 2008), assuming that child restraints that are easier to use are more likely to be correctly used. However, it remains unknown if CREP 'ease of use' ratings correlate with real-world correct/incorrect use. To examine this, data on correct and incorrect use of child restraints of known make and model from a New South Wales observational study were coupled with published CREP scores. Mean CREP ease of use scores were examined between restraints with and without errors, using independent sample T-tests. There was no significant difference in mean ease of use scores between restraints used correctly or incorrectly. The findings suggest an evidence-based approach is required to identify restraint features with a low propensity for misuse.

212	Stephan, K. Allen, T. Newstead, S. Symmons, M. Lenné, M. McLure, R. Hillard, P. Day, L.	Motorcyclists Road Environment Road Design	Road environment factors associated with motorcycle crashes in Victoria, Australia	This purpose of this study was to investigate motorcycle crash risk factors associated with the road environment on urban and rural public roads in Victoria (Australia). The study used a case-crossover design to investigate environmental risk factors conducted in conjunction with a population-based case-control study which investigated rider, vehicle and trip risk factors. Case sites were crash locations where a motorcycle rider was injured (hospital admission). Control sites were locations on the route of the motorcyclist prior to the crash, matched for the presence of an intersection (or midblock) and a curve (or straight). A detailed set of site characteristics was assessed and recorded at all sites. A number of road environment factors were significantly associated with injury crash risk, including those related to the road surface and curve geometry.
213	Allen, T. Mulvihill, C. Oxley, J.	Motorcyclists Personal Protection – Helmets, Clothing, etc.	Survey of off-road motorcycle riders in Victoria, Australia	A significant proportion of serious injury motorcycle crashes in Victoria occur in off-road areas. To help inform future research and safety strategies, an online survey of adult off-road motorcyclists was conducted. The most prevalent age groups were in the range 40-54 years, and 70 percent reported at least 10 years off-road riding experience. The most popular riding areas were single track or natural terrain, followed by double track or unsealed roads. While 70 percent of riders agreed that off-road riding is a risky activity, 85% agreed that “I put safety first”. Wearing rates of helmets, gloves, goggles/visor and boots were all high, but rates were lower for other types of protective gear and lower overall for riders aged under 20. Eight percent of riders reported a serious injury crash in the past 3 years, with half of these occurring on a double track or unsealed road.
214	Lynch, R. Crittenden, K. O Toole, D. Rodrigues, P.	Road Safety Barriers	Smart Routine Real-Time Monitoring of Wire Rope Barriers	Wire rope safety barriers reduce the risk of death and injury from road accidents, but require regular visual and physical inspections to ensure the correct tension is maintained. To reduce inspection costs and provide quicker information, Viotel has developed a Smart barrier monitoring system. Monitoring units can be installed in under 5 minutes using a rolling lane closure, and provide hourly measurements of wire rope tension as well as real-time information about significant impacts on the barrier. Solar panels and batteries are used to power the units. Trials of this system in Australia/New Zealand have demonstrated the effects of ambient temperature on barrier tension with diurnal and seasonal variations. Impacts have been detected using vibration monitoring and in some cases the resulting tension drop due to impact damage has been quantified. The real-time data of flexible barrier condition can be used to prioritise and schedule maintenance.
215	Teerds, S.	Child Restraints	4 out of 5 child car restraints fitted incorrectly?	If you think a child car restraint does not need to be professionally fitted, think again. Figures from Kidsafe Queensland show that 80% of car seats checked in the past year were incorrectly installed, which can prove deadly for children in the event of a crash. In 2020 more than 1100 people tragically lost their lives on Australian roads, including 55 children. Research by NeuRA shows that a correctly fitted child restraint, which is appropriate for the child’s age and size, can reduce the risk of serious injury or death in road crashes by up to 70 per cent.

216	Zayerzadeh, A. Tahmassebi, S. Shuey, R.	Road Safety in Developing Countries Road Safety in a Global Perspective	Comparison of the Pandemic Effect on Traffic Safety in Iran	This paper investigates the impact of the COVID-19 pandemic on road safety factors including traffic volume, fatalities, speed and injuries in Iran at national and provincial level. The results reveal that while the correlation between the average hourly traffic and number of traffic fatalities at national level is normally stronger than the provincial level, however, after the outbreak, the correlation at both levels was increased. Additionally, at provincial level the average reduction in the number of deaths to traffic volume indicator was higher than the national level. Overall, it can be concluded that the average speed on the road network has been smoothly increased with no significant correlation found on casualties. The post-COVID ‘new normal’ reduction in traffic volume and increase in the number of people who work from home needs to be investigated accurately in the future studies to help us being more prepared to cope with similar disasters.
217	Brown, J. Albanese, B. Koppel, S. Charlton, J. Olivier, J. Keay, L. Bilston, L.	Child Restraints	Child restraint practices in Sydney: Misuse is still a problem	Prior to the introduction of legislation requiring mandatory use of age-appropriate restraint by children up to age 7, only about half of children in NSW used the most appropriate restraint type. Observational studies also reported errors in the way restraints were used were widespread with one in two children affected. In this study, we used the same methods to examine restraint use in the Greater Sydney metropolitan area approximately 10 years after the introduction of the 2009 legislative change. Most children (97.8%, 95%CI 96.3-99.4) were observed to be using a legally appropriate restraint. However, less than half were in correctly used restraints (Any error = 40.4% (95% CI 32.6-48.3; Any serious error= 43.8% (95% CI 35.0-52.7). The results indicate a substantial increase in appropriate restraint use, at least in the Sydney region but no improvement in correct restraint use.
218	San Luis, S. Marcelo, D.	Child Restraints	Advocating for a Child Restraint Systems Law in the Philippines	Advocating for a law mandating child restraint systems (CRS) was challenging in the Philippines. Legislators thought that (1) the law was unnecessary since majority of children use public transportation or motorcycles, and (2) CRS are expensive. Both the public and enforcers were not familiar with CRS. To build our case during legislation, advocates (1) briefed policymakers that CRS is one of many interventions to protect children through a safe systems approach and (2) referenced a commissioned study on the availability, affordability, and acceptability of CRS in the country.
219	Powell, S. Bestman, A. Bilston, L. Whyte, T. Brown, J.	Child Restraints	Insights into parental decision making about transition to adult belt	Correct restraint of children is critical to reducing the severity of injury in the event of road related trauma. However, in Australia, the premature transition of a child from booster seat to adult seat with lap and sash belt is common. There is limited research on how parents make transition decisions and to date, no single metric for assessing child readiness to transition. Using ‘talk aloud’ methods, this research examined parent decision-making in the assessment of a safe seatbelt fit for their child. This information has been used to identify primary parent behaviours and drivers to support parents in making safe transition decisions when children move from booster seats to the adult seat with lap and sash belt.

220	Schoots, K. Machin, T. Senserrick, T.	Driver/Rider Training Novice Driver/Rider Licensing	Learner Driver Mentoring Programs: positive outcomes for disadvantaged novice drivers	Learner driver mentoring programs (LDMPs) help disadvantaged novice drivers achieve the compulsory driving experience required by Australian graduated driver licensing systems (GDLS), however, beyond licensing support, LDMPs have the potential to foster other safety benefits. The aim of this research is to identify the positive benefits that LDMPs offer disadvantaged participants, during their learner and early provisional driving stages. A preliminary systematic literature review, focusing on Australian LDMPs, was conducted in 2020, and is being expanded in 2022 to critically explore new Australian and wider international literature on associations between LDMPs and participants' road safety behaviours, perceptions of procedural justice and social inclusion outcomes. The 2020 study found LDMP participants to be safer drivers than matched equivalent drivers without LDMP experience, and the 2022 study will expand on these findings to provide a greater understanding of the positive changes that LDMPs can offer the young, disadvantaged drivers of tomorrow.
221	Koorey, G. Sim, P. Dioni, G.	Crash Data Collection Road Environment	How Do We Measure Harm in Land Transport?	How we measure the level of harm in our land transport system may influence how we manage our safety goals. Traditional road safety measures of harm are the numbers of deaths and injuries suffered in crashes. The potential for these to be under-reported is well known but also overlooks other examples of casualties within the transport environment. Recent safety investigations of people walking, biking, motorcycling and using other transport devices in Auckland found that considerably more people are suffering serious injuries on roads and paths from incidents not involving other vehicles. Research into road crashes nationally found similarly large social costs from non-motorised user incidents. These findings may help inform funding decisions for maintenance of paths, vegetation and kerb-crossings, where many incidents occur. Targeting reduced casualties on our transport network can also be at odds with other targets to increase modes like walking and cycling (due to personal health benefits).
223	Haupt, J. Amoh-Gyimah, R.	Speed, Speeding & Travel Speeds Driver Risk	Estimating injury reduction associated with speed limit changes in WA	When selecting life-saving road safety countermeasures to be implemented, practitioners routinely are faced with the challenge of having to rely on potential injury reduction estimates that might not consider local context and/or specific crash problems. Injury risk reduction ratios associated with speed limit change scenarios for pedestrian, side-impact and head-on crash types were estimated taking into consideration Western Australia's (WA) traffic speed data, projected mean speed reduction, perception-reaction time and breaking to estimate more realistic reduced impact speeds, the probability of a crash occurring along the vehicle stopping distance trajectory, and recent peer-reviewed studies on the relationship between impact speed and injury risk. The presented results provide guidance to WA practitioners when considering speed limit changes; however, the method can be applied to any location where traffic speed data is available. Further required refinements of the method are highlighted.

225	Amoh-Gyimah, R. Lajszczak, H. Price, A.	Road Environment Land Use & Urban Planning	Macroscopic Road Safety Modelling: How non-road related features influence crashes	Road safety engineers and planners are mostly interested in how road and roadside features influence road traffic crashes. However, there are other non-road and roadside features that also affect road crashes. This study investigates these non-road and roadside features in the Perth metropolitan area. Socio-economic, land-use, traffic, transport and crash data were sourced from various state and federal government agencies and were aggregated into ABS statistical area level 2. The relationship between crashes and these non-road and roadside features were established using the geographically weighted Poisson regression. The result suggests that, as the number of non-road and roadside features such as schools and % of population cycling to work increases, crashes are likely to increase. On the other hand, an increase in the % of population under 17 years, % of population working from home and % of households with no vehicles have the potential of reducing crashes. This study provides further knowledge to safety engineers and planners to be proactive in addressing road safety issues.
226	Harman, B. Stables, M.	Road Safety in a Global Perspective Road Safety in Developing Countries Road User Training – General (Bicyclists, Workplace, OHS, Etc.)	Macroscopic Road Safety Modelling: How non-road related features influence crashes	In 2021, the Global Road Safety Partnership (GRSP) worked closely with the World Bank to deliver enhanced road crash investigation and reporting training to police officers from the Pacific Island countries of Samoa, Solomon Islands and Vanuatu. The programme was delivered via \`distance learning\` due to travel limitations resulting from the COVID-19 global pandemic. Training was made possible through the development of a series of paper-based crash investigation and reporting modules that were supplemented with a series of weekly interactive webinars and written tests to assess participant understanding of critical concepts. GRSP also developed a Crash Investigation and Reporting guide to supplement modules and webinar content. This case study presentation will demonstrate the learnings identified, and that continue to emerge, which will provide an ongoing evidence-based guide to the crash investigation and reporting capacity building improvements in Samoa, the Solomon Islands and Vanuatu.
227 also Full Paper	Ellizar, E. Larastiti, S. Bawono, T. Mulyana, W. Kurniawan, C.	Road Safety in Developing Countries School Safety	Youth Participation in School Safety Zones Assessment (Case Study: Indonesia)	The impacts of Manahan flyover development in front of Junior High School 1 in Surakarta City, Indonesia increase the road safety risks to the students due to its poorly urban mobility planning. Since its establishment in 2017, there have already been 12 crashes that occurred around the flyover which resulted in two deaths in two years after the opening. This research aims to assess the school safety zones using the Star Rating for Schools from the International Road Assessment Programme (iRAP) and to propose recommendations for safer road infrastructure by empowering youth participation to identify the problems as road users. Advocacy to the Government of Surakarta City is important to raise awareness and improve road safety in school zones surrounding the Manahan flyover area. The SR4S results is an evidence-based to influence the government as the decision-makers to provide safety environment into the area impacted from the Manahan flyover development. https://doi.org/10.33492/JRS-D-22-00033

228 also Full Paper	Nanda Kumar, A. Guzzomi, A. Ellis, P. Amoh-Gyimah, R. Wiseman, B.	Signage & Signalisation	Understanding and improving temporary road signage stability	Temporary road signage is used to regulate traffic and advise road users, however wind and passing heavy vehicles have been known to cause collapse. This project aimed to gain an understanding of sign stability in the presence of passing road trains and investigate the possibility of improving stability through design modifications. ANSYS Fluent simulations and field trials were carried out to assess stability. The findings from the simulation showed that the current design is unstable and highly prone to wind induced failure. The simulations suggested that road train passage at 100 km/h is capable of inducing a ~8 m/s velocity in the sign's proximity, which is greater than that permissible for a rigid sign with no leg mobility. Field trials showed that the modified sign remained stable at 1.2 m from the edge line however it was still prone to collapse at closer distances. https://doi.org/10.33492/JRS-D-22-00037
229	Shuey, R.	Novice Driver/Rider Licensing Driver/Rider Training	Coaching novice drivers to sustainable road safety	A critical observation in road safety is the statistical aberration in the risk of road trauma from the learner driver cohort to the first year of licensed solo drivers. For decades, reform measures have increased hours and types of learner driver experiences while mandating stringent rules for new drivers. Although achieving a slight decrease in trauma, the road safety risk of these newly licensed drivers has remained relatively stable, globally. The Safe System Approach coupled with the Decade of Action 2030 provides an imperative to review the end-to-end process of the driver licensing system. This paper reviews the learner driver process of the standard instructional method of training vs coaching with a curriculum as a more effective learning methodology for sustainable safety. Both processes are discussed with the coaching model for learner drivers presented as a new paradigm to be considered as the foundation for novice driver safety.
231 Poster	Jassin, B.	Road Safety Strategy Road Environment	How will Christchurch reach the Road to Zero target?	New Zealand and Christchurch have adopted an interim Road to Zero target: a 40% reduction in deaths and serious injuries (DSIs) on our roads by 2030. It is important to recognise how difficult it will be to meet this target. Numerous cities around the world have adopted Vision Zero, but US cities like Chicago and New York saw road deaths increase in 2020 from 2019. Christchurch City Council conducted research to determine how Christchurch could reach the Road to Zero target. After working to understand difficulties in modelling, multiple assumptions were developed. This research ultimately involved evaluating existing DSI savings data. The research concluded that Christchurch is on track to meet the Road to Zero target, and led to a number of essential strategic actions to ensure we meet the target, such as ensuring delivery of safe system interventions like raised safety platforms, speed management, and encouraging safe choices.

235	Wundersitz, L. Edwards, S. Thompson, J.	Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Prevention and Mitigation of Fatal Crashes in Regional/Remote Areas	Road users in regional/remote areas have a higher risk of death and serious injuries than those in metropolitan areas. This study used a Safe Systems based approach to investigate the potential of different interventions to prevent fatal crashes or mitigate injury severity in regional/remote areas. The findings showed that, while road user behaviour is a large contributor to fatal crashes in regional/remote areas, it is road and vehicle based countermeasures that provide the greatest potential to prevent these crashes and mitigate related injuries. Investment in safe roadside infrastructure, particularly to protect road users in road departure crashes, and the use of policies and incentives to accelerate the uptake of newer vehicles with safe vehicle technologies are most promising. These interventions should be coupled with effective enforcement strategies to deter unsafe driver behaviours; speed management to match the quality of the road and infrastructure; and measures to ensure restraint use compliance.
236	Wundersitz, L. Raftery, S.	Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	System Failures and Extreme Behaviour in Fatal and Injury Crashes	Within the road system, there are compliant road users who make an error that leads to a crash, indicating a ‘system failure’ and also road users who deliberately take risks and engage in ‘extreme’ behaviour that leads to a crash. This study provides an indication of the relative contribution of system failures and extreme behaviour in fatal and injury crashes to improve our understanding of interventions needed to create a safe system. Using the same methodology and definitions as Wundersitz et al. (2014), crashes from two samples (N=157 fatal crashes, N=235 injury crashes) were reviewed. Consistent with previous findings, the majority of fatal (70%) and injury crashes (93%) in South Australia were attributable to failures within the transport system. The findings demonstrate that strategies focusing on system-wide improvements can be effective in reducing the incidence and severity of a large proportion of fatal and serious injury crashes.
237	Downard-Wilke, A. Lieswyn, J. Lloyd, W. Gregory, M.	Intersections and Roundabouts	Why don't we build safe roundabouts?	In New Zealand, we are currently being told that it's time we stopped paying the road toll. Yet our roundabout design philosophy utilising a tangential design is based on maximising efficiency. This may also be why urban planners typically decry their use at all – our roundabouts permit high traffic speeds that make crossing (or using) them on foot or by bike difficult – if not impossible for mobility impaired or elderly road users. In contrast, the continental European focus based on radial designs is on maximising safety. Recently, Australasian designers have begun using raised safety platforms for speed control. This paper will assess design philosophies, their underlying reasons, and recommend actions that aim at improved safety.
238	Bamrungwong, C. Kronprasert, N.	Road Safety in Developing Countries Road Safety Audit and Road Safety Review	Using Video-Based Surrogate Measures for Rural Road Safety Assessment	The traditional methods to evaluate the safety effectiveness of roadway are based on statistical analyses of crash data. However, in low- to middle-income countries like Thailand, such data may be underreported or incomplete. Department of Rural Roads of Thailand has recently developed the new risk-based approach for safety assessment of rural road improvement projects. This approach applied Video Analytics, which processes a video signal from close-circuit televisions using a machine learning algorithm to investigate the near-miss incidents at high-risk locations, and used Traffic Conflict Technique as a surrogate safety analysis to determine the risks of incidents based on the evasive and braking actions of drivers from traffic video recordings. The study presented the application of this video-based surrogate safety to risk assessment of various safety countermeasures on rural road segments in Thailand.

239	Grzebieta, R. Gaffney, T. Rechnitzer, G.	Vehicle Crashworthiness Crash Testing	Vehicle rollover crashworthiness Australian Design	Fatalities and injuries to seat belted occupants resulting from rollover crashes commonly occurs in Australia. An analysis of 2000–2007 single vehicle rollover fatalities in three Australian states was carried out at TARS UNSW using data from the Australian National Coroners Information System (NCIS).
			Rule – it's time!	Rollovers accounted for 35% of all occupant fatalities in a single vehicle transport injury event. Of those crashes 16% occur in urban environments whereas 84% are rural crashes. Moreover, vehicle rollovers are among the most common causes of spinal cord paralysis injury (SCI) and traumatic brain injury (TBI) in Australia. Yet no government mandated Australian Design Rule (ADR) exists regarding minimum rollover crashworthiness requirements that mitigates crash severity in such crashes. Evidence demonstrating why such an ADR is needed and recommendations regarding how it can be readily developed based on existing United States vehicle crashworthiness Federal Motor Vehicle Safety Standards (FMVSS) are presented.
240	Prabhakharan, P. Sterling, K. Baker, J.	Pedestrians Signage & Signalisation	Evaluation of the NSW Pedestrian Protection Program	The NSW Pedestrian Protection Program (PPP) aimed to upgrade all two-phase signalised intersections with timed pedestrian protection (TPP). Specifically, the program sought to eliminate, or temporally separate, the green roundel signal for a turning driver commencing at the same time as a green walk signal on a parallel pedestrian movement. Evaluation of the program sought to identify whether it resulted in reduced pedestrian crash rates, fewer pedestrian-vehicle conflicts, and increased visibility of pedestrians whilst crossing. It also explored whether the program had been delivered as intended.
241	Wanty, D. Fay, D.	Road Safety in Developing Countries	Opportunities to improve road safety in developing South Pacific nations	Coinciding with the UN Decade of Action for Road Safety, key Government agencies of developing South Pacific nations, assisted by development partners, have undertaken steps to improve their road safety record. This paper illustrates several efforts and opportunities, firstly from the viewpoint of an ACRS individual member involved in providing technical assistance to Samoa, and Fiji in the road safety arena. Insights are provided on the economic, institutional and political constraints that can compromise successful project implementation. Suggestions for the current decade are made, with a call for a common crash analysis system to be funded and provided for the region to spur evidence-based identification of problem areas, overdue for treatment in the 2011-2020 national action plans. Likewise the benefits of a regional approach to updating traffic regulations and enforcement resources are discussed.
242	Mustafa, M. Bakar, H. Legino, R. Azmi, E. Ja'far, M. Ibrahim, A.	Community Programs Road Safety in Developing Countries Advocacy	Eyes on the wall: Mural art for road safety advocacy	Lack of road safety awareness among school community, the parents, local residents and road users on the importance of protecting the safety of the children become a major issue which contribute to high number of accidents involving pupils. On this basis, this study assumes that mural art can improve understanding of road safety issues, which, in turn, will improve quality of life for not only the pupils, but also the teachers and school employees. Mural art was painted at three primary schools in Negeri Sembilan State that have high road accident risk. A questionnaire survey was distributed to the teachers and school employees to acquire information on their level of road safety understanding as well as their perception towards mural art painting for improving road safety. The results demonstrate mural art may increase road safety awareness and can become a good medium for advocacy.

243	Wilmot, A. Gorell, R.	Distraction and Inattention Driver Risk	Safer placement of digital billboards	Digital billboards are becoming more common on our road networks. Static boards are being replaced with digital, with little need for planning approval. Assessment of safety impact of billboards is contentious; placement is often controlled by planning considerations not road safety impacts. We set out to develop a driver centered approach to assessing the potential road safety impact of a digital billboard. Our literature review into cognitive demand, field of view and message processing has resulted in a new methodology for assessment of digital billboards which is robust, logical and defensible. Our approach assesses the location of the billboard on the road network, the placement of the billboard relative to the driver’s field of view and the driver’s visibility of the billboard.
244	Salmon, P. KC, B. Irwin, B. Brennan, C. Read, G.	Scooters Motorcyclists Bicyclists	What influences gig economy delivery rider behaviour and safety?	The safety of gig economy delivery riders is a growing area of concern; however, as a relatively new form of work, there has been little research undertaken to examine delivery rider crash causation or the influences on delivery rider behaviour. This study involved the development of an AcciMap showing the factors that influence gig economy delivery rider behaviour and safety in Victoria, Australia, based on a literature review and workshops with delivery riders and gig economy and road safety stakeholders. The findings demonstrate that there are multiple factors influencing delivery rider behaviour and safety spanning all levels of the ‘gig economy delivery rider system’. It is concluded that efforts to enhance rider safety should target eight key areas including the delivery task, the workforce, apps, algorithms and data, infrastructure, culture and social influences, clients, customers and other road users, delivery platform processes, and laws and regulations.
245	Poulter, C. Elliott, C. Anderson, C. Manousakis, J. Howard, M.	Fatigue Driver Risk	A Graduated Approach for Validating Roadside Fatigue Detection Technologies	Driver fatigue contributes to approximately 11 per cent of all road fatalities annually in Victoria. The objective of this project was to investigate the efficacy of new and emerging technologies to detect driver impairment from fatigue in a roadside setting. The project adopted the following graduated approach to investigate the efficacy of candidate technologies; 1) desktop evidence review 2) laboratory-based assessment 3) experimental assessment in a driving context 4) operational utility assessment. The outcomes of this project have the potential to inform the establishment of a bespoke impairment assessment protocol for driver fatigue that may be suitable in road safety practice.
249	Jurewicz, K.	Speed, Speeding & Travel Speeds	Effect of speed limit compliance on severe injury crash risk	The Victorian Road Safety Strategy 2021-2030 has an objective to reduce fatalities and serious injuries (FSI) where speed is a contributing factor. Managing this factor requires not only setting appropriate speed limits but also managing drivers’ compliance. There is good research on safety effects of specific speed limit enforcement interventions. Less is known about general relationship between speed limit compliance and road safety. The purpose of this paper is to use recently published research to propose a general relationship between speed limit compliance levels and the risk of FSI crashes. Such relationship could be useful in allocation of enforcement resources to busy locations where speed limit compliance rates are low.

250	Small, M.	Road Safety in Developing Countries	Developing road safety strategies in low and middle income countries	Developing a jurisdictional strategy is a critical starting point for achieving sustained reductions in road trauma. Regrettably, strategy setting is often bogged down with planning jargon and analysis of available information rather than strategizing around major issues and options that can cut through and deliver lasting change. Effective road safety strategy focuses on the vital few, the big issues through which lasting change can be delivered, and this is particularly important in low and middle income countries. Data is always an issue, but there is almost always sufficient data to present a strong case for change with an approach which can be delivered within the local context. This paper will outline four key elements for developing effective road safety strategies in low and middle income countries with examples drawn from Asia and Africa, at both a national and sub-national level. Lessons learned include focusing on the vital few, appropriately using available data, and promoting lasting stakeholder engagement.
252	Head, A. Dance, G.	Road Safety Strategy	Prioritising pedestrians in a safe system	The recently launched Pedestrian Network Guidance (PNG) sets out how to apply safe system principles for pedestrians which means full separation from motor vehicles or where this cannot be achieved, ensuring vehicle speeds do not exceed 30km/h to reduce the risk of death or serious injury. However, many other factors contribute to making a place walkable such as ensuring walking routes are direct and connected to places pedestrians wish to reach; and that routes are legible and attractive for people. Often, safe system treatments can also contribute to or support these important walking network characteristics. However, sometimes a proposed safe system treatment conflicts or hinders providing other important aspects for pedestrians? What do practitioners need to consider when a primary safe system treatment for pedestrians does not fit with the needs of other modes on a corridor? This presentation will explore the challenging aspects of adhering to safe system principles whilst still ensuring places that people walk are attractive and comfortable.
253 Poster	McDonnell, A.	Young Drivers Education – general and other School Safety	Crash Bash - Engaging Road Safety Messaging for Young Drivers	Young drivers on restricted licences are over represented in death and serious injury statistics. This reinforces the importance and need to embed safe road safety education and practises at an early age by targeting secondary school students, especially young males. In collaboration with the New Zealand Police and The Court Theatre, Crash Bash is an interactive touring show exploring the risks of driving with high school students and teaching young drivers how to make safe choices on the road. Delivering key road safety messages in an entertaining, informative and memorable performance today will lead to better outcomes for our young drivers and their friends tomorrow.
256	Martin, L. Brown, M.	Speed, Speeding & Travel Speeds	Auckland Transport Safe Speed Programme - A Step Towards Zero	On 30 June 2020 Auckland Transport implemented the majority of Tranche 1 of the Safe Speeds Programme. This included the delivery of speed limit changes on approximately 10% (over 800km) of Auckland's local road network to achieve safe and appropriate speed limits. Tranche 1 roads were a mixture of high-risk roads and those that were already operating at lower speeds than the existing speed limit. It included roads from high-risk rural areas, the city centre, a number of town centres, residential areas and urban roads. The overall target of these speed limit changes was to reduce the number of death and serious injury (DSI) crashes on the roads. Using an area based approach, Tranche 1 has an estimated 86.6 reduction in death and serious injuries over 5 years. Though it is to early to provide a statistically robust evaluation, early results show a reasonable decrease in crashes across these roads.

How to successfully engage a community in road safety

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Abstract

Lack of community engagement in road safety issues has been a stubborn hurdle to achieving greater road safety outcomes. In this paper, we breakdown the four steps used to provide a detailed guide on how to develop and implement a successful road safety campaign that engages the community and achieves positive outcomes. The four steps were: 1) key stakeholder engagement, 2) community consultation, 3) campaign creation and delivery and, 4) evaluation. As this project was conducted in 2020/2021, we include how we managed disruptions caused by COVID-19. Key findings show the campaign successfully achieved the goal (humanise cyclists), increased understanding of safe behaviours and positive influence on attitudes about cyclists. While this project focused on cyclists, the insights can be used to improve community engagement in any area of road safety.

Background

This project was conducted in the Alpine Shire region in the Victorian Alps. The value of cycling tourism in this part of Victoria is an estimated A$120 million per year. However, the narrow, mountainous roads can make sharing the space challenging. Initially, the Alpine Shire Council (the Council) requested a campaign to address drivers, particularly visitors/tourists with negative attitudes about cyclists. The Council believed local residents were positive about cyclists. We started by testing these assumptions and developed a research approach including:

- Concerns about drivers and cyclists sharing the roads in the Alpine Shire region including residents, visitors and specific locations
- Attitudes and culture about key factors in perceptions about cyclists and drivers/vehicle type
- Road rules, behaviour and infrastructure: understanding of how road rules contribute to behaviour on the roads. Advice about sharing the roads and the role of infrastructure
- Suggestions to improve road safety

Method

Restrictions in response to COVID-19 impacted the project causing major delays and disruption. The final mixed-method project had four stages: 1) stakeholder engagement, 2) community consultation, 3) campaign creation and delivery and, 4) evaluation.

Stakeholder engagement: two online focus groups were held with stakeholders from the region, including: tourism operators (e.g. accommodation), cycling related businesses (e.g. bicycle shops), government (e.g. state parks, police), education and health.

Community consultation: an online survey, informed by focus group insights, explored: concerns, attitudes, road rules, infrastructure, road user behaviour (driver and cyclist).

Campaign development: developed in collaboration with creative agency, DGB group, included campaign brand, logo and key messaging. We included eleven local residents who were filmed on and off their bike, spoke about their community and the importance of cycling. The campaign included digital, print collateral, a short film (3:28 mins) and video clips.

Evaluation: Two months post-campaign, an online survey was conducted to evaluate the campaign effectiveness in terms of empathy for road users, knowledge of road rules and understanding of safe, shared road use.

Results

Key findings from the focus groups and community consultation survey (n=569, cyclists, 68%; drivers, 32%) challenged the Council's assumptions as residents reported negative attitudes towards cyclists. Negative comments mentioned legitimacy (roads are for cars, not bikes) and value of trips (i.e. cyclists only ride for pleasure). Campaign distribution included reach and engagement through a Monash Media article (almost 1 million), almost 90,000 social media points of contact and over 1,000 views on YouTube (click on Figure 1).

Figure 1. Live, Drive, Ride like a local. Click to watch full video (3:28 mins)

Evaluation survey responses (n=97) reported positive reactions. After watching the video, the top two unprompted key messages were: people riding bikes are normal people (34%) and mutual respect is needed when sharing the road (27%) with most people (92%) agreeing that more education of drivers and cyclists is needed. Most respondents wanted campaigns to include the local area (91%) and local residents (82%) rather than social influencers (51%) or celebrities (48%).

Conclusion

This project successfully engaged a local community to humanise cyclists, specifically by identifying cyclists as local people. The project provides important insights about the type of content that engages local communities and will help to inform future campaigns.

3

'*Fix Crash Corner*' – A Roundabout Story

Bruno Royce

Director/Principal Transportation Engineer - Traffic Engineering Solutions Ltd

Abstract

In 2020, a new roundabout was constructed at the intersection of Church and Victoria Streets, Auckland. It replaced a 'Stop' controlled cross-roads junction with adverse crash history, nicknamed 'crash corner' by locals, with 54 reported crashes over 5 years. The constructed roundabout was the first 'Safe Systems – Vision Zero' design of its kind in New Zealand, being a fully raised roundabout with 4 pedestrian crossings. Independent crash analysis determined that the new roundabout had reduced reported crashes to ZERO. The 'lifetime' crash cost savings of the new roundabout were estimated at a Present Value of over $NZ10m. The roundabout also improved pedestrian amenity, upgraded access to public transport and local shops, encouraged modal shift, improved social well-being, and reduced carbon emissions. The project progressed from scheme to constructed within 6 months, and was selected as a finalist in the IPWEA NZ 'Asset Management Excellence Awards' (2022).

Background

The innovative roundabout was a collaborative project between Auckland Transport, Traffic Engineering Solutions, and Liveable Streets. The project was fast-tracked from scheme to construction in under 6 months, with advanced scheme/detailed design prepared within a month, and construction arranged in parallel with final design.

'Safe System' Crash Savings

Independent crash analysis was commissioned to examine reported crashes '*before*' and '*after*' at the roundabout, and on nearby surrounding roads, using the CAS[1] database.

At the previous cross-roads intersection before the roundabout was constructed, 54 crashes were reported over 5 years within a 50m radius of the roundabout, equating to 11 reported crashes per year. Reported crashes included 1 serious injury crash and 23 minor injury crashes.

Since installation, independent crash analysis (June 2021) determined that there were **ZERO** crashes reported at the roundabout, over an 18 month period since construction. The independent analysis concluded that "*Given the very high number of recorded crashes of one particular type before the intersection was upgraded and the absence of any crashes post upgrade it can be concluded that the roundabout has been effective at addressing the crash pattern at this intersection.*"

Indeed, chi-squared analysis indicates an approximate 99.9% probability that the 'intervention' had a significant effect on reported crashes at the junction.

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[3] CAS: Crash Analysis System – New Zealand Transport Agency (Waka Kotahi)

The financial cost of the on-going crashes at the cross-roads junction were estimated at over $700,000 per year. Using NZTA EEM[2] guidelines, the Present Value of the crash cost savings due to construction of the roundabout were estimated at over NZ$10m.

Crash statistics were also reviewed further afield on the surrounding road network. This determined that as well as achieving crash reduction at the junction, the roundabout created a 'halo effect' further east, with crashes nearby reducing from 16 crashes (over 5 years) to zero at the nearby junction. The project not only benefited those that use and live near the intersection, but also further along the roads outside the project boundaries.

***Note:** The full independent crash analysis report is available as a separate attached document for perusal if needed.*

Benefits to a Wide Range of Transport System Users

Pedestrian surveys 'before' and 'after' indicated an 80% increase in pedestrian traffic at the junction after installation of the roundabout, showing a clear increase of use after pedestrian safety and amenity were improved. Also, upgraded bus stops near the intersection demonstrated an effective 50% increased utilisation.

Conclusions

A fairly complex design and construction project was implemented efficiently, quickly, safely and successfully, despite adverse on-site conditions, thanks to a collaborative team spirit and '*can do'* team attitude. Also, independent crash analysis established that the roundabout was effective at achieving substantial crash savings.

Consideration should be given to re-valuating reported crashes at the roundabout at a later date, when additional crash data is available. Also, similar roundabout designs should be considered at sites with a similar layout and crash history.

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[3] NZTA EEM: New Zealand Transport Agency (Waka Kotahi) – Economic Evaluation Manual

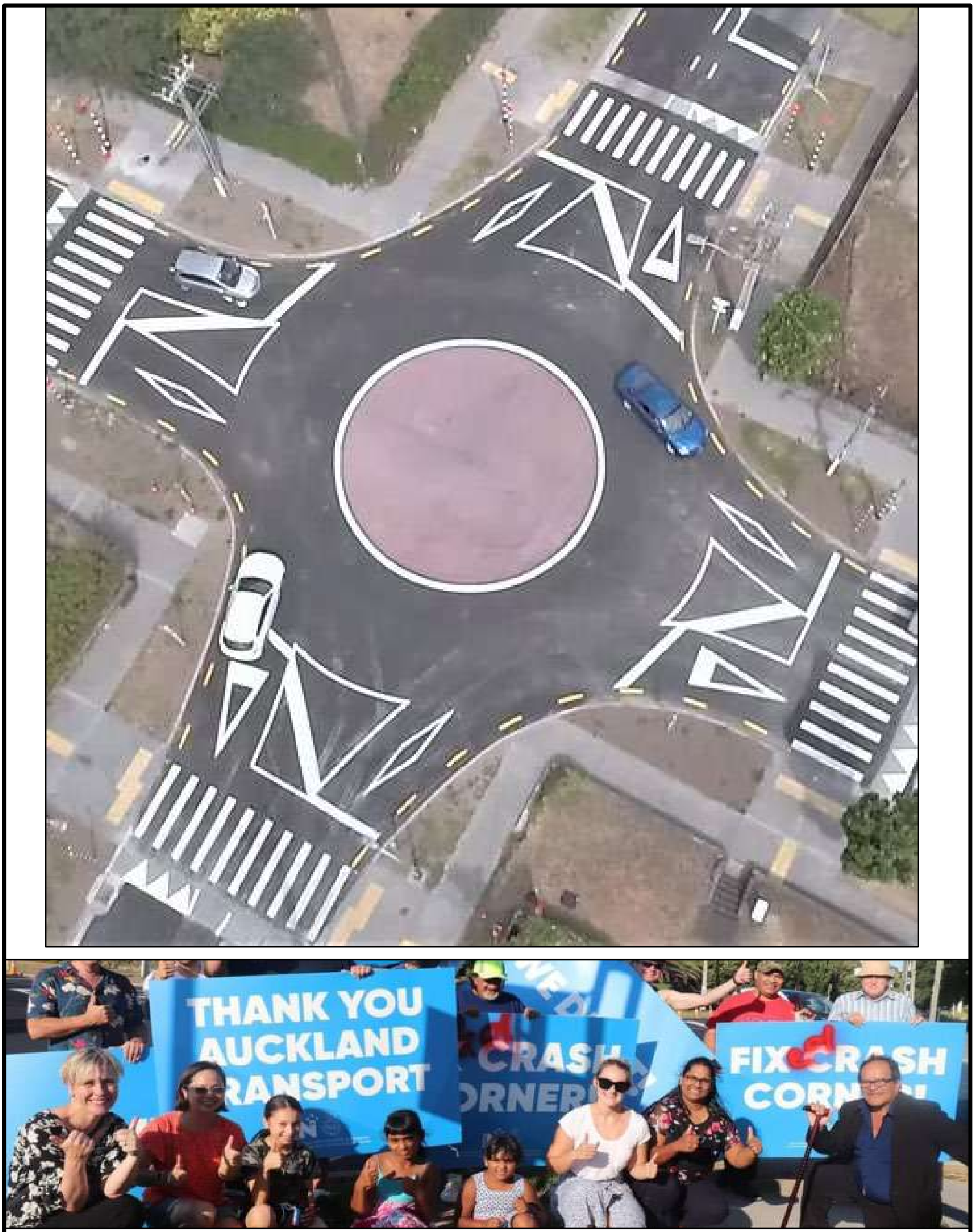

Figure 1. The New Roundabout, and Local Residents Celebrating its Completion

5

Embedding Safe System in Victoria: Blockers, Enablers and Upcoming Activities

Hafez Alavi[a], Chris Jones[b], Carly Hunter[b]

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Abstract

The Safe System approach was adopted in Victoria in 2004, and since has been the cornerstone of every road safety strategy and action plan, most recently the Victoria Road Safety Strategy 2021-2030. However, there is vast evidence that its insufficient embedment in our road and transport management system has stymied its potentials to save serious road trauma on our roads. To diagnose why the Safe System implementation gap exists and how road safety management system and stakeholders could be enabled to do so, five workshops were delivered by HA consulting and Road Safety Victoria (RSV) with over 60 representatives from several stakeholders. Survey participants identified a high personal alignment to the Safe System principles but identified a range of practical day-to-day blockers, and suggestions for what could enable better decision making. By understanding why the gap exists, a reform roadmap of project level concepts has been developed to address gaps.

Background

The Safe System approach was adopted in Victoria in 2004 (Howard, 2004), and since has been the cornerstone of every road safety strategy and action plan, most recently the Victoria Road Safety Strategy 2021-2030. However, a recent Victorian parliamentary inquiry (Parliament Of Victoria, Economy and Infrastructure Committee, 2021) identified that there is insufficient implementation and embedment in our road and transport management system which has stymied its potential to save serious road trauma on our roads.

Project purpose

Road Safety Victoria (RSV), a recently created division in Victoria's Department of Transport, "is to make every road journey safe and ensure that Victoria continues to be a leader in road safety initiatives and innovation." To diagnose why Safe System is not embedded in every transport decision, it is important to gauge key stakeholders' attitudes and beliefs towards the Safe System approach and identify key Safe System Embedment blockers and enablers. These two were our key objectives that were deemed to help us develop specific concept-level projects as a part of a Safe System Embedment Roadmap.

Method

To provide a deep understanding of why and how the Safe System approach has not been fully adopted in Victoria and how all the players in the road project and road safety management system could be enabled to do so, five technical workshops were conducted with more than 60 representatives. Decision making areas surveyed included internal DoT business areas, infrastructure delivery agencies, stakeholder groups, local government authorities, and Victoria's road safety partnership members.

Lessons Learned

Attitudes and beliefs – Zero road trauma and Safe System principles

Across surveyed participants there was a strong alignment of personal values towards the Safe System principles. Key survey findings were that:

- Only 12% of participants disagreed with the statement that: "No one should be killed or seriously injured on our roads"
- Over 75% of participants believe that "Zero deaths and serious injuries are possible before 2060".
- 97% of participants agree that: "The road system should be designed to be forgiving if people made mistakes"
- Over 65% of participants agree that: "While the public need to abide by road rules, the ultimate responsibility is upon the road authorities to keep them safe"

Blockers and enablers

When surveyed, most practitioners agree with a proposed list of generic blockers:

- Organisational culture and priorities
- Political decisions impacting project decision making
- Publics attitude and support
- Policy and standards
- Technical capability and know-how
- Mindset & change management

Participants generated the following list of key organisational enablers:

- Influence the organisational culture
- Influence political decisions
- Policy and technical standards
- Technical know-how
- Embed accountability in decision making
- Make safety a clear priority

When asked what personally stops them to make Safe System decisions stakeholders reported the following areas:

- Stakeholders
- Processes
- Technical matters
- Practical matters
- Leadership

Implications and next steps

The survey demonstrated that no signal blocker or enabling action could be taken to embed a Safe System decision making in all transport decisions. A roadmap of reform projects is instead being planned to address the challenges and build on ideas self generated by the community of practitioners. The high-priority projects and their description are shown in Table 1. These projects are now being assessed for funding and implementation.

Table 1. High-priority Safe System Embedment project concepts

Safe System Embedment in Frameworks & Processes	To ensure Safe System is embedded and included in every decision in the road safety management and project governance processes.
Safe System and Future Planning	To work closely with network planning, network integration, corridor planning, precinct planning, movement and place and other key planning and ensure Safe System is embedded in these activities
Early, Proactive Safe System Integration	To provide practical Safe System advice and support to key stakeholders during early stages of programs and projects
Safe System Embedment KPIs & Reporting	To develop Safe System performance metrics in alignment with Safe System Embedment and the State Road Safety Strategy
Safe System Plans for Regions and LGAs	To support regions and LGAs to adopt the learnings of the SSE and enhance their Safe System plans, targets, KPIS etc.
Best-Practice Safe System Case Studies	To provide clear, easy-to-use Safe System practice and solutions for persistent road safety problems that block key stakeholders. To provide communication and engagement material to all road safety practitioners, leaders, managers, politicians, advocacy groups to barrack for Safe System. To determine Safe System knowledge gaps amongst key stakeholders and provide them with best-practice Safe System measures and advice.
Design Innovation project for specific issues	To identify gaps in our Safe System Infrastructure "toolkit" that result in non safe system outcomes on the network and develop innovative solutions to address these.
SSE Project Management	To support RSV with the delivery of the high-priority projects with providing a dedicated resource.
Safe System Capability Improvement	To uplift practical Safe System knowledge amongst key stakeholders within and without DoT. To encourage politicians, leaders, managers, and decision makers to fully include Safe System in their decision making and communications.
Pilot fatal review and safe system analysis for system learnings	Current process for fatal crash analysis is not fully safe system aligned and still follows conventional approach

References

Howard, E., 2004. Implementing A ‘Safe System’ Approach To Road Safety In Victoria. 2004 Road Safety Research, Policing and Education Conference –Perth, W.A. 14 – 16 November 2004.

Parliament Of Victoria, Economy and Infrastructure Committee, 2021. Inquiry into the increase in Victoria’s Road Toll, 13-16.

Embedding Safe System in Victoria: Blockers, Enablers and Upcoming Activities

1 Drivers of Change

National / Victoria

- The Magnitude & Costs of Trauma
- Victoria's Road Safety Strategy

International

- 2nd Decade of Action (2021 – 2030)
- Sustainable Development Goals (SDGs): #3 & #11

2 3 Key Questions

- **Our SSE Vision**
  - **Blockers & Enablers**
    - **Roadmap of Actions**

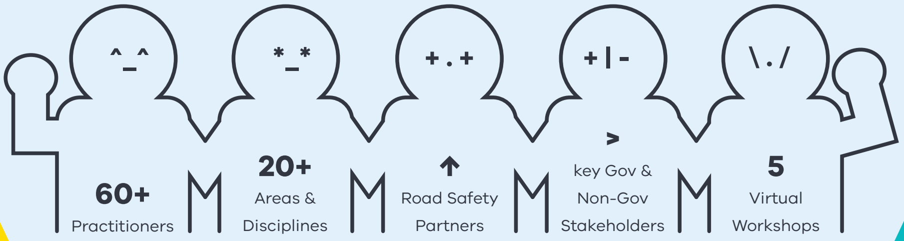
???

3 Safe System Embedment Our Purpose Statement

TAC & RSV contribute to the road safety partnership and key stakeholders in the State of Victoria to sustainably achieve:

- A culture where transport safety is inherent in all we do (Safe System Culture)
- 50% reduction in road fatalities and serious injuries by 2030
- Zero road fatalities and serious injuries by 2050
- Tangible road safety outcome milestones for all road users on the way to 2030/2050.

4 Our Consultation



60+ Practitioners

20+ Areas & Disciplines

↑ Road Safety Partners

> key Gov & Non-Gov Stakeholders

5 Virtual Workshops

5 Safe System Embedment Roadmap

1 Current & Ideal States

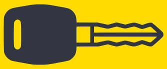
2 Areas of Intervention

3 Map Stakeholders

4 Activities & Milestones

5 Governance & Reporting

6 Monitor KPIs/SPIs



6 Key Intervention Areas

- Policy & Standards
- Strategy & Planning
- Org Culture & Leadership
- Capability & Know-How
- Government & Political Sphere
- Business Processes & Procedures
- Communication & Engagement

7 Our Response Immediate Activity Plans

- SSE Frameworks & Processes
- Future Planning
- Proactive SS Integration
- SSE KPIs & Reporting
- SS Plans for Regions & LGAs
- Best-Practice Case Studies
- Safe System Design Innovation
- Safe System Capability
- Pilot Fatality Review

ADVANCING
SUSTAINABLE
TRANSPORT SAFETY

HEA
CONSULTING

VICTORIA State Government

Department of Transport

6

Fatal motorcycle crashes analysis in Thailand: Accounting for unobserved heterogeneity

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Abstract

In 2016, motorcyclists were about 74% of the total deaths due to road crashes in Thailand. Using motorcycle-crash data in Thailand from 2016 to 2019, this study explored the effects of wide ranges factors including rider actions and characteristics, roadway characteristics, environmental and temporal characteristics and crash characteristics on fatal motorcycle-crashes using random parameter binary probit with heterogeneity in means and variances. The results show that fatal-motorcycle crashes were highly associated with factors such as male riders, riding with pillion, speeding, improper overtaking, fatigue, flush/raised/depressed median road, grade road, U-turn, bridge, wet road surface, nighttime, lit/unlit road, weekend crash, hitting large truck and head-on crashes. These findings could be used as guideline for policies formulation to mitigate or reduce motorcyclist fatality rate.

Background

Motorcyclist fatality rate due to traffic crashes are significantly more than other vulnerable road users due to lack of protection in the event of the crashes comparing to vehicle driver (Rifaat, Tay, & De Barros, 2012; WHO, 2018). In Thailand, motorcyclists were about 74% of the total deaths due to road crashes in 2016 and the numbers are steadily on the rise. This study aims to investigate factors affecting motorcyclist injury severities in Thailand using accident data from 2016-2019 (DOH, 2018).

Method

To account for unobserved effect (see Mannering, Shankar, and Bhat (2016)), a random parameter binary probit with heterogeneity in means and variance (RPMHMV) was adopted. See Tay (2015) and Zubaidi, Obaid, Alnedawi, and Das (2021) for binary probit modelling with random parameters and see Seraneeprakarn et al. (2017) and Se, Champahom, Jomnonkwao, Karoonsoontawon, and Ratanavaraha (2021) for how to allow explanatory variables to influence means and variances of random parameters. This study used the simulated maximum likelihood estimation with 200 Halton draws. Marginal effects were also calculated to capture the effect of a one-unit change on the severity outcome probabilities.

Results

Table 1 presents the modelling result of RPMHMV. As shown in Table 1, male, riding with pillion and speeding indicators produced significant random parameters with their average marginal effects increasing the likelihood of fatal injury. Crash occurring between 07:00-08:59 and 16:00-17:59 decrease the mean of male rider making fatal injury less likely and crash occurring between 09:00-15:59 decrease the mean of rider with pillion, rendering fatal injury less likely.

Regarding rider characteristics, improper overtaking and fatigue rider had higher probability of sustaining fatal injury with marginal effect of 0.15634 and 0.07238. whereas rider under influence of alcohol were less likely to die in the crash (in line with Islam (2021)).

For roadway attributes (Table 1), the marginal effects showed that crashes on main lane, frontage lane and 4 lane road had lower probability of fatal injury. In contrast, crashes on flush/raised/depressed median, grade road, U-turn area, bridge area increased the likelihood of motorcyclist injury severity.

Moving to surrounding environmental and temporal characteristic, crashes on wet road surface, crashes during nighttime on lit or unlit road, during midnight to early morning, and during weekend were found to have higher probability of fatal injury in motorcycle crashes.

Lastly, in crash characteristics group, hitting other motorcycle crashes had lower probability of fatal injury; whereas hitting large-truck and involving in head-on crash increased the likelihoods of fatal injury to motorcyclists.

Conclusions

This study explored the effects of wide range of associated risk factors on the fatal motorcycle-crashes. Results showed that fatal motorcycle crashes were highly associated with male riders, rider with pillion, speeding, improper overtaking, falling asleep, flush-, raised-, and depressed-median, grade road, U-turn, bridge, wet road surface, nighttime crash, early morning crash, weekend crash, hitting large truck and head-on crashes type. This paper can provide insights into preventing fatal motorcycle crashes and the finding could be used to facilitate the development of the corresponding crash injury mitigation policies.

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Table 1. Estimation result for fatal motorcycle crash in Thailand

Variable	Parameter estimate	t-stat	Marginal effect
Constant	-1.09	-3.88	
Random Parameters			
Male	0.16	1.71	0.04500
Standard deviation of "Male indicator"	*0.91*	*44.91*	
Pillion	0.38	4.41	0.11013
Standard deviation of "Pillion indicator"	*1.10*	*33.53*	
Speeding	0.23	2.05	0.06478
Standard deviation of "Speeding	*0.27*	*15.04*	
Rider characteristic			
Improper overtaking	0.52	3.87	0.15634
Alcohol	-0.56	-5.89	-0.13982
Fatigue	0.25	1.67	0.07238
Roadway characteristic			
Main lane	-0.39	-5.23	-0.10087
Frontage lane	-0.96	-9.94	-0.21457
4-lane	-0.24	-3.21	-0.06823
Flush median	0.73	2.76	0.21734
Raised median	0.54	2.03	0.15213
Depressed median	0.74	2.79	0.21638
Grade road	0.33	3.85	0.09552
U-turn	0.16	2.92	0.04624
Bridge	0.39	3.08	0.11636
Environmental and temporal characteristic			
Wet road	0.57	4.56	0.17037
Lit road	0.15	2.05	0.04231
Unlit road	0.44	5.44	0.13000
Midnight to early morning	0.59	4.63	0.17820
Weekends	0.48	10.47	0.13736
Crash characteristic			
Hit motorcycle	-0.65	-11.02	-0.16434
Hit large truck	1.26	22.88	0.39482
Head-on crash	0.50	7.41	0.15130
Heterogeneity in means			
Male: Peak-hour	-0.34	-3.01	
Pillion: None peak-hour	-0.22	-2.10	
Model Summary			
Number of observations	13795		
	-8653.38		
	-7485.83		
	0.135		
Note: fatal is coded '1' and non-fatal is coded as '0' for model estimation process. All indicators are coded as binary. Ex: 1 if rider is male, 0 otherwise.			

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Drivers' knowledge of Advanced Driver Assistance Systems

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Abstract

This study examined a sample of Australian drivers' knowledge of Advanced Driver Assistance Systems (ADAS). The study also assessed what information drivers sought about ADAS prior to purchase, and how drivers learned about these systems after purchase. Drivers (*N*=217) who had purchased a vehicle with ADAS within the past five years were invited to complete a 20-minute online questionnaire. The findings revealed that over half of respondents (56.0%) did not seek out information about ADAS prior to purchase. After purchase, learning about ADAS via the owner's manual and trial-and-error were the most reported approaches. Car manufacturers were ranked first most often by participants as to who should be responsible for delivering information about ADAS in Australia. Further, and on average, participants reported that they would be unlikely to engage in risky driving behaviours (e.g., removing hands from steering wheel, taking eyes off road) when using ADAS.

Background

Advanced Driver Assistance Systems (ADAS) are safety systems which can assist a driver with the operation of a vehicle. These systems may be passive (i.e., systems which alert the driver; e.g., lane departure warning) or active (i.e., a system that takes control of the vehicle; e.g., lane keeping assist). Research has reported that ADAS may reduce the likelihood of crashing (Spicer et al., 2018) and injury-related crash rates (Cicchino, 2017). Despite these potential advantages, there remains a lack of consumer knowledge of the functions of ADAS, and research from the Netherlands and the US have found that one method drivers use to learn about these functions is via trial-and-error (e.g., Boelhouwer et al., 2020; Lubkowski et al., 2021). This study aimed to extend upon previous research and to assess how Australian car users are informed about ADAS and their knowledge on the effects of these systems on driver behaviour.

Method

Drivers (*N*=217) aged 18-90 years (*M*age=47.87 years, 149 male) completed a 20-minute online questionnaire. Participants were required to hold a valid licence, reside in Australia, and have purchased a vehicle which had at least one of the following five ADAS: adaptive cruise control, autonomous emergency braking, lane departure warning, blind spot monitoring, and rear-cross traffic alert, within the past five years. The questionnaire included items which measured demographics, how drivers were informed about these systems in their vehicle, and perceptions of who should be responsible for delivering information about ADAS in Australia. Participants were also asked to read 10 short written scenarios to assess their knowledge of the effects of ADAS on driver behaviour.

Results

More than a third of participants reported having adaptive cruise control in the vehicle (78.3%), followed by autonomous emergency braking (70.5%), then lane departure warning (67.3%). Fifty-six percent of participants reported not seeking out information about ADAS prior to vehicle purchase. After purchase, over half of participants reporting learning about ADAS via the owner's manual (55.8%) and using trial-and-error (53.9%).

Car manufacturers were ranked first most often as to who should be most responsible for delivering information about ADAS in Australia (see Table 1). A Wilcoxon signed-test showed that car manufacturers were ranked as being significantly the most responsible to deliver information about ADAS when compared to all other response options. On average, participants also rated that they would likely conduct safe driving behaviours and were unlikely to engage in risky behaviours (e.g., removing hands from steering wheel) if systems were active, in different contexts.

Conclusions

The findings are consistent with previous research which reported that drivers learn about ADAS via the owner manuals and trial-and-error (Lubkowski et al., 2021). However, and as reported in Ovideo-Trespalacios et al. (2021), while user manuals include safety-critical information about ADAS, they may not be well understood by all owners. To assist with gaining appropriate knowledge about ADAS, there is a need to communicate where drivers can find out reliable and accurate information about ADAS prior to using these systems to optimise potential safety benefits.

Table 1. Participants' ranking of onus of responsibility for delivering information about ADAS in Australia

	Rankings (%)						
Response options	1	2	3	4	5	6	7
Car manufacturers	46.3	30.7	9.8	7.8	3.9	1.0	0.5
Car dealerships	29.3	36.1	16.1	5.4	6.8	2.4	3.9
Australia Government	11.2	3.9	8.3	16.6	30.2	11.2	18.5
Independent vehicle safety authorities	7.8	15.1	44.9	13.7	6.8	7.3	4.4
Insurance companies	0.0	5.4	11.7	36.1	11.2	12.2	23.4
State or Territory Governments	4.9	7.3	4.9	17.1	20.0	41.5	4.4
Local Government	0.5	1.5	4.4	3.4	21.0	24.4	44.9

Note. n = 205. Participants were asked to rank who should be responsible for delivering information about ADAS in Australia from numbers 1 to 7, with 1 = *most responsible* and 7 = *least responsible.*

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Sharing AV intended pathway may help during silent failures

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Abstract

Drivers of conditional (SAE Level 3) automated vehicles (AVs) are expected to stay alert at all times when driving in case of system failure. However, little information is provided to the operator as to what the intended manoeuvres are of conditional AVs. An online experiment was conducted to observe whether participants (*N*=394) would be able to anticipate safe and unsafe manoeuvres if a pathway heads-up display were overlayed in an image. This shared pathway showed the intended manoeuvre of the conditional AV. The results showed that participants anticipated both safe and unsafe manoeuvres correctly 87% of the time. Self-report ratings of trust in the conditional AV were significantly lower when participants observed unsafe projections compared to when observing safe projections, showing evidence of trust calibration. These findings highlight the potential of shared pathway heads-up displays (HUDs) to calibrate trust and help AV drivers anticipate silent failures.

Background

Conditional (SAE Level 3) automated vehicles (AVs) are vehicles which are capable of operating all safety features in most driving conditions. However, the driver is expected to be ready to intervene in case of system limitations, such as a *silent failure*. Silent failures is when an AV makes an error that it is unaware of, and therefore, cannot issue a take-over request. A human-machine interface (HMI) that displays the intended manoeuvres of the conditional AV through a *shared pathway* on a heads-up display (HUD) could be a way of ensuring that that AV operator knows what the AV is planning to do next. This experiment extends upon the limited research which has investigated silent failures (Bianchi Piccinini et al., 2020; Louw et al., 2019; Mole et al., 2020) and aimed to test an online HUD designed to help conditional AV drivers anticipate silent failures.

Method

Participants (*N* = 394) aged between 17-85 years (*M*age = 28.24 years; 35% male) who lived in Australia and held a valid driving licence completed a 30 minute, two part, online experiment. The experiment reported herein was a 2x2 study design, with the independent variables (i) presence vs absence of object recognition bounding boxes (ORBB) and (ii) safe vs unsafe manoeuvre as depicted by the shared pathway. Participants were shown a series of six photos depicting different traffic scenarios. Each photo could appear in one of four different versions, representing the four randomised conditions (see Figure 1).

After presentation of each photo, participants were asked, “is human intervention required in the scenario above?” If an unsafe manoeuvre was shown, then participants were expected to answer “Yes”. If a safe manoeuvre was shown, participants were expected to respond “No”. Participants’ accuracy and response time was measured in relation to this question, as well as items relating to trust in the AV.

Figure 1. Example of a traffic scenario used in the photo experiment under four different conditions under the 2x2 design

Results

A linear mixed model was used for analysis. Participants chose the correct response of whether intervention was required 87% time and were significantly quicker to respond under the unsafe manoeuvre condition (*M*=4753.23ms, *SE*=240.97ms) than the safe manoeuvre condition (*M*=5963.96ms, *SE*=239.18ms). Participants self-reported levels of trust in the AV were significantly higher when the HUD displayed a safe manoeuvre (*M*=5.46, *SE*=.044) than an unsafe manoeuvre (*M*=2.24, *SE*=.045). These items were measured on a 7-point Likert scale (1=*strongly disagree*, 7=*strongly agree*).

Conclusions

The results indicate that the shared pathway was effective at warning participants of silent failures. The safe condition led to high trust in the AV whereas the unsafe condition led to low levels of trust in the AV. Shared pathway shows capabilities of calibrating trust, and aide in the conditional AV operators to anticipate unsafe manoeuvres ahead of time. This study is one of the first studies to investigate shared pathway for AVs in a controlled experiment. Further research is recommended to investigate the utility of shared pathway in the context of AVs.

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Normative influences on illegal smartphone use among young drivers

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Abstract

Illegal smartphone use among young drivers contributes to a substantial number of road crashes. Studies have suggested that norms (e.g., descriptive, injunctive) influence this behaviour; however, the relative influence of the various norms is unexplored. The current survey study (*N* = 137) utilised an extended Theory of Planned Behaviour which included four distinct types of norms: subjective, injunctive, descriptive, and moral. The aim was to identify which norms are most influential on illegal smartphone use (both intention and behaviour) among young drivers aged 18 to 25 years. Hierarchical regression analyses found that, overall, the extended model accounted for 70.3% of variance in intention. Of the normative constructs, injunctive norm and descriptive norm were significant predictors of intention. Injunctive norm and intention were significant predictors of behaviour. These findings suggest that injunctive and descriptive norms be the foci of social norms interventions aimed reducing illegal smartphone use among young drivers.

Background

Young drivers are the most likely age group to use their smartphone while driving, which contributes to their increased crash risk. Given they report being aware of the risks and legal penalties associated with this behaviour, there must be other contributing factors influencing this risky behaviour, such as normative influences (Carter et al., 2014). Broadly, normative influence is defined as the way people look to others for guidance on how to think and act (Shulman et al., 2017) and can be broken down into several distinct norms, including descriptive norm, injunctive norm, subjective norm, and moral norm. For example, people often choose to engage in behaviours based on what they perceive others commonly do (i.e., descriptive norm) or what they perceive important others will approve of (i.e., subjective norm). Indeed, studies have found that young drivers' perceptions of their peers' smartphone use behaviour and the level of their peers' approval are related to their own engagement in smartphone use while driving (Donmez et al., 2019). Given previous studies typically focus on a single type of norm, the current study aimed to investigate the relative influence of various norms on illegal smartphone use among young drivers.

Method

This online survey study applied an extended Theory of Planned Behaviour (TPB; Ajzen, 1991) to investigate the ability of the standard TPB constructs (i.e., attitude, subjective norm, perceived behavioural control) and the additional constructs (i.e., descriptive norm, injunctive norm, moral norm) to predict illegal smartphone use (both intention and behaviour) among young drivers aged 18 to 25 years. Participants (*N* = 137) owned a smartphone, had a current driver's licence (P1, P2, or open), had engaged in illegal smartphone use while driving, and resided in NSW.

Results

An hierarchical multiple regression analysis found the standard TPB constructs (along with past behaviour) accounted for 64.2% of the variance in intention to illegally use a smartphone while driving $F(3,131) = 99.05$, $p < .001$. Descriptive norm, injunctive norm, and moral norm accounted for an additional 6.1% of the variance over and above the standard TPB constructs $F_{change}(3, 128) = 8.80$, $p < .001$. Overall, the final model accounted for 70.3% of variance in intention with perceived behavioural control ($\beta = .43$), injunctive norm ($\beta = .23$), attitude ($\beta = .20$), past behaviour ($\beta = .16$), and descriptive norm ($\beta = .13$) as significant predictors. Injunctive norm ($\beta = .43$) and intention ($\beta = .35$) were significant predictors of behaviour.

Conclusions

Research in relation to other risky health behaviours (e.g., alcohol use) finds that normative perceptions are often misperceptions where young people overestimate the degree to which others approve of, and engage in, the risky behaviour. In accordance with social norms theories, social norms interventions can be developed to correct these misperceptions. As such, this study's findings suggest that injunctive norm and descriptive norm could be the focus of social norms interventions aimed at correcting normative misperceptions about illegal smartphone use among young drivers, and reduce engagement in this risky behaviour.

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Star Rating For Road Safety Audits

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Abstract

Road Safety Audits (RSAs) and the International Road Assessment Programme (iRAP) methodology both have the same overall objective: to reduce road trauma, yet the two approaches are different. RSAs are a formal, systematic and detailed examination of road safety concerns by an independent and qualified team of auditors. RSAs leverage the knowledge and experience of these auditors and only present issues the auditors believe present risks to the travelling public. The iRAP methodology is a highly standardized, data and evidence driven process that produces quantifiable safety metrics such as star ratings and investment plans. By combining the RSA methodology and the iRAP methodology, the advantages of each approach can be amplified, and the limitations of each can be minimized. We refer to such a syncretic combination as Star Rating for Road Safety Audits (SR4RSA).

Background

RSA and the iRAP methodology have the same overall objective yet the two approaches differ: RSA leverage the knowledge and experience of auditors; iRAP is highly standardized, driven by data and evidence, and produces quantifiable safety metrics - meaning that prior to committing to a design, it is possible to check that the scheme would achieve a safety target. Each approach when used in isolation improves safety, yet infrastructure safety management tools such as RSA and the iRAP methodology can (and should) be used in parallel exactly because of the different but complementary perspectives they bring to the road design process (PIARC, 2019).

The Central Asia Regional Economic Cooperation (CAREC) Program on Road Safety determined that to successfully implement the Global Plan and CAREC's Transport Strategy, policy makers, road authorities, engineers, and other key stakeholders should understand how the iRAP methodology (including Star Rating performance targets) can be integrated with RSAs to enhance the safety of road designs. It was thus agreed that a fifth Asian Development Bank (ADB) CAREC Road Safety Engineering Manual on SR4RSA should supplement the four published so far: (i) Manual 1: Road Safety Audit; (ii) Manual 2: Safer Road Works; (iii) Manual 3: Roadside Hazard Management; and (iv) Manual 4: Pedestrian Safety.

Purpose and Description

The purpose of the CAREC manual on SR4RSA is to share approaches for how RSA and the iRAP methodology can be used together to improve safety in road designs and achieve safety performance targets for new roads, road upgrades and road rehabilitation projects.

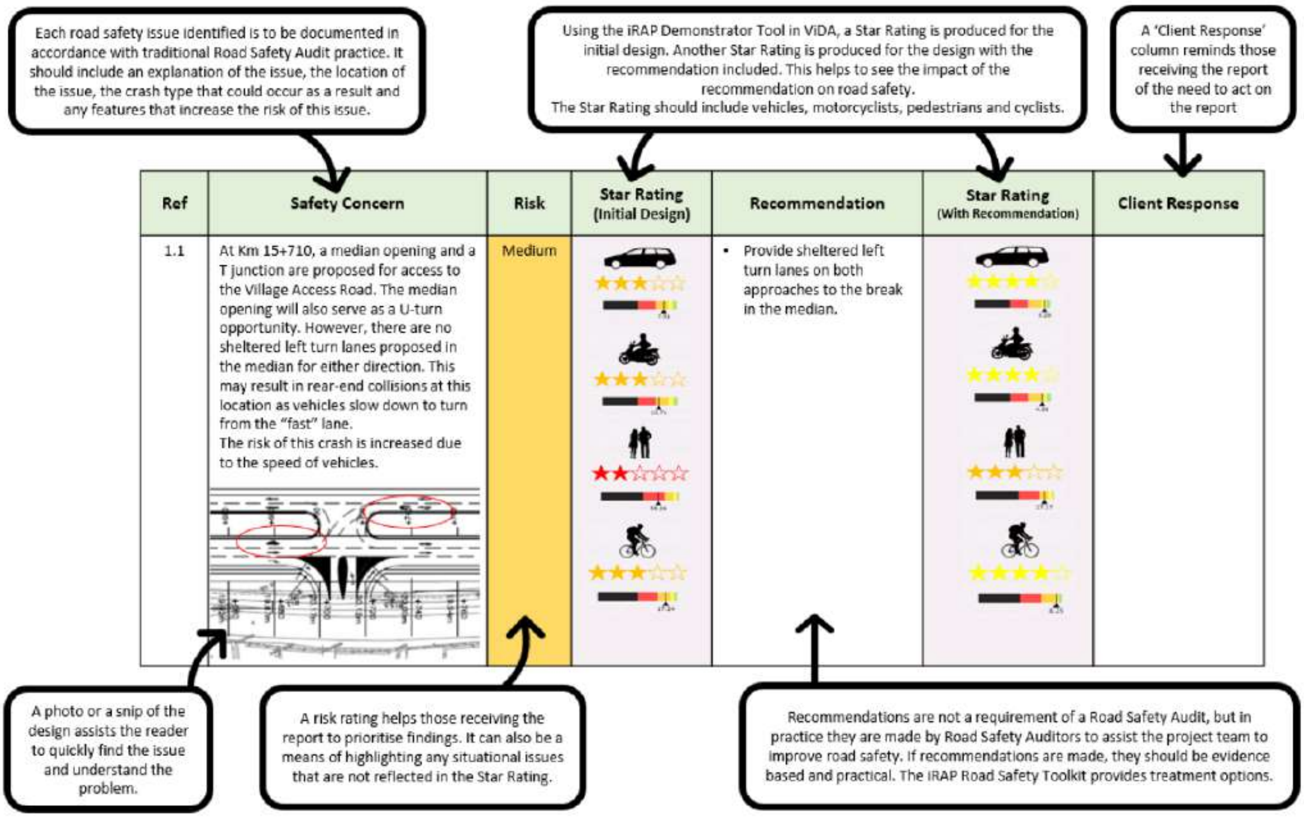
Evaluation and Conclusion

The main advantages of the SR4RSA process:

- Harnesses the expert experience and independence of road safety auditors, but frames each audit finding within a data and evidence-driven global standard.
- Produces objective risk metrics (Star Rating Scores and Star Ratings), can estimate fatalities and serious injuries, and assists in achieving (and quantifying) global Star Rating targets.
- Can produce economic analysis for safety countermeasure/recommendation options.

- Can be relatively easy to learn and includes components that are highly repeatable between auditors.
- Can consider all types and details of road safety issues, and can be context-sensitive.
- Can be performed at all stages of design, build, and pre-opening phases of a road project.
- Ensures vulnerable road users (pedestrians, cyclists and motorcyclists) are specifically considered in the audit process along with passenger vehicle occupants and any other road user identified by the auditors.

A core component of an SR4RSA assessment is the addition of Star Ratings for each safety concern identified by, and recommendation made by, the RSA team. These are added for both the existing design (i.e., the design without any recommendations being implemented) and for the design with recommendations implemented (see Figure 1). This provides the client, design team, and audit team with an evidence-based safety assessment and a measurement of the likely impact of recommendations.



Each road safety issue identified is to be documented in accordance with traditional Road Safety Audit practice. It should include an explanation of the issue, the location of the issue, the crash type that could occur as a result and any features that increase the risk of this issue.

Using the iRAP Demonstrator Tool in ViDA, a Star Rating is produced for the initial design. Another Star Rating is produced for the design with the recommendation included. This helps to see the impact of the recommendation on road safety.
The Star Rating should include vehicles, motorcyclists, pedestrians and cyclists.

A 'Client Response' column reminds those receiving the report of the need to act on the report

Ref	Safety Concern	Risk	Star Rating (Initial Design)	Recommendation	Star Rating (With Recommendation)	Client Response
1.1	At Km 15+710, a median opening and a T junction are proposed for access to the Village Access Road. The median opening will also serve as a U-turn opportunity. However, there are no sheltered left turn lanes proposed in the median for either direction. This may result in rear-end collisions at this location as vehicles slow down to turn from the "fast" lane. The risk of this crash is increased due to the speed of vehicles.	Medium	★★★☆☆ ★★★☆☆ ★★☆☆☆ ★★★☆☆	- Provide sheltered left turn lanes on both approaches to the break in the median.	★★★★☆ ★★★★☆ ★★★☆☆ ★★★★☆	

A photo or a snip of the design assists the reader to quickly find the issue and understand the problem.

A risk rating helps those receiving the report to prioritise findings. It can also be a means of highlighting any situational issues that are not reflected in the Star Rating.

Recommendations are not a requirement of a Road Safety Audit, but in practice they are made by Road Safety Auditors to assist the project team to improve road safety. If recommendations are made, they should be evidence based and practical. The iRAP Road Safety Toolkit provides treatment options.

Figure 1. A typical RSA safety concerns and recommendations table with Star Ratings

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Metacognitive Rumination and Road Rage: Driver Anger Progression and Expression

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Abstract

This study investigated the relationships between metacognitive beliefs, anger rumination, trait driver anger, and driver aggression in a sample of Australian drivers (*N* = 246). Firstly, frequencies indicated that nearly all drivers engaged in verbal driver aggression (94%), approximately half of the drivers engaged in vehicle aggression (53%), and a quarter of the drivers engaged in physical aggression (27%). Driver aggression was more common among males, open licensed, and middle-aged drivers. Path analysis indicated that that metacognitive beliefs influenced cognitive constructs such as anger rumination and constructive expression. Additionally, such factors were shown to more prominently influence trait driver anger, and the degree to which it was expressed. Bivariate correlations also demonstrated that the relationships carried forward to more specific dimensions of anger rumination and driver aggression styles. The findings of this study may assist to identify the origins of psychological mechanisms involved with anger progression and expression.

Background

Even milder forms of aggressive driving behaviours (e.g., verbal aggression) can lead to serious injury or death (Stephens & Sullman, 2015). Metacognition is a concept concerned with how thoughts and emotions are regulated and expressed (Wells & Mathews, 1996), and thus may be a potential moderating factor in the progression and expression of driver anger. This study investigated a) the extent of driver aggression types among a sample of Australian drivers, and b) the relationships between metacognitive beliefs, anger rumination, trait driver anger, and driver aggression.

Method

Participants and Procedure

A survey containing items related to metacognition, anger rumination, driver anger and driver aggression, was shared online via Facebook advertising. Of the total sample (*N* = 246), 57.3% were male, and were age between 19 and 83 years old (M = 50, SD = 16). The final data were analysed with analysis software: SPSS and SPSS AMOS (version 27).

Measures

A number of self-report questionnaires were used to assess the constructs, including an adapted version of Positive Metacognitive Beliefs about Rumination Scale-Adapted version (Watkins & Moulds, 2005), a modified version of the Negative Beliefs about Rumination Scale (Papageorgiou & Wells, 2001), the Anger Rumination Scale (Sukhodolsky et al., 2001), the short 14-item version of the Driving Anger Scale (Deffenbacher et al., 1994), and the 15-item short form of the Driving Anger Expression Inventory (Stephens & Sullman, 2014).

Results

The results found that nearly all drivers engaged in verbal driver aggression (94%), approximately half of the drivers engaged in vehicle aggression (53%), and a quarter of the drivers engaged in physical aggression (27%). Driver aggression was more common among males, open licensed, and middle-aged drivers (Table 1).

Table 1. Frequencies of Driver Aggression Types Across Demographic Factors.

Variable	**Group**	***N***	***Percentage of Drivers who Engage in Behaviour***			
			Physical Driver Aggression	**Verbal Driver Aggression**	**Vehicle Driver Aggression**	**Constructive Expression**
Sex						
	Male	141	37.8%	94.3%	58.2%	97.2%
	Female	105	15.2%	93.3%	45.7%	98.1%
Age Group						
	16-25	22	27.3%	95.5%	54.5%	100.0%
	26-35	33	18.2%	93.9%	57.6%	97.0%
	36-45	49	28.6%	89.8%	59.2%	93.9%
	46-55	35	25.7%	100.0%	54.3%	97.1%
	56-65	57	31.6%	94.7%	52.6%	100.0%
	>65	50	26.0%	92.0%	42.0%	98.0%
Licence Type						
	Restricted	17	17.6%	76.5%	23.5%	100.0%
	Open	205	27.8%	95.1%	55.1%	98.5%
	Commercial	24	25.0%	95.8%	54.2%	87.5%
TOTAL		**246**	**26.8%**	**93.9%**	**52.8%**	**97.6%**

Structural path analysis indicated that there were a hierarchical series of relationships present, in that metacognitive beliefs significantly predicted cognitive constructs such as anger rumination and constructive expression. Additionally, such factors were shown to more prominently influence trait driver anger, and the degree to which it was expressed. Constructive expression appeared to be an attenuating factor between anger rumination (angry after thoughts, thoughts of revenge, angry memories, understanding of causes) and driver aggression (physical, verbal and vehicle aggression). Bivariate correlations also demonstrated that the relationships carried forward to more specific dimensions of anger rumination and driver aggression styles.

Conclusions

This study has highlighted a number underlying contributing factors that may account for the high prevalence of road rage like behaviours on Australian roads. The results have also demonstrated cognitive factors and processes that are at least in-part responsible for the manifestation of trait driver anger, and the expression of that anger on the road. The highlighted effects that metacognitive beliefs, anger rumination, and constructive expressions demonstrated towards trait driver anger and aggression, may provide a touchstone for future research to build upon. Such an avenue of research could provide valuable information for future interventional formats in targeting the cognitive components responsible for exacerbating trait driver anger, before it becomes an output behavioural response.

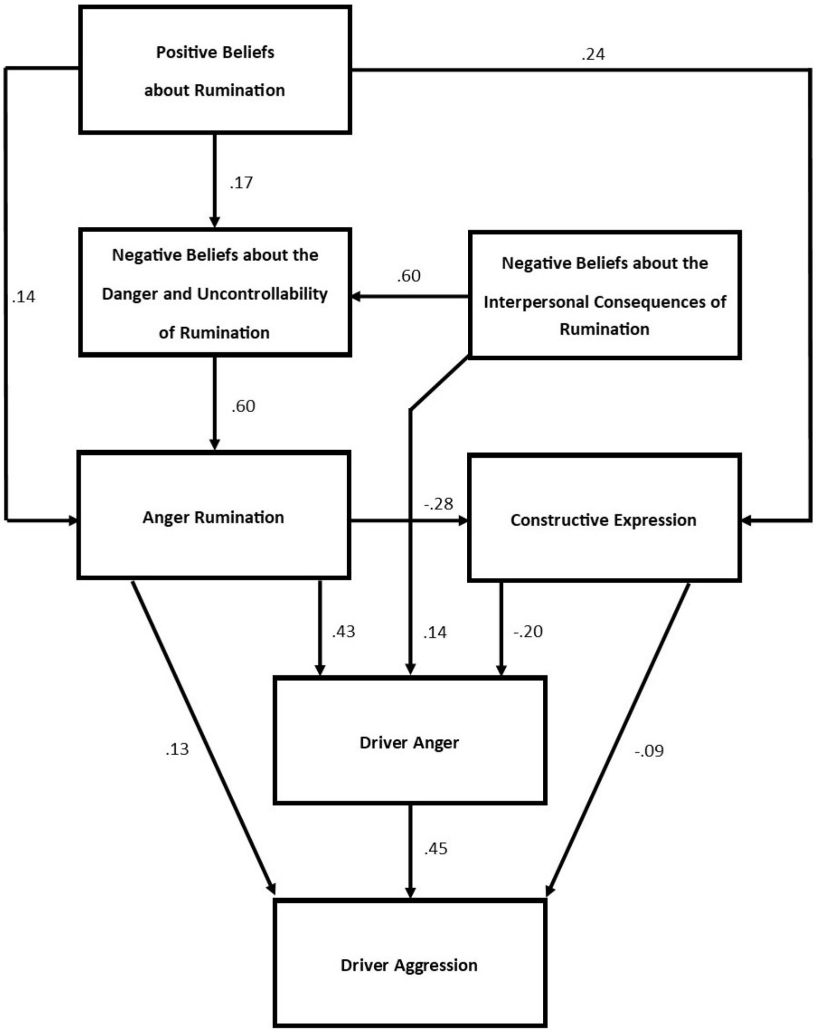

Figure 1. Flow Diagram for the Proposed Model and the Revised Model with Direct Effects.

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Metacognition, Rumination and Road Rage

S. Love, L. Kannis-Dymand, J. Davey, & J. Freeman

Even milder forms of aggressive driving behaviours (e.g., verbal aggression) can lead to serious injury or death (Stephens & Sullman, 2015). Metacognition is a concept concerned with how thoughts and emotions are regulated and expressed (Wells & Mathews, 1996), and thus may be a potential moderating factor in the progression and expression of driver anger. This study investigated a) the extent of driver aggression types among a sample of Australian drivers, and b) the relationships between metacognitive beliefs, anger rumination, trait driver anger, and driver aggression.

Driver Aggression

Driver Anger

Predisposition to Anger

Anger Rumination

Cognitive Inflexibility

Dysfunctional Metacognitions

15

Demonstrating the development of Local Government road safety management systems.

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Abstract

The role of Local Government in road safety has never been more crucial. As new guiding strategies come into effect both nationally and in Western Australia, it is acknowledged that the sector needs to be better engaged and resourced to achieve the vision of zero deaths and serious injuries. WALGA's RoadWise Program has developed a demonstration project to assist Local Government on this journey. Based on current international best practice in road safety management, in particular the International Standard for Road Traffic Safety (RTS) Management (ISO 39001) and associated materials, this project sought to work with a pilot Local Government to create a tailored road safety management system. Having such a system in place would show that the Local Government leading this demonstration is prioritising efforts and resources to guide their road safety actions, in working towards the elimination of harm from use of the road system.

Background

As system designers, Local Governments have a strategic and operational road safety role as road managers, planning authorities and fleet managers, in addition to their community development and leadership roles. Local Governments are crucial partners in the translation of safe system principles into practice, and it is argued that to achieve the vision of zero road deaths and serious injuries, the support and participation of Local Government is essential.

This project is a fresh approach to work previously undertaken by WALGA's RoadWise Program. The Local Government Safe System Project (2009-2013) provided strong evidence in formative evaluation and relevant benchmarks, along with an agreed set of principles to guide Local Governments in the adoption and implementation of the safe system approach. This Demonstration Project benefits from that work, as well as acknowledging changes in the wider road safety environment including new and emerging research, evidence and strategies.

Purpose of Project

The purpose of this project is to demonstrate that Local Government can develop bespoke management processes and systems to proactively manage and improve road safety performance.

The Review of National Road Safety Governance Arrangements recognises the opportunity to engage and support Local Governments as owners of the majority of the road network. At the same time acknowledging significant challenges, such as the disparity in funding and legislative powers, for the sector.

While a strong body of evidence exists at an international and national level as to how road trauma can be prevented, the challenge is how to translate this knowledge into best practice and real change on a local level. While there are many guides and tools available there are few practical examples where safe system principles have been embedded within the policies and practices, across the organisation, of a Local Government in Australia.

Description of Project

The project involved working with three Local Governments towards implementing a road safety management system using the International Standard, along with Austroads and other guiding and supporting material. The project, whilst still in progress, will lead to management systems that focus each Local Government organisation on its road safety objectives and targets and, using a safe system approach, guide how activities are planned and implemented.

Stage 1 – Development

A comprehensive literature review was conducted of all relevant information on road safety management systems including the International Standard for Road Traffic Safety (RTS) Management Systems (ISO 39001). A project proposition was then developed. A set of selection criteria was also created and utilised to produce a shortlist of Local Governments in Western Australia to approach with offers to collaborate.

Stage 2 – Planning

An internal project plan was developed and program deliverables were set for the implementation of the Demonstration Project. Research and development of new resources and the identification and updating of existing resources was completed.

Stage 3 – Implementation

Three Local Governments accepted the offer to collaborate and are currently piloting the project. Two Local Governments secured endorsement from their Council via a Council Agenda item and a Council resolution, and one Local Government is proceeding with senior staff support.

A small project working group has been set up within each participating Local Government to establish a good working relationship and to lead the implementation of the project. Timelines have also been established in conjunction with the working groups. They are being guided through the process outlined in Figure 1 in ISO 39001 and Table 1 with specific tools being developed to assist participating Local Governments through the six-step process.

Next Steps

To continue to work with each Local Government to implement remaining steps in the process.

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Table 1. Tools developed/updated for use in project

Tool	Purpose
Local Government Capacity Indicator tool	To conduct a baseline review of current road traffic safety position of the organisation, to determine risks, gaps and opportunities and, to measure changes at regular intervals throughout the project
Organisation Readiness Review	To conduct a baseline review of current road traffic safety position of the organisation, to determine risks, gaps and opportunities and, to measure changes at regular intervals throughout the project
Context of the Local Government mapping tool	To identify the roles and responsibilities that a Local Government has in relation to road safety, linkages with third parties, and the legislative framework
Leadership and vision workshop	To establish the leadership role of elected members in the process and to set a long term vision for road safety
Implementation planning tool	For identification and selection of road traffic safety performance factors

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Implications of Safety Performance Functions on predicting high-speed highways' crashes

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Abstract

Hot spots and crash trends can be monitored through the Road Injury Crash Index (RICI); the ratio of severe crashes to vehicle miles travelled (VMT). Although RICI is widely accepted as an effective measure of road safety performance, it cannot explain "why" crashes are occurring. We investigate the contributing factors to severe crashes through the application of the Safety Performance Function (SPF). In particular, we developed alternative SPF models with linear and non-linear kernels to estimate severe crashes for a subset of highway segments within Northern Virginia. Overall, our results align with prior findings that annual average daily traffic (AADT) and segment length contribute to severe crashes. We also identify behavioural factors, such as driver distraction, alcohol usage, and speeding, as the most significant causal factors for severe crashes. Our findings have methodological and strategic implications on the way local and municipal road operators can monitor and reduce severe crashes.

Background

Several highway agencies rely on the Safety Performance Function (SPF) to estimate crash frequency based on changes in traffic volume and roadway characteristics (Donnell, Gayah, & Jovanis, 2014; Kweon & Lim, 2014; Srinivasan & Bauer, 2013). According to the Highway Safety Manual (HSM), SPFs typically incorporate a function of annual average daily traffic (AADT) and segment length (AASHTO, 2010) across different roadway types to predict average crash frequency and crash severity. However, several studies have recognized that municipalities and local road operators may encounter biased and inefficient estimated parameters during their attempt to develop SPFs using regional data (Afghari, Haque, Washington, & Smyth, 2019; Farid, Abdel-Aty, Lee, & Eluru, 2017). In this paper, we investigated the calibration of SPFs according to localized crash data and its assumptions.

Methodology

In this study, we used crash data in Virginia maintained by the Virginia Department of Transportation (VDOT). Necessary data points regarding date, location, roadway characteristics, and crash severity were pulled from VDOT's open data portal, while segment lengths were manually calculated (Di, 2022). Crash data from 2013 to 2019 were pulled from the VDOT database and subsequently aggregated to crash frequencies by hourly intervals.

We developed SPF models with Negative Binomial and Poisson kernel and compared the model performance with Ordinary Least Square (OLS) Regression. The SPFs were fitted on crashes occurring on urban multilane highways parallel to Express Lanes located within the Greater Washington Area (GWA). The analyses mentioned in this study are applied to 2018 crashes with reported injuries and/or fatalities (Fatal, Severe Injuries, Visible Injuries, Non-visible Injuries; KABC). The models were evaluated using Root Mean Square Error (RMSE) and cross validation.

Data

The I-495 and I-95 corridors provide connections between Washington, DC and the surrounding municipalities in Virginia and Maryland. In the Northern Virginia area, both I-495 and I-95 include tolled lanes (Express Lanes) that run parallel to toll-free lanes. The I-95 Express Lanes consist of over 30 miles of reversible lanes that provide direct access to Washington, DC, while the I-495 Express Lanes consist of 14 miles of bi-directional lanes that connect to I-95 just south of Washington, DC. Crash data from 2013 to 2019 was obtained from VDOT for the approximately 45 miles of these corridors that include both Express Lanes and toll-free lanes.

Based on the VDOT crash data, 26,688 total crashes occurred along these portions of the corridors between 2013 and 2019 including 6,283 along I-495 and 20,405 along I-95. However, the analyses mentioned in this study are limited to the 4,151 crashes that occurred in 2018. The breakdown of these crashes by variable as well as the average AADT for the corridor is shown in Table 1.

Table 1. 2018 Crash Data

	I-495		**I-95**	
	Express Lanes	Free Lanes	Express Lanes	Free Lanes
Average AADT	18,460	180,426	19,656	174,799
Speeding Crashes	23	444	60	1,470
Alcohol Crashes	1	29	3	96
Distraction Crashes	8	119	22	473
Fatal Crashes	0	0	0	2
Injury Crashes	15	243	36	682
Total Crashes	**63**	**904**	**139**	**3,045**
Total Crashes/AADT	**0.3%**	**0.5%**	**0.7%**	**1.7%**

Results & Conclusions

In line with prior research, the model results indicate that AADTs are positively correlated with the number of KABC crashes. Speeding, distracted-driving, and alcohol-use also contributed to the segment crash frequency. Based on the model estimation, we find that speeding is the most influential variable that causes KABC crashes compared to alcohol-use or distracted-driving as shown in Table 2. As such, speeding should remain a paramount concern for operators of urban multilane roads within the Greater Washington Area.

Table 2. Model Coefficients

	Ordinary Least Squares		**Poisson**		**Negative Binomial**	
Variables	Estimated coefficient	P value	Estimated coefficient	P value	Estimated coefficient	P value
AADT	0.007	< 0.01	1.19	< 0.01	0.83	< 0.01
Speeding	0.02	< 0.01	3.83	< 0.01	5.00	< 0.01
Alcohol	0.01	< 0.01	1.22	< 0.01	1.27	< 0.01
Distraction	0.02	< 0.01	1.04	< 0.01	2.02	< 0.01

Moreover, comparison of the models suggests that the Poisson model performs better than the OLS and Negative Binomial models as shown in Table 3. Although Negative Binomials are meant to best address datasets with high frequencies of zero count (crashes are ultimately rare events), after performing the dispersion test, we find that the performance of the Poisson over the Negative Binomial is due to under dispersion of the dataset. When the mean and variance of the dataset are not significantly different from each other, a Poisson model has better performance (Cameron & Trivedi, 1990). Therefore, we recommend the use of the Poisson whenever modeling crash data at the hourly level.

Table 3. Model Performance Indicators

Model	**Deviance Residuals**					**RMSE**
	Min	1Q	Median	3Q	Max	
OLS	-1.56	-0.48	0.02	0.45	2.63	0.71
Poisson	-6.34	-0.05	-0.04	-0.03	4.95	0.08
Negative Binomial	-2.51	-0.05	-0.04	-0.03	4.53	0.54

Road operators and governments are using road safety as one of their key performance indicators. This study explores and compares SPFs with different kernels using crash and traffic data on I-495 and I-95. The model identifies factors that contribute highly to crashes along GWA urban multilane highways, which can be used as the focus of future road safety campaigns.

Acknowledgements

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17

A Step Change – Network Speed Intelligence.

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Abstract

In order to achieve our ‘Zero by 2050’ target, a step change is required; this paper proposes that network wide speed intelligence, on a point to point basis, is that step change. The implementation of this concept will deliver Victoria with a world-first capability to understand and manage mobility across an integrated road transport system, as well as numerous significant benefits beyond safety, such as rural freight movement logistics, network operation improvements, urban livability, and meeting transport sector emission targets. The approach is to provide access to reliable, current, and readily accessible network wide speed data on a flexible point to point basis. Closing the gap towards zero deaths and serious injuries by 2050 necessitates today’s innovation for tomorrow. Once established, Australia can become a global leader in Safe System network system design.

Problem

The Victorian rural high-speed network is approximately 180,000 kilometers long, and over 140 lives are lost on Victoria’s country roads each year, accounting for 55 percent of all road deaths. On the vast network of roadways, an average of 105 fatalities and over 1,000 serious injuries occur each year. Infrastructure alone cannot solve this problem and other methods of ‘closing of the gap’ by 2050 are expected to come from network-wide management of exposure to risk (speed situations) and gradual improvements in vehicle safety overtime.

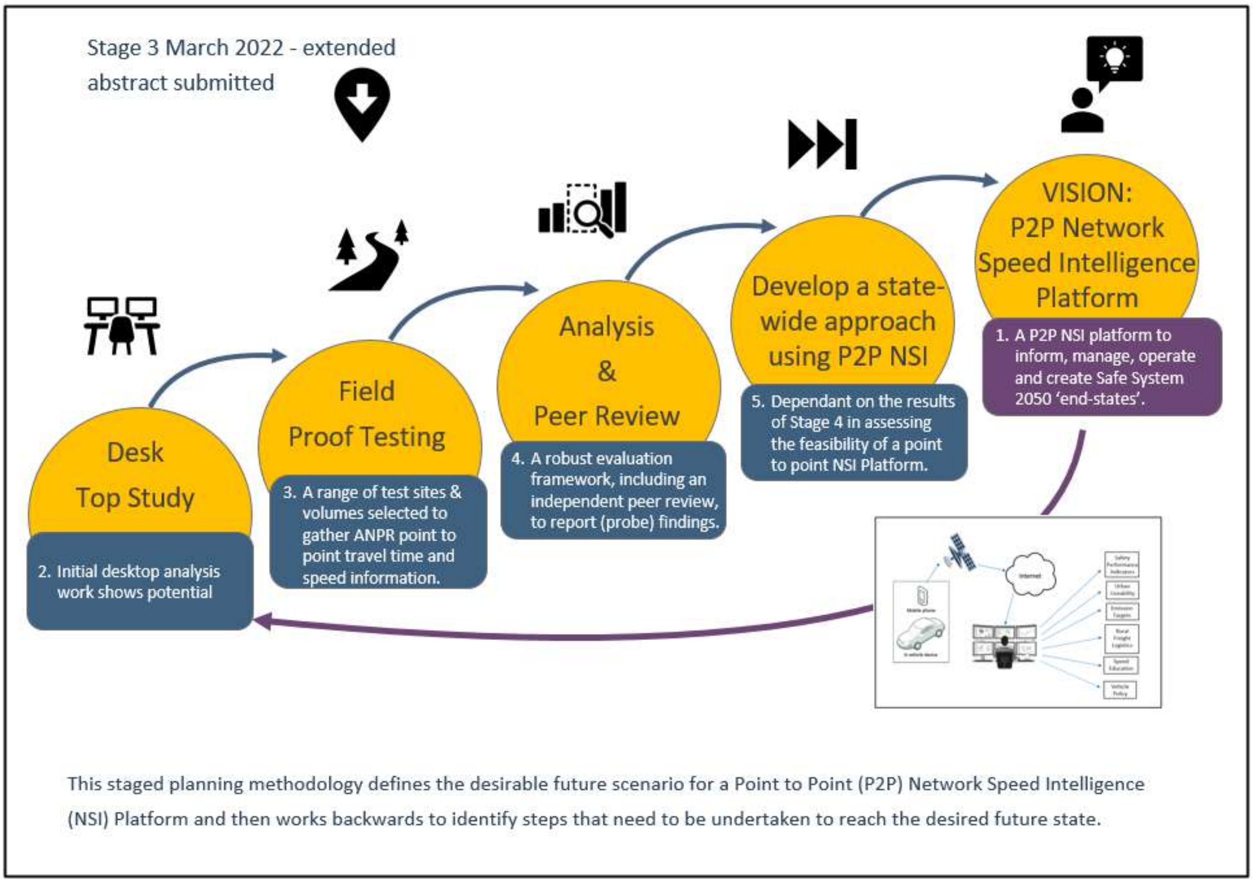
Solution

Road Safety Victoria and the Transport Accident Commission have partnered to investigate digitizing Network Speed Intelligence (NSI) using newly available mass speed data, which will introduce unique analytics to support decision making. The most important capability shift in recent years that has provided this opportunity for a new approach is on the use of onboard devices (probes) to collect speed data and make this information available for many purposed, including road safety benefits. Validating the probe data against tested, high-trust point to point speed collection processes, such as Automated Number Plate Recognition, is an important step.

On-vehicle probe data (also known as floating car data) is primarily made available through mobile phone systems and in car navigation devices. It is non-identifiable and does not carry any personal information. The uniqueness of this initiative is the ‘point to point’ approach. This means that analysis can be performed at any location, from a single point source to any road length or network of road type. Once validated, the new capability can be available for use across the entire road network at any time.

Description of Project

The goal of the proof testing is to develop algorithms that will convert vehicle probe data into NSI. A robust evaluation framework, including an independent peer review, has been established to academically assess and validate the trial data. The proof testing component is expected to be complete in the second half of 2022. These results, as well as other potential stages, can then be used to create a robust NSI platform. Figure 1 depicts the staged approach to show the usefulness of probe data on a network point to point basis.



1. A P2P NSI platform to inform, manage, operate and create Safe System 2050 'end-states'.
2. Initial desktop analysis work shows potential
3. A range of test sites & volumes selected to gather ANPR point to point travel time and speed information.
4. A robust evaluation framework, including an independent peer review, to report (probe) findings.
5. Dependant on the results of Stage 4 in assessing the feasibility of a point to point NSI Platform.

This staged planning methodology defines the desirable future scenario for a Point to Point (P2P) Network Speed Intelligence (NSI) Platform and then works backwards to identify steps that need to be undertaken to reach the desired future state.

Figure 1 – process to determine usefulness of probe data on a network point to point basis

Future Benefits

A 'system-design' approach to eliminate harm will predominantly rely on a new domain whereby Safe System pillars are genuinely integrated, with the NSI a key tool, to create new safety performance indicators and pathways to current and future targets. There are also many other road transport benefits to NSI. Figure 2 depicts a simplified use of a digitised NSI platform and some examples of the benefits.

Conclusion

This work has the potential to provide transformation change today in order to meet tomorrows 2030 and 2040 targets and, ultimately, achieve near-zero serious trauma by 2050.

Acknowledgements

Michael Nieuwesteeg, Bruce Corben, Zita Ultmann, Matt Allan, Chris Jurewicz, Ross Gregory, Shoji Nakayama

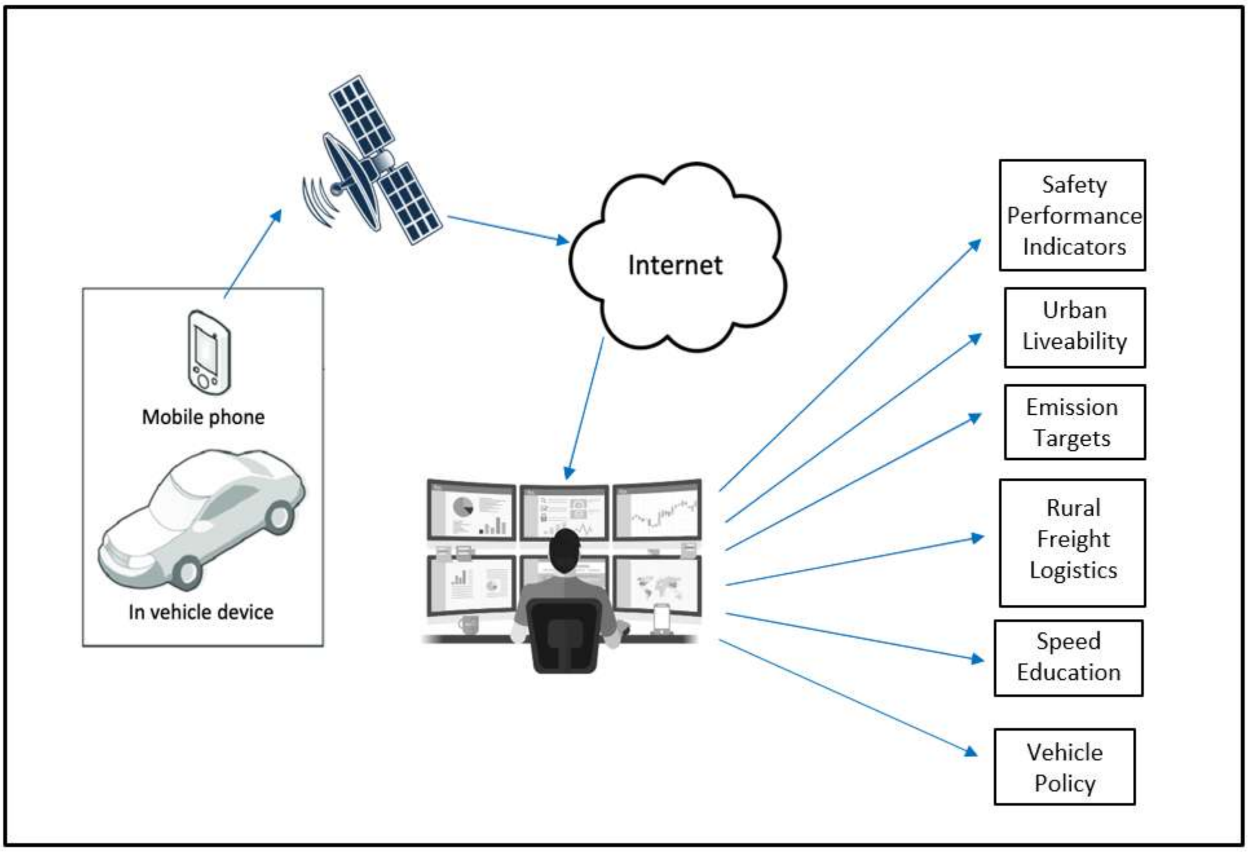


Figure 2 – Future state NSI Platform

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Tsela Tshweu

Maatla Otsogile and Galebowe Motlhajoe

Society of road safety ambassadors

Abstract

Despite increasing motorisation in Botswana, the donkey cart and bicycle are still the main means of transport in the rural areas and is used on a daily basis for transporting children to and from schools, community members to work, clinics and farms as well as for basic livelihoods such as access to access water, fuel wood. However, Increasing motorisation, combined with some inadequately maintained infrastructure, has made these transport modes unsafe, in both urban and rural areas, and worse, the needs of these road users are routinely omitted from the designs of road improvements as most of the roads have no special provision for donkey carts and bicycles, making their users vulnerable. In the last four years, about 299 road crashes involving donkey carts were registered because the donkey carts were not visible. SORSA hence implemented a project dubbed Tsela Tshweu which attempted to redress this problem.

Background of Project

Tsela Tshweu is a national traffic prevention, awareness and education program aimed at curbing crashes relating to non-motorized transport. We had realized that most donkey carts and bicycles lack the basic safety equipment of adequate reflectors and lights making them not visible and hence causing vehicle donkey carts crashes. Therefore, this valuable road-safety initiative involved the supply and fitting of front and rear reflectors on donkey carts and bicycles. This also entailed educating donkey cart users through pamphlets and kgotla meetings that like motorists they are expected to obey road safety precautions in order to curb road crashes in our country. The idea for the project began in 2016, soon after the Founder and Coordinator of SORSA, Mr Maatla Otsogile nearly had a crash with a donkey cart due to visibility issues. It happened one winter night when he was driving back to his village along a road with a lot of traffic from the city. It was dusk, and as he approached a village, just after a curve, he found himself almost hitting a donkey cart crossing the road. Thankfully, he wasn't speeding. After he hit the brakes hard, he swerved to the edge of the road, avoiding the donkey cart by a whisker". That is how this intervention was birthed.

Evaluation and Effectiveness

Initially, when the project began four five ago, there were 666 donkey carts with reflective tape in three rural villages along the busy A1 Highway. The program has since grown to 2876 donkey carts in 12 communities, and now also includes bicycles that use reflective tape. The program has made a tremendous difference. Crashes involving donkey carts dropped from 299 during the year before the project to 176 the following year —a reduction of more than 40 % in five rural villages along A1 Highway. However, there are serious problems with data collection and under reporting. The police don't really acknowledge non-motorised transport and don't prioritise it. We are engaging them to strengthen this area to be able to better measure the extent of the problem, and our program's impact. Overall, we feel the program is effective, given that we see more donkey carts at night that have reflective tape on them, and by the feedback and appreciation we receive from the communities involved.

22

Perceptions of crash risk associated with speeding: a qualitative study

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Abstract

While the relationship between speed and crashes is well established, there remains considerable public and political debate regarding these risks, particularly in relation to low-level speeding. This study involved focus groups (*n* = 39) with Queensland motorists to examine the determinants of risk perceptions associated with speeding. Results showed that while the speed-crash risk relationship is well understood, many continue to perceive the risks associated with low-level speeding as “manageable” and crashes to be more contingent on other factors. Decision-making processes regarding risk perceptions were influential on subsequent behaviour, such that participants who focused primarily on the probability of a negative consequence occurring (risk susceptibility) were more likely to report lower risk perceptions and greater speeding, compared to those who focused primarily on the severity of the negative outcome (risk severity). Cognitive biases were regularly used to justify speeding and manage paradoxes between perceptions and behaviour. The research highlights the difficulty of effectively conveying information about the risk of speeding to motorists and provides recommendations for enhancing this message.

Background

The relationship between vehicle speeds and crashes is well established and based on indisputable laws of physics (Elvik, Vadeby, Hels & van Schagen, 2019). Nonetheless, there remains considerable public and political debate regarding these risks, particularly in relation to low-level speeding (exceeding the speed limit by 1-10 km/h). Research has demonstrated a negative relationship between perceived risk and actual speeding behaviour (Stephens, Nieuwesteeg, Page-Smith & Fitzharris, 2017), as well as paradoxical attitudes, with many motorists aware of the risks but still reporting regularly speeding (Department of Transport and Main Roads, 2020). Researchers have argued that individuals may attempt to resolve these paradoxes through a number of cognitive biases, including risk-mitigating beliefs, optimism bias and illusory invulnerability (Brown & Cotton, 2003; Delhomme, 1991).

Method

This study involved a thematic analysis of 10 qualitative online focus groups (*n* = 39) with motorists from across Queensland, including regional areas. Sessions lasted up to 90 minutes, with questions covering a range of topics such as the perceived risk of speeding, individual decision-making processes, sources of information, comparable risks, and a hypothetical scenario about crashing while low-level speeding. Participants were recruited through the TMR Transport Talk research panel and were reimbursed for their participation ($100 e-gift card). All sessions were conducted by the same facilitator. Video and audio were recorded for de-identified transcribing purposes only and deleted thereafter.

Results

The majority of respondents reported engaging in low-level speeding at least some of the time, with greater levels of compliance reported where there are higher levels of vulnerable road user activity. While the physical principles underpinning the speed-crash risk relationship were well understood, the magnitude of any increase in risk was perceived as being contingent on other factors, such as the prevailing conditions and the degree over the speed limit. As such, many participants argued that low-level speeding is not inherently risky, or that the risks are "acceptable" or "manageable", and that the risks associated with speeding only really apply to moderate (11-20 km/h over) and excessive speeds (more than 20 km/h over).

Decision-making processes regarding risk perceptions were influential on subsequent behaviour. Specifically, participants who focused primarily on the probability of a negative consequence occurring (risk susceptibility) were more likely to report lower risk perceptions and greater speeding, compared to those who focused primarily on the severity of the negative outcome (risk severity). Importantly, very few participants appeared to appropriately consider both factors. The hypothetical scenario confirmed that many participants could not conceive a feasible situation where low-level speeding was the cause of a crash, expressing absolute disbelief that other factors would not be involved, which influenced subsequent perceptions regarding culpability. There was clear evidence of the presence of cognitive biases, used to justify speeding and manage the paradoxes between perceptions and behaviour. This included a number of risk-mitigating beliefs, optimism bias, illusory invulnerability and self-fulfilling prophecies borne from continual negative reinforcement when speeding (e.g., not experiencing fines or crashes when speeding).

Conclusions

The research highlights that effectively conveying the relationship between speed and crash risk to motorists is an inherently difficult and challenging task. Increasing the understanding of 'absolute' versus 'relative' risk appears to be a major hurdle. In reality, a speed-related crash is a relatively uncommon event, but speeding increases risk and the potential consequences can be catastrophic. Self-reported speeders typically develop their risk perceptions with a focus on absolute risk and risk susceptibility. Increasing their perceived risk severity may be integral to achieving behavioural change. It is recommended that public education and awareness place more emphasis on risk severity, and be more realistic regarding risk susceptibility, when developing messages to discourage speeding. Indeed, while both are fundamental to accurate risk perceptions, very few motorists appear to appropriately consider both.

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23

Mobility Kit: the toolkit to help improve road safety

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Abstract

All road safety work involves talking about complex interactions on the road but as road safety professionals, we do not have a toolkit to help us clearly communicate and engage with stakeholders. Our typical workaround is a scribbled drawing or using pens and mobile phones to represent different road users and 'drive' or 'ride' them across the table. While these approaches help clarify scenarios in a meeting, it assumes everything magically fits imaginary roads. It fails to communicate the specifics of three-dimensional road interactions, time, or the road rules. In response to this, we have developed the Mobility Kit using scaled LEGO elements to represent roads and people across different modes. Also included is a deck of road rule cards, created to explain Australian road rules related to common scenarios. The coherent, cost effective kit is currently being tested with plans for release to road safety professionals and the community.

Background

Explaining how people move on the road, including road design, the road rules and especially the resulting *interactions* is complex. As an interdisciplinary team, we quickly realised that we needed better tools to communicate discipline-specific ideas. Our idea was to use LEGO bricks and elements and to develop a method of annotating drawings of road spaces with the road rules – and the reverse: annotating the road rules with drawings.

LEGO works at a scale around 1:32. Scale is very important: it provides a better understanding of the shared road space. This instantly overcomes the distortion of a quickly scribbled drawing. Doing this in three dimensions also gives an insight into sightlines. Finally, moving the LEGO models allows us to "animate" complex road interactions and introduce the fourth dimension of time.

Road rules are vast, interdependent and hierarchical, leading to the insight that they share similarities with collector cards or card-based games, for example Pokémon or Uno. The road rules, could be encoded graphically with the rich information they need, in a format that is physically and graphically engaging. With over 400 road rules, we are developing cards by scenario, starting with common interactions (e.g. turning left).

We first used our LEGO approach at a stakeholder workshop in August 2018 and presented it at the 2021 ARSC where we were awarded Conference Theme Award for an innovative approach. Since then, we have engaged in a conventional product development process to design a kit consisting of LEGO parts, printed road scenarios, and a set of road rule "collector cards".

Method

The product development process (Eppinger and Ulrich, 2015) employed ensures a systematic approach. A key step is to develop and test prototypes. To this end, our kit is being tested with road safety practitioners, school teachers, NGO advocacy groups for vulnerable road users, and researchers. For

Figure 1. Mobility Kit

distribution, while we could purchase and re-distribute LEGO bricks through the 'Pick a Brick' service, it would be more effective to launch through LEGO Ideas. The LEGO Ideas platform enables consumers to design LEGO sets whereupon they are submitted, competitively scored by the LEGO community and voted into production (LEGO, 2022).

Results

The set contains scaled representations of five humans (pedestrians), guide dog, wheelchairs, micro-mobility modes (i.e. skateboard, kick-scooter etc), bicycles, cargo bicycle, motorcycles and a passenger car. Additional bricks allows users to create road elements or augmented vehicles, for example to turn a bicycle into a delivery bicycle. Road rule cards illustrate road scenarios with the applicable road rules to help guide how LEGO might be used to demonstrate road user interactions.

A download link (Johnson, Johnston & Napper 2022) provides printable road user scenarios for users to try, and as a prompt to draw their own.

Conclusion

Understanding road interactions is a challenge for many people, both lay and professional. The Mobility Kit allows users to accurately simulate interactions across four dimensions in a table-top setting with a strong connection to the invisible, yet ever present, road rules.

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Making the road rules clear and simple: turning left

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Abstract

There is a high level of confusion and misunderstanding among drivers and cyclists in Australia about road rules that relate to cycling. The negotiation of left turns, that is when a driver is turning left and a cyclist is continuing straight, has been identified as particularly complex and confusing. We explain how taking an interdisciplinary approach– from law, design, and road safety – has enabled us to create key road safety messages that are clear and simple about the negotiation of left turns. Legal, road safety and design research was combined in an iterative development process which resulted in the production of an infographic poster, 'This is Turning Left'. The infographic accurately presents road rules applicable to left turn negotiations in the context of design and road safety issues that affects how drivers and cyclists experience this negotiation in practice.

Background

Commencing in 2018, this project focussed on cyclist safety in the negotiation of left turns – that is when a driver wants to turn left and the cyclist wants to continue straight (Napper et al, 2021). This negotiation is governed by road rules set out in State and Territory legislation which mostly adopt the substance of non-binding 'model' Australian Road Rules (1999). This legislative structure is notable: despite separate road rule laws existing in each state, they are largely uniform around Australia.

In Victoria, left turn negotiations between cyclists and drivers are regulated by the *Road Safety (Road Rules) 2019* (Vic) ('Rules') rule 141(2), which imposes an obligation on a cyclist to give way to a vehicle that is 'indicating' and 'turning left'. We looked at the legislative history of this rule and found that the requirement of a vehicle to both be 'indicating' and 'turning' was key to triggering a give way obligation.

While rule 141(2) directs road users about how a left turn should be negotiated, it's not the whole picture. Rule 141(2) uses terms defined under the Rules, and references behaviours that are regulated elsewhere in the Rules. This means that a left turn negotiation cannot be fully understood by reading rule 141(2) alone but requires a reader to be able to identify when other road rules must be consulted and understand how different parts of the Rules are connected, so that legislative requirements can be more clearly communicated to road users.

Method

We decided that the left turn scenario would be best represented in three distinct steps: 'prepare', 'approach', 'turn'. Graphic designers were then tasked with designing an infographic to communicate the steps in tuning left, while taking account of the behaviours and design features that would affect different road users and capturing the relevant road rules.

The infographic underwent iterative development as the team challenged legal, design, and and safety issues arising by the communication of information in this format. We sought feedback from select road safety stakeholders during this process, that contributed to the final presentation of the infographic poster.

Results

As shown in **Figure 1**, the central arrow highlights three stages of the left turn negotiation. Actions relating to the cyclist appear on the left-hand side, and actions relating to the driver of a motor vehicle, on the right-hand side. The central arrow is annotated with road rules at the point that they are relevant to the interaction. Annotations adopted language used in the road rules, amongst descriptions of related behaviours. Road rule references were supplied to enable the audience to locate the complete road rule within the Victorian Rules for more information.

Conclusion

Unpacking the road rules and interactions on the road is complicated. The road rules are connected and interrelated and a negotiation like left turns has many stages and different perspectives. However, this infographic is a tool that helps navigate these complexities, presenting the key messages in a clear and simple way for both road safety professionals and the community.

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this is turning left

This infographic describes what happens when a driver wants to turn left and they are sharing the road with a cyclist who is travelling straight.

The Road Rules govern all road users, including people who drive vehicles on Victorian roads. Unless stated otherwise, 'drivers' include drivers (motor vehicles), riders (motorbikes), and cyclists (bicycles), RR 15, 17, 19

cyclist

A person riding a bicycle RR 17

straight

A cyclist must not

- pass on the left of a motor vehicle that is indicating (to turn left) **and** is turning left RR 141(2)
- create a hazard by moving into the path of a turning motor vehicle RR 253

When a motor vehicle is indicating to turn left, whether it is stationary or turning, a cyclist may

- wait behind or
- pass on the right side of the motor vehicle if safe to do so RR 140, unless the motor vehicle displays a 'do not overtake turning vehicle' sign RR 143

turning

A person causes their vehicle to turn (motor vehicle, motorbike, bicycle) RR 348

turning left

Turning left involves a driver changing the motor vehicle's direction to the left, in order to

- enter a road at an intersection
- enter a road at another place
- enter an area adjacent to the road (e.g. car park) RR 4, 12, 13, 45(1),45(2), 348

While a driver causes the motor vehicle to turn left by turning the steering wheel; this is visible to others by the

- change in direction of the motor vehicle's tyres
- motor vehicle moving to the left

driver

A person driving a motor vehicle RR 16 A person riding a motorbike RR 19

turn

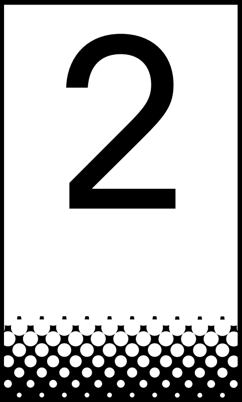
A driver must follow the Road Rules about turning left at intersections or other places with

- traffic lights or arrows
- stop or give way signs
- stop or give way lines
- pedestrian crossings
- no signals, signs, or lines RR 4, 62, 67, 69, 72, 73, 74, 81

approach

A cyclist may pass a motor vehicle on the left that is indicating left, but is not yet turning RR 141(2)

Watch for signs that the driver might be about to start turning



indicating (left)

A driver indicates left by

- operating the motor vehicle's indicator lights, or
- gives another change of direction signal as allowed for their motor vehicle type RR 46, 47

A driver should continue to give way (below) as they are indicating left

approach

A driver must indicate for long enough to give sufficient warning to other people on the road including other drivers, riders, cyclists and pedestrians RR 46

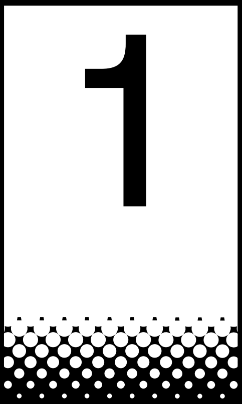
Some Road Rules suggest that indicating for at least 5 seconds provides sufficient warning about a change in direction RR 46(3)

prepare

A cyclist must

- ride as near as practical to the left side of the road RR 129
- ride in a bicycle lane (if provided) unless it is not practical to do so RR 247, 153(4), 247

A cyclist must not cause a hazard or obstruct other vehicles RR 253



giving way

A driver or cyclist gives way by

- slowing down
- stopping if necessary
- if already stopped, waiting until it is safe to continue RR 4

prepare

A driver must

- drive as near as practical to the left side of the road RR 129
- give way to other motor vehicles and bicycles when changing the direction of their motor vehicle,such as
  - changing between marked lanes RR 148
  - moving to the left within a marked lane RR 148A

A driver must not drive in a bicycle lane, unless permitted RR 153. For example, a driver is permitted to drive in a bicycle lane for up to 50 metres prior to turning left RR 158

Marilyn Johnson, Vanessa Johnston, Robbie Napper

this is turning left is informed by the Road Rules (Road Safety Road Rules) 2017 (Vic), made pursuant to the Road Safety Act 1986 (Vic). The Road Rules are referred to as "RR"

RMIT UNIVERSITY

MONASH University

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Historic Rollout of Bicycle Infrastructure in the Philippines

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[a] HA Consulting, [b] The World Bank, [c] DTV Capacity Building

Abstract

Several hundred kilometers of bicycle lanes and infrastructure have been built in the metropolitan areas across the Philippines as a part of this unprecedented action to promote active transport. A good part of the implemented bicycle lanes have road and pavement marking and are separated from traffic by temporary or permanent devices. This exciting, nationwide active transport program was led by key governmental bodies as a part of the Government of the Philippines (GOP) active transport legislation, i.e., the Bayanihan to Recover as One Act (Bayanihan II). To support the GOP implementing the active transport program, the World Bank (WB) provided Technical Assistance to ensure the program outcomes were aligned with international best practice and the Safe System approach. The WB took up this engagement to support the Philippines' Government amid COVID-19 and public transport disruption, to facilitate post-COVID-19 recovery through green, safe, and inclusive active transport as the preferred way of mobility.

Acknowledgment

Within 9 months, the Philippines was able to create almost 500 kilometers of bike lanes along national roads, with more local governments connecting to this larger network, still today. This has not been an easy feat and many stakeholders across the government, the private sector, the academia, advocacy groups, civil societies and other non-governmental organisations have been crucial to this success. The World Bank team feel privileged to be able offer technical assistance to this important program.

Background and project purpose

In September 2020, the Government of the Philippines (GoP) legislated Bayanihan II, which was the government's second coronavirus pandemic relief measure meant to serve as the country's response to health and economic problems stemming from the COVID-19. Bayanihan II identified active transport development as a priority intervention area and allocated PHP1.316 billion (US$26 million equivalent) to develop accessible sidewalks and protected bicycle lanes, procurement of bicycles, bicycle racks and related safety equipment for bicycle distribution, sharing and lending programs.

To support GOP implementing Bayanihan II, the World Bank (WB) provided Active Transport and Traffic Safety Technical Assistance (TA) to ensure the project outcomes comply with international best practice and the Safe System approach.

With support and resources from the Government of Australia and the World Bank's Global Road Safety Facility (GRSF) under the Bloomberg Initiative for Global Road Safety (BIGRS), the World Bank has allocated a team of local and international experts to deliver a tailored technical assistance. Briefly, the scope of such TA has been:

- Task 1: Review of current bicycle infrastructure design standards and guidelines
- Task 2: Community Consultations on design standards and infrastructure

- Task 3: Detailed design Road Safety Audit (RSA)
- Task 4: Training and capacity building
- Task 5: Post-construction Road Safety Inspection (RSI)

Method

The WB TA team developed several specific procedures to address the requirements of each task – which main activities are summarised below:

- Task 1: Review of current design standards and guidelines
  - Systemic gap analysis and assessment based on the Dutch bicycle infrastructure design principles
- Task 2: Community Consultations on design standards and infrastructure
  - Perception surveys
  - Focus groups
- Task 3: Detailed design RSA
  - Safe System assessment
  - RSA of concept designs
- Task 4: Training and capacity building
  - Providing knowledge and skills for a safe system based life cycle asset management approach to cycling infrastructure planning and design. XXX
- Task 5: Post-construction RSI
  - Safe System assessment
  - RSI of constructed infrastructure

Key findings

Review of design standards and guidelines

Community consultations on design standards and infrastructure – key findings and recommendations

- The emerging modal shift to cycling calls for the greater need for infrastructure supporting active transport. Lack of proper infrastructure is the biggest barrier to cycling. Existing infrastructure must focus on Safety and Comfort based on respondents' perceptions and be supported by evidenced-based interventions.
- There is a great deal of intercity trips made by respondents, which gives emphasis on the importance of creating intercity networks through the efforts of the National Government (for national highways) and collaboration between adjacent cities (for connecting local roads).
- It's important to consult and involve stakeholders such as vulnerable road users, cyclists and motorists to ensure that the infrastructure and intervention is understood by all road users.

Table 1. Review of design standards and guidelines findings and recommendations

	Findings	Recommendations
1	An effective active transport strategy or policy for the Philippines is yet to be developed and effectively implemented.	Develop policy briefs, active transport str and action plans, and 'Cycling Fact Sheets' Philippines.
2	There are scarce, random, non-comprehensive data on cycling demand, use and infrastructure.	Develop a r [illegible] and regularly u bicycle i [illegible] dataset.
3	No comprehensive data on cycling trips exist to inform the design standards and guidelines.	D [illegible] ycling trip metric [illegible] in the design standar
4	Cyclist health and safety could b [illegible] measured and included in the desi [illegible] and guidelines.	[illegible] Safe System and the Level of [illegible] TS) approaches in the Philippines' [illegible] ards and guidelines.
5	Cycling comfort is not fully [illegible] standards and guidelin [illegible]	Enhance the comfort of bicycle infrastructu better include more vulnerable cyclists.
6	The current de [illegible] elines are fairly quiet a [illegible] re attractive bicycle in [illegible]	Develop and include in the guidelines pr criteria to enhance the attractiveness of the infrastructure.
7	Bicycle infra [illegible] ot fully included in the infrastructure [illegible] n the Philippines.	Develop an appropriate bicycle infrastr lifecycle for the Philippines including st planning, development, delivery, evaluatio maintenance.

Road Safety Audit (RSA) and Road Safety Inspections (RSIs)

Capacity building

The trainings and capacity building were successful to:

- Create insights into typical planning, design, and safety issues
- Help participants apply their learnings promptly and at times concurrent to trainings
- Deliver the promised outcomes of enhancing the participants knowledge and understanding of the best practices and fundamentals, and enabling them take and use these in their day-to-day practice
- Show that online training can be actionable and provide practical and useful solutions to ongoing programs and projects.

Next steps

Within 9 months, the Philippines was able to create almost 500 kilometers of bike lanes along national roads, with more local governments connecting to this larger network, still today (a total Government investment of US$21.3 million). This multi-sectoral cooperation not only enabled more people to see cycling as a reliable and beneficial form of transport, but also empowered and inspired local governments and communities to create their own networks to promote and enable a safe active mobility.

Table 2. RSA recommendation and RSI observations

	RSA Recommendation	RSI Observation
1	Provide separate bicycle lanes or preferably consider parallel cycling routes away from C-5	Limited and poor cyclist separation from traffic Unprotected side-street and property access points Limited bicycle lane [illegible]
2	Consider on-street parking and access management to ensure roadside friction and conflict are minimised	Unprotected si[illegible]erty access points Parked v[illegible]nsport such as jeepne[illegible] pushing them out int[illegible]
3	Consider pop-up bicycle infrastructure to te[illegible] the viability of design concepts and cyc[illegible] feedback	[illegible]p bicycle infrastructure are [illegible]ng bollards or other devices. [illegible] is limited to mainly separation of [illegible] traffic and no innovation is observed at [illegible]ions, roundabouts and other location along [illegible] network where pop-up and temporary [illegible]rastructure including tactical urbanist solutions could add significant value
4	Consider improv[illegible]ement quality and [illegible]age, and provide a[illegible]bridges and bicycle [illegible]	Bicycle lane obstructions Tight lanes and risk of falls and snagging against road furniture Motorcyclist and cars encroachment Potholes, drainage grills and many other pavement risks Poor maintenance of road marking and signing

Following of the success of the first round of investments into bicycle infrastructure the Government has doubled the budget allocation for cycling infrastructure for 2022 to:

- Upgrade bicycle infrastructure
- Expand cycling network
- Roll out bike share schemes
- Collect cycling data.

The World Bank team is working with the key governmental stakeholders to ensure: a) the recommendations of this TA are adopted, and b) effective planning is carried out to provide technical assistance for these upcoming activities. Some of these upcoming activities are:

- Develop and run design bicycle infrastructure technical design workshops with Local Government Units (LGUs) to support them implement the key findings in their projects
- Provide technical assistance to key stakeholders to successfully deliver the newly announced funded activities (as per the above dot points in this section)
- Develop and run training and capacity building activities to support key stakeholders' practitioners.

HISTORIC ROLLOUT OF BIKE INFRASTRUCTURE IN THE PHILIPPINES

WHAT WE DID

1. REVIEW STANDARDS & GUIDELINES
2. COMMUNITY CONSULTATIONS
3. SAFE SYSTEM DESIGN AUDITS
4. CAPACITY BUILDING
5. ROAD SAFETY INSPECTIONS

500 KM NETWORK BUILT IN LESS THAN A YEAR

313km US $14.5M

Metro **Manila**

129km US $2.7M

Metro **Cebu**

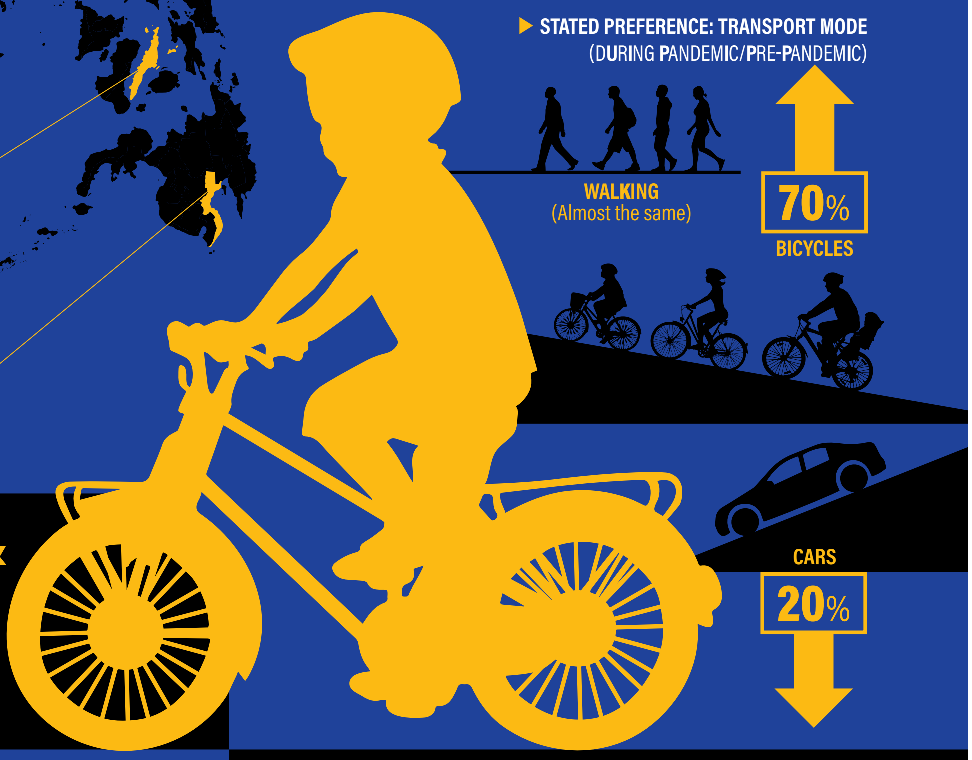
55km US $2.6M

Metro **Davao**

COMMUNITY CONSULTATIONS

▶ ON-STREET DESIGN MATTERS: SAFETY, COMFORT, ATTRACTIVENESS

▶ STATED PREFERENCE: TRANSPORT MODE (DURING PANDEMIC/PRE-PANDEMIC)



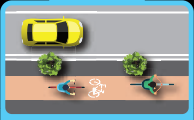
WALKING (Almost the same)

70% BICYCLES

CARS 20%

INFRASTRUCTURE & NETWORK DESIGN

CLASS 1



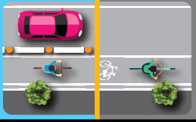
Separated from the road

CLASS 3

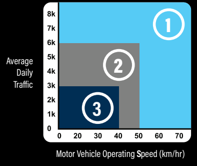
Shared lanes, cyclists have priority

CLASS 1 & CLASS 2

Protected with bollards & curbs



Pavement markings



WHAT IS HAPPENING NOW

▶ **EXPANSION**

National & local governments are continuing to expand bicycle lanes (expected 1,778 km in total by next year) using some of the learnings from the first 500 km & results of WB recommendations.

▶ **MAINTENANCE**

The challenges now are on maintenance of the constructed bike lanes and converting Class 2&3 lanes to Class 1.

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Australian Government

ADVANCING SUSTAINABLE TRANSPORT SAFETY

HEA CONSULTING

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Variables Affecting Vehicle Collisions in Australian Road Tunnels

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Abstract

In the existing literature, studies about road tunnel safety appear only in particular countries and discuss particular topics with limited information on Australian road tunnels. This paper aims to elaborate on the characteristics of vehicle collisions and investigate affecting variables on casualties and types of vehicle collisions. Data was obtained from Transport Main Road (TMR) Queensland and Center for Road Safety (CRS) New South Wales for seven road tunnels with lengths greater than one-kilometre. The analysis method includes statistical descriptive, cross-tabulation, and logistic regression. It found the most common type of collision in Australian road tunnels is a rear-end collision. The variable of speeding has a significant impact on the number of casualties. While vehicle types, vehicles involved, and speeding are variables affecting types of vehicle collisions. This paper supports tunnel designers and tunnel operators in developing a prevention strategy and policy development to make safer road tunnels.

Background, Method, Results and Conclusions

Vehicle collisions in road tunnels receive quite low attention compared to open (surface) roads because not every country has road tunnels. Existing research appears only in specific countries as a case study or focuses on specific topics with limited information on Australian road tunnels. Meanwhile, road tunnel conditions differ from open (surface) road conditions, resulting in different driving behaviour. As a result, the characteristics of vehicle collisions and how to mitigate collisions in road tunnels differ. This paper aims to identify the characteristics of vehicle collisions in Australian road tunnels and to investigate the affecting variables that influence the number of casualties and the types of vehicle collisions.

The datasets were obtained from the Transport Main Road (TMR) - Queensland and the Centre for Road Safety (CRS) - New South Wales for a total of seven road tunnels with lengths greater than one kilometre. TMR data ranges from January 1, 2010 to November 30, 2019. While the CRS dataset spans from January 1, 2015 to December 31, 2019. There is no consistency in the variables and terminology used in the datasets between TMR and CRS. As a result, data cleaning and data transformation are carried out to select variables that are appropriate for the purpose of the study. There were a total of 262 collision data with 12 variables from both TMR and CRS. Vehicle collisions data include collisions that occur inside road tunnels and on-ramps leading to road tunnels. A general statistical analysis applies to describe the characteristics of vehicle collisions. A cross-tabulation (crosstab) analysis is performed to describe the relationship between the dependent and independent (explanatory) variables. Binary logistic regression (BLR) and multinomial logistic regression (MLR) are also applied to identify the variables affecting the number of casualties and types of vehicle collisions.

The descriptive analysis provides information about vehicle collision characteristics in road tunnels around greater Brisbane and greater Sydney area, which are useful for comparison to other cities in different countries. Crosstab analysis for casualties revealed that speed limit and horizontal alignment were variables affecting casualties. The speed limit is consistent with prior research, but the horizontal alignment is contradicted to them. While crosstab analysis for collision types discovered that rear-ends and side-impact collisions are associated with multi-vehicle collisions and speeding (exceeding the speed limit). The BLR analysis generates a mathematical model to predict casualty, with the speed limit being the primary variable affecting casualty. The MLR analysis discovered three variables that affect the type of collision: vehicle types, the number of vehicles involved, and the factor of speeding.

Based on the overall findings, intervention on the tunnel, vehicle, and driver categories can be implemented to improve safety. While the environment category cannot be intervened. The tunnel category includes technical variables that assist the tunnel operator or tunnel designer in managing vehicle collisions and the development of tunnel safety policy.

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A Vision Zero Pedestrian Network Safety Planning Approach

Hafez Alavi

HA Consulting

Abstract

Australia's National Road Safety Strategy 2021-30 has set national actions to develop network safety plans to prioritise most impactful road safety treatments. No rigorous method is available to develop pedestrian network safety plans in Australia or New Zealand. This stops us from developing effective pedestrian safety infrastructure and speed management action plans to achieve zero pedestrian serious road trauma. We have developed a thorough pedestrian network safety planning method, which is currently being applied in a couple of jurisdictions. This paper is to introduce the method and its development process, and the findings and results of its application in national and international jurisdictions will be discussed in future road safety events.

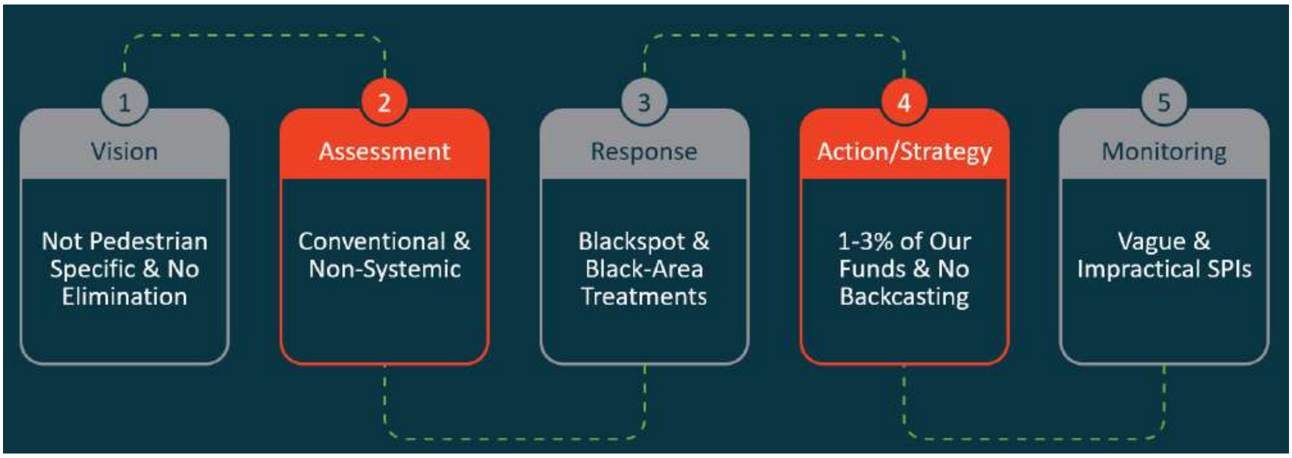
Problem definition

Pedestrian injuries compose a significant part of our urban serious road trauma, pose major social costs to the community, and discourage people from taking up walking or allowing their children to walk. Moreover, studying the pedestrian deaths and hospitalization rates in Victoria shows that the pedestrian safety issue is escalating and urgent responses are required if we are to promote walking in the post-covid years.

Figure 1. Pedestrian trauma and its social impacts in Victoria (2010-2019)

Figure 2. Pedestrian deaths and hospitalisations in Victoria (2010-2019)

Our investigation of pedestrian safety strategising and action planning activities in Victoria shows major shortcomings along the strategy/planning approach applied in Australia/New Zealand (Austroads Guide to Road Safety Part 7: Road Safety Strategy and Management). Figure 3 shows these shortcomings.



1 Vision: Not Pedestrian Specific & No Elimination

2 Assessment: Conventional & Non-Systemic

3 Response: Blackspot & Black-Area Treatments

4 Action/Strategy: 1-3% of Our Funds & No Backcasting

5 Monitoring: Vague & Impractical SPIs

Figure 3. Road Safety Strategy and Management – Pedestrian Safety Planning Shortcomings

Project purpose

To provide Australia and New Zealand jurisdictions with a robust approach to pedestrian network safety planning, a new methodical, step-wise approach was require. This was also to depart from the current conventional approaches of pedestrian blackspot and black-area treatments to a more systemic, area-wide risk-based approach.

Furthermore, this pedestrian safety risk based approach could be married up with movement and place frameworks to ensure the developed action plans are compatible with other network and precinct planning approaches applied across various road authorities.

Methodological questions

There were certain methodological questions that we had to grapple to develop a pedestrian safety action planning method that address Safe System and Vision Zero requirements, while offered replicable and systematic steps to define, measure, prioritise and address pedestrian serious road trauma risk across various roads and streets networks. Our key methodlogical questions were:

- What is pedestrian safety risk, and how is it distributed across the roads and streets network?
- Where are the high risk locations/areas and how we can prioritise them for interventions?
- What is the ideal pedestrian Safe System End State to achieve Zero for pedestrians?
- What are the attributes of these high-risk areas, and what needs to be done to achieve the Safe System End State for pedestrians?
- How these risk analyses and intervention developments could be modelled?
- How these risk analyses and intervention developments could be married up with the movement and place frameworks?
- How are these interventions developed, packaged, costed and evaluated to be included in a pedestrian safety action plan?

Pedestrian Network Safety Planning approach

We developed a practical/analytical framework to investigate and address these methodological questions. Figure 4 and 5 show the developed framework.

Figure 4. Pedestrian safety planning framework and Step 1

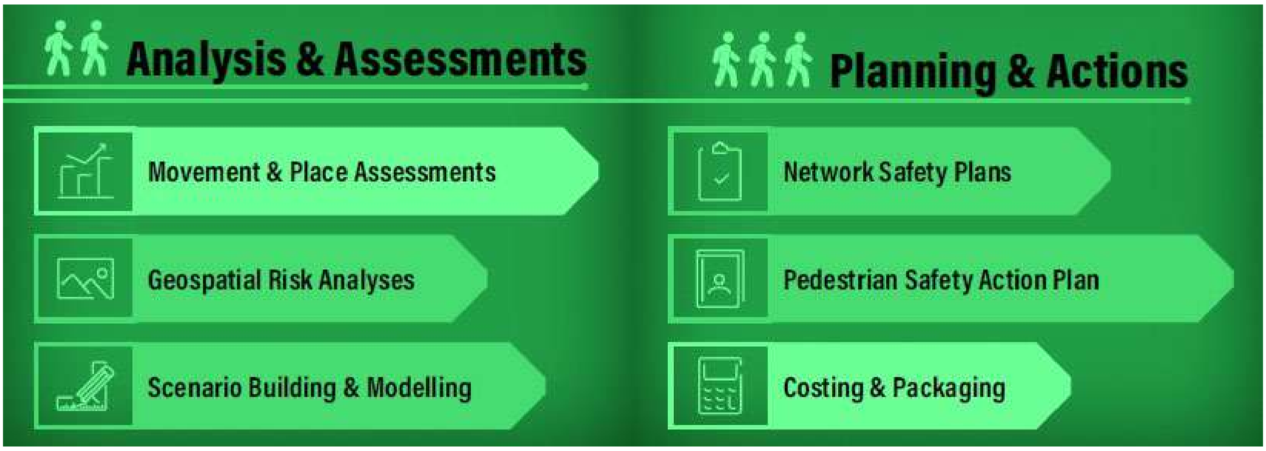


Figure 4. Pedestrian safety planning framework - Step 2 and 3

Based on our developed methodological questions and adopted method, we developed a step-wise approach to develop a Vision Zero pedestrian network safety planning approach:

1. Risk definition and high-risk area detection/mapping
2. High pedestrian risk area data extractions
3. Vision Zero pedestrian safety measure identifications
4. Movement and Place assessments
5. Pedestrians safety measures packaging and costing

Pedestrian safety deliverables

Several deliverables are envisaged to be resulted from the developed approach – Figure 6 shows some of these outputs and deliverables.

Figure 7 shows some of the early results of mapping pedestrian safety interventions against the movement and place framework – this is as a part of the 5th step of the proposed method.

Next steps

The developed pedestrian network safety planning is unprecedented and is deemed to be a viable approach to achieve Vision Zero outcomes for pedestrians. There are certain areas where the practice can grow and gain from further work:

- More rigorous inclusion of other pillars of the Safe System in the action planning steps
- Utilising more sophisticated pedestrian injury and exposure data in risk assessments
- Utilising more sophisticated Movement and Place framworks
- Enhancing the accuracy of costs and effectiveness of the shortlisted pedestrian safety measures
- Monitoring and evaluating the developed pedestrian safety action plan to learn more about the adequacy and effectiveness of the approach.

The method is currently being applied in a few jurisdictions across Australia/New Zealand and overseas. The findings of these will be presented in future road safety events.

Acknowledgements

I acknowledge the contributions of Dr Johan Strandroth, Jessica Truong and David Shelton in their reviewing of the method and sharing invaluable insights with me.

Pedestrian Safety Deliverables

1 Vision & Targets

2 Safe System End State

3 Network Risk Levels

4 Performance Indicators

5 Movement & Place

6 Action Plans

Figure 6. Pedestrian safety planning deliverables

Figure 7: Typical pedestrian safety measures suggested under the Movement & Place framework

A VISION ZERO
PEDESTRIAN NETWORK SAFETY PLANNING APPROACH

{ 1 }. PEDESTRIAN TRAUMA IN VICTORIA

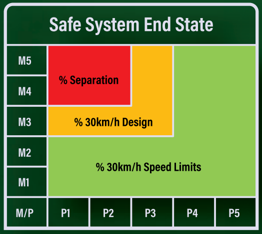
12%	14%	18%
All MAIS3+*	All Deaths	Social Costs

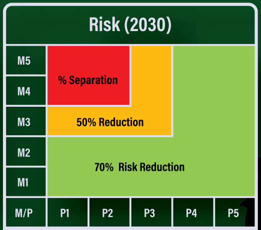
*Maximum Abbreviated Injury Scale

{ 2 }. WHAT THE STATE CAN DO

1	2	3	4	5
VISION	ASSESSMENT	RESPONSE	STRATEGY	MONITORING
Specific Pedestrian Targets	Network-wide Ped Risk Assessments	Cost-Effective Safe System Measures	Network Safety Plan & Adequate $$$	Ped Safety Performance Indicators
CURRENT				ZERO

{ 4 }. PEDESTRIAN SAFETY PERFORMANCE INDICATORS





{ 3 }. PEDESTRIAN SAFETY PLANNING APPORACH

Step 1

Data & Literature

- Pedestrian Trauma
- Traffic, Road, Land Use, Road Use
- Evidence Base & Guidance

Step 2

Assessment & Analysis

- Geospatial Risk Analyses
- Movement & Place Assessments
- Fatal Pedestrian Trauma Investigations

Step 3

Action & Packaging

- Safe System Measures
- Scenario Building & Modelling
- Pedestrian Safety Acton Plan

Hafez Alavi

ADVANCING
SUSTAINABLE
TRANSPORT SAFETY

HEA
CONSULTING

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The Reducing Aggressive Driving (RAD) program

Amanda N Stephens[a], Sharon Newnam[a], Kristie L Young[a]

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Abstract

Aggressive driving is a road safety issue, with angry or aggressive drivers having similar odds of crashing as when they are impaired or distracted (Dingus et al., 2016). The Reducing Aggressive Driving (RAD) program was designed to support drivers to avoid anger or aggressive driving. The RAD is a two-hour online group-based program that helps drivers to understand what makes them angry and the risks associated with anger and aggression. Facilitated group-led discussion, provides a forum for each participant to develop personal, realistic strategies to deal with their own anger before it turns into aggression. Evaluation of the RAD has demonstrated the effectiveness of this approach in reducing self-reported anger tendencies while driving, as well as lowered frequencies of self-reported aggressive driving. In addition, benefits of the RAD have been observed beyond the driving context. Thus, the RAD program has demonstrated potential to improve road safety through the reduction of dangerous aggressive driving.

Background

Risky aggressive driving, such as speeding, tailgating or red light running, increases the odds of crashes and serious injury crash (Paleti et al., 2010). Given the complexity of aggression, solutions to reduce these behaviours need to be flexible and focus on why drivers behave aggressively on the road. The Reducing Aggressive Driving (RAD) program, developed with the support of the ACT Road Safety Fund, was designed to address this need.

The RAD has two key objectives: 1) challenge drivers' key beliefs regarding aggressive driving, and 2) provide drivers with knowledge and strategies to avoid anger and aggression in their future driving. This presentation will focus on an evaluation of the RAD in reducing angry and aggressive driving from pre to post participation in the program. Data generated from implementation of the RAD (i.e., strategies to avoid anger and aggression) will be discussed in the presentation.

Method

The RAD was delivered across 10 sessions between April to June, 2021. A total of 94 drivers, all of whom were aged over 18, resided in Australia and had some level of aggressive driving, attended one session. To measure changes in anger and aggression after the RAD, participants were asked to complete questionnaires related to their tendencies to become angry while driving and their aggressive behaviour. The Measure for Angry Drivers scale (Stephens et al., 2019) measured anger tendencies overall, and in situations of perceived danger, hostility from others and travel delays. Frequency of aggression was measured with the Driving Anger Expression Inventory short form (Stephens & Sullman, 2014), that measures verbal, physical and aggressive use of vehicles as well as positive ways of dealing with anger. These measurements were taken at three timepoints: before participation in the RAD (baseline), one month and four months after participation in the RAD. A subset of 67 participants completed all timepoints and were included in the final sample (Mean age = 38, SD = 15; 55% male).

Results

Strategies to avoid aggression identified during the RAD

Strategies identified during the RAD were behavioural (e.g. better journey management), cognitive (e.g. imagine it was your mother) and relaxation (e.g. take five deep breaths) based. Almost all drivers (86%) said the RAD helped them generate realistic strategies to reduce anger and 86% were still using these strategies up to four months after participation. The most commonly used strategies were to play music or listen to the radio, tell yourself to ignore it, or ask yourself whether this will matter in the long term.

Self-reported anger and aggression before and after the RAD

Figures 1 and 2 show that self-reported anger tendencies and aggression frequencies were significantly lower after the RAD, when compared to Baseline and these changes were sustained at the four month follow up.

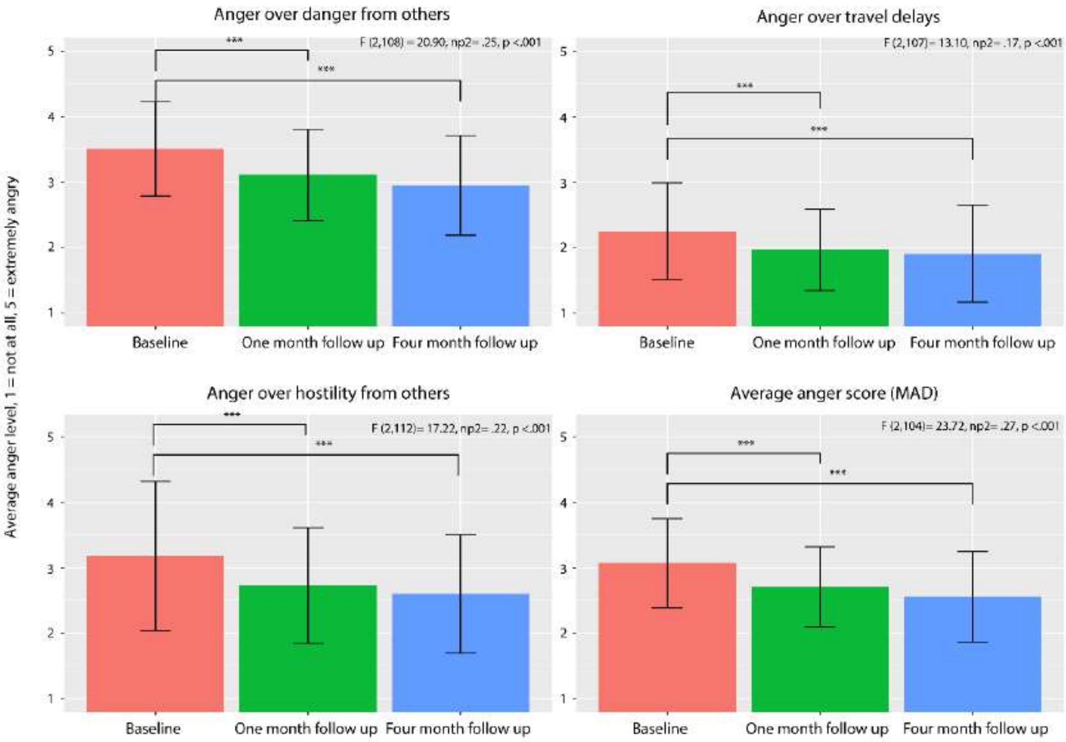

Figure 1. Changes in anger across the RAD evaluation

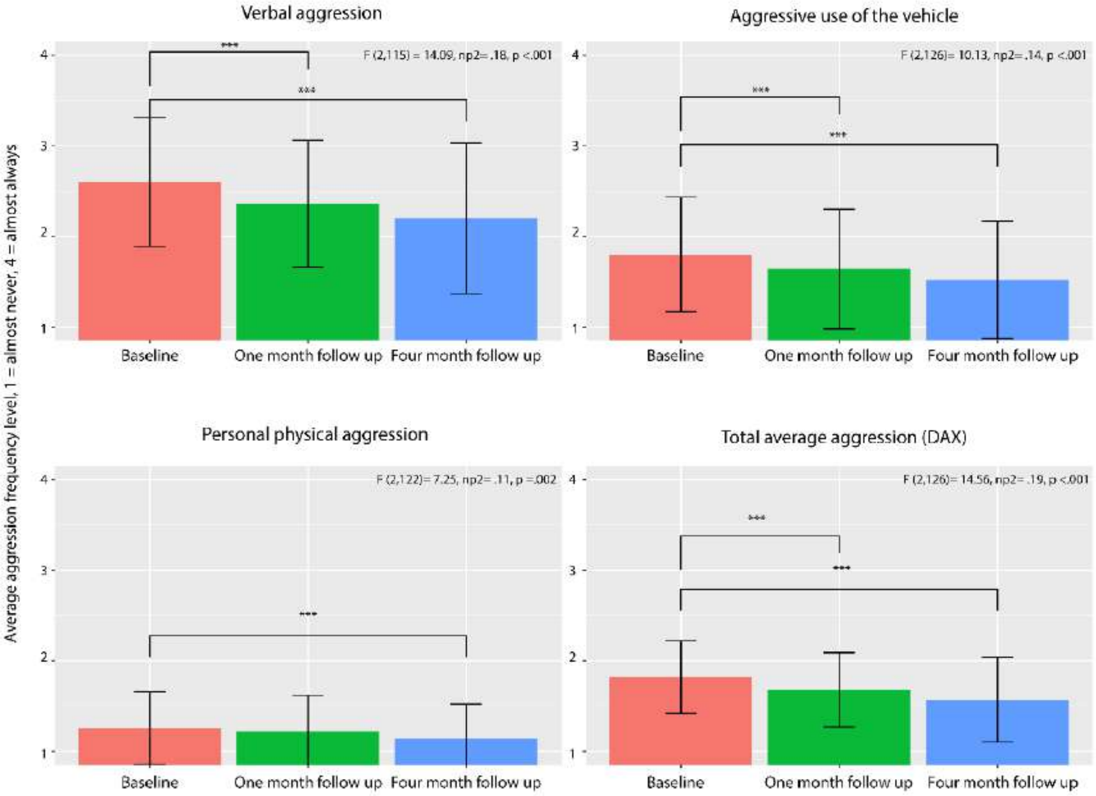

Figure 2. Changes in aggression across the RAD evaluation

Conclusions

Anger and aggression were lower after participation in the program, providing evidence of the potential of the RAD to reduce anger and aggressive driving. Further research is required to measure changes in behaviour using objective measures (i.e. vehicle telematics, or driving simulator).

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Road Safety Epidemiology for the Safe System Approach

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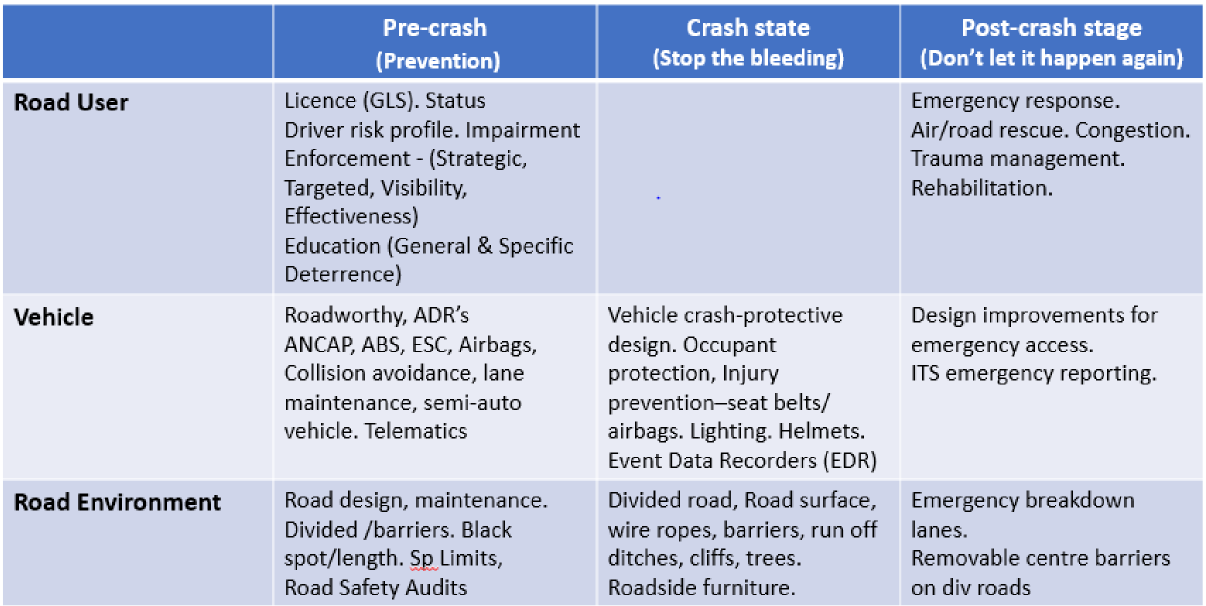
Abstract

Australia and many other jurisdictions have been served well with the Haddon Matrix. Using this method to analyse crash data has enabled effective strategies since the 1970's resulting in a steady downturn of road fatalities. However, because it relies on injury and fatality data it must be questioned whether it is sufficient for a strategy underpinned by the Safe System Approach. As the name suggests road safety advancement is increasingly calling for a more systemic and dynamic analysis of road trauma risk factors. Psychologists like James Reason and many others have developed injury factor analysis tools that have been applied in occupational and aviation safety. These approaches support the analysis of latent root causes – methods that have generally not been applied in road safety. Apart from work-related road safety, this kind of systemic analysis has largely been absent. This paper aims to make a case for taking a deeper analysis of road trauma data through the adaptation of practices being used in other injury sectors.

Background

The 'scientific method' of analysing road injury causation was embraced in the 1960s following the work of Dr William Haddon, public health expert. Haddon's injury analysis method called for identification of contributing factors prior to, during and after the crash event, grouping them into three categories, vehicle, road environment and human factors (Haddon, 1968). That is, in a manner similar to traditional medical epidemiological examination of how infectious diseases occur, i.e. injury epidemiology conceptualised the components of a host (human), a vector or agent (vehicle) and an environment (road) to find how the transfer (in this case of harmful energy forces) would result in injury. Figure 1 presents the 2-dimensional risk factor assessment matrix as developed by Haddon and populated in the context of a police crash investigation. This is used to assess the interrelationship between the road environment at the pre-crash (prevention), crash state (colloquially termed- stop the bleeding) and the post-crash stage (don't let it happen again). This can be applied for a specific crash or collectively for categories of crashes.

This injury analysis model can be applied simply at the strategic level for road safety. It is a matter of looking at, for example, road fatality data and counting the number of times a behavioural, vehicle and/or a road environment factor was present, before during and after a crash, and putting these numbers in the appropriate cells of the matrix. Then, by adding all of the cases where road user factors were present and dividing by the total number of crashes in the data set, a percentage of crashes involving behavioural factors can be calculated, and so on for vehicle and road environment factors. This analysis provides information about the relative contributions of road injury factors,



	Pre-crash (Prevention)	Crash state (Stop the bleeding)	Post-crash stage (Don't let it happen again)
Road User	Licence (GLS). Status Driver risk profile. Impairment Enforcement - (Strategic, Targeted, Visibility, Effectiveness) Education (General & Specific Deterrence)		Emergency response. Air/road rescue. Congestion. Trauma management. Rehabilitation.
Vehicle	Roadworthy, ADR's ANCAP, ABS, ESC, Airbags, Collision avoidance, lane maintenance, semi-auto vehicle. Telematics	Vehicle crash-protective design. Occupant protection, Injury prevention–seat belts/ airbags. Lighting. Helmets. Event Data Recorders (EDR)	Design improvements for emergency access. ITS emergency reporting.
Road Environment	Road design, maintenance. Divided /barriers. Black spot/length. Sp Limits, Road Safety Audits	Divided road, Road surface, wire ropes, barriers, run off ditches, cliffs, trees. Roadside furniture.	Emergency breakdown lanes. Removable centre barriers on div roads

Figure 1 Haddon Matrix for identifying road injury factors

thus enabling a focus on investments in prevention programs to address those risk factors that occur most often in fatal crashes.

This injury analysis model can be applied simply at the strategic level for road safety. It is a matter of looking at, for example, road fatality data and counting the number of times a behavioural, vehicle and/or a road environment factor was present, before during and after a crash, and putting these numbers in the appropriate cells of the matrix. Then, by adding all of the cases where road user factors were present and dividing by the total number of crashes in the data set, a percentage of crashes involving behavioural factors can be calculated, and so on for vehicle and road environment factors. This analysis provides information about the relative contributions of road injury factors, thus enabling a focus on investments in prevention programs to address those risk factors that occur most often in fatal crashes.

Developments in Injury Epidemiology

Psychologist, Dr James Reason (1990), built a "Swiss Cheese" model depicting a system of holes in the safety defense system that would enable a hazard trajectory to run its course resulting in a harmful event. He also argued and provided evidence that human error is not a cause, but rather a consequence of organisational shortcomings (Reason, 1990). This is not to say that human errors did not occur; rather it was a recognition that human errors are shaped by upstream workplace and organisational factors.

System thinking is not new in the safety field and the aviation industry Maurino, D.et al. (1995).. It just hasn't been fully applied in road safety. Indeed, nearly 25 years ago Rasmussen (1997) reviewed a range of models for understanding accident causation and emphasised the need for a multi-disciplinary understanding that human activity occur within a dynamic socio-technical system of interactions.

Working in the areas of aeronautics and astronautics, a group proposed a new accident model that calls for continuous controls of processes, instead of controls on individual system component failures (Leveson, 2004, p. 250)." Unlike the Haddon model predominantly used in road safety, this type of systems based accident model has a stronger focus on understanding why the control system failed and why they made components unstable, than on immediate error factors. In other words, it asks how the conditions were developed such that an operator error could result in harm.

Indeed, with the advent of “safe system” there has been a call for a paradigm shift in the way we conceptualise road injury risk (Rechnitzer, G. and Grzebieta, R., 1999, Grzbieta, R. and Rechnizer, G. 2000, Williamson, A. 2021). Here, the integrated crashworthy system recognises the vehicle, occupants and the road environment in an holistic approach.

There have been important developments in recent years to develop a systems-focussed crash data analysis more like the root cause analysis approach taken in some sectors (Mcllroy et al, 2021, Salmon, P. et al, 2020). This type of analysis delves into the foundational crash causes to critically identify reform actions as prevention focused initiatives addressing the higher-order factors and continually asking why in the investigative approach.

Conclusions

While a road and traffic system is not as controllable as a workplace, it is time to apply some of the more advanced system analysis methods to understanding systemic risk factors and root causes of injury in this sector. This holistic approach is recommended to substantially impact upon road trauma reduction.

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Approaches To Managing Speed In New Zealand's Capital

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Abstract

Unsafe speed limits and high numbers of road crashes with injuries make Wellington roads unsafe, have high social cost, present a barrier to active transport, and limit mode choice for Wellingtonians. Nine speed management options were assessed using cost benefit analysis. Area-level permanent speed reduction was most effective for reducing road crash-related injuries. The best performing option had the 30 km/h speed limit for local streets and 40 km/h for arterial roads, with substantial crash reduction benefits (over $500 million, discounted over 40 years), albeit with high cost and relatively high vehicle travel time disbenefits. Incremental cost benefit calculations indicated that, depending on the total budget available, the most efficient options were permanent speed reductions at schools and the 40/30 km/h mix. Implementing variable speed limits around schools provided the lowest benefits and very low value for money compared to area-wide speed management approaches or permanently reduced speed around schools.

Background

Speed is a major contributing factor to death and serious injuries on New Zealand roads. During the 2012-2021 period, 3,063 injuries (17 fatalities; 496 serious injuries; 39% involving pedestrians or cyclists) were reported from crashes on Wellington city's urban road network (excluding State Highway).

Wellington City Council uses speed management as a key means of reducing harm on its roads: 50 km/h default urban speed limit; safer speed zones (30 km/h) in most town centres, and 30 km/h on most central city streets. Nevertheless, nearly 80% of Wellington roads require speed limit reduction to align with the safe and appropriate speed calculated for the road.

Wellington City Council is assessing options for speed management to align with the city's priority to provide a safe, resilient and reliable network of transport infrastructure that supports active and public transport choices and to comply with The Land Transport Rule: Setting of Speed Limits 2022. Wellington City has 81 schools and most of them will require speed limit reduction.

Methods

The cost benefit analysis of nine speed management options included detailed cost estimation, modelling of vehicle travel time disbenefits using a mesoscopic traffic model in AIMSUN, and crash savings estimation using Crash Analysis System data and Monetised Benefits and Costs Manual procedures, assuming a 40-year analysis period. The options varied based on their approach to safe speeds around schools (permanent or variable) and across the city (30 km/h, 40 km/h, or 50 km/h default) as well as the implementation timing (by 2024 (accelerated) or by 2030) (Figure 1).

Results

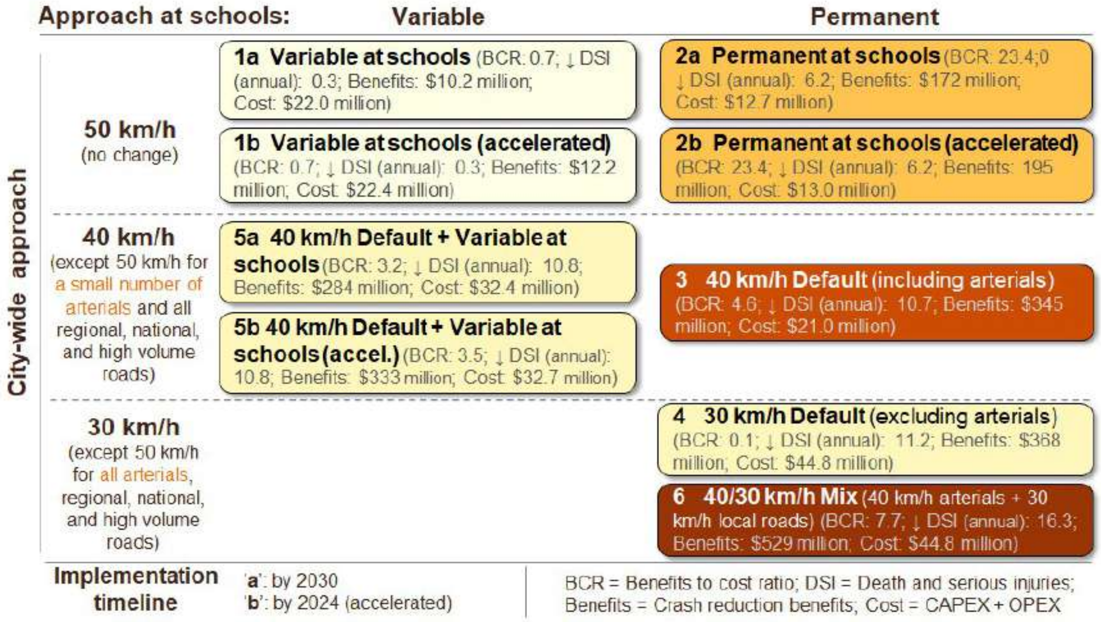
The best performing option (#6) with the speed limit of 30 km/h for local streets and 40 km/h for arterial roads provided substantial crash reduction benefits followed by option #4 (30 km/h default). Both options had high costs and relatively high travel time disbenefits.

Permanent speed reduction at schools options (#2a and #2b) provided the highest value for money but had lower total benefits compared to most other options.

Options #3 (40 km/h default), #5a and #5b provided medium value for money.

Options with variable speed limit at schools (#1a and #1b) were the worst performing options.

According to incremental cost benefit calculations, depending on the total budget available, the most efficient options were options #2a and #2b with permanent speed reduction at schools and option #6 (40/30 km/h mix).



City-wide approach

Approach at schools:	Variable	Permanent
50 km/h (no change)	**1a Variable at schools** (BCR: 0.7; ↓ DSI (annual): 0.3; Benefits: $10.2 million; Cost: $22.0 million)	**2a Permanent at schools** (BCR: 23.4;0 ↓ DSI (annual): 6.2; Benefits: $172 million; Cost: $12.7 million)
	1b Variable at schools (accelerated) (BCR: 0.7; ↓ DSI (annual): 0.3; Benefits: $12.2 million; Cost: $22.4 million)	**2b Permanent at schools (accelerated)** (BCR: 23.4; ↓ DSI (annual): 6.2; Benefits: 195 million; Cost: $13.0 million)
40 km/h (except 50 km/h for a small number of arterials and all regional, national, and high volume roads)	**5a 40 km/h Default + Variable at schools** (BCR: 3.2; ↓ DSI (annual): 10.8; Benefits: $284 million; Cost: $32.4 million)	**3 40 km/h Default** (including arterials) (BCR: 4.6; ↓ DSI (annual): 10.7; Benefits: $345 million; Cost: $21.0 million)
	5b 40 km/h Default + Variable at schools (accel.) (BCR: 3.5; ↓ DSI (annual): 10.8; Benefits: $333 million; Cost: $32.7 million)	
30 km/h (except 50 km/h for all arterials, regional, national, and high volume roads)		**4 30 km/h Default** (excluding arterials) (BCR: 0.1; ↓ DSI (annual): 11.2; Benefits: $368 million; Cost: $44.8 million)
		6 40/30 km/h Mix (40 km/h arterials + 30 km/h local roads) (BCR: 7.7; ↓ DSI (annual): 16.3; Benefits: $529 million; Cost: $44.8 million)

Implementation timeline 'a': by 2030
'b': by 2024 (accelerated)

BCR = Benefits to cost ratio; DSI = Death and serious injuries; Benefits = Crash reduction benefits; Cost = CAPEX + OPEX

Figure 1. Nine speed management options with the results of cost benefit analysis

Conclusions

In the cost benefit analysis, area-level permanent speed reduction was most cost effective at reducing road crash-related injuries with the best performing option having the speed limit of 30 km/h for local streets and 40 km/h for arterial roads. Options with permanent speed reductions at schools provided the highest value for money while implementing variable speed limits around schools provided the lowest benefits and very low value for money. This analysis did not assume any change in travel behaviour due to traffic speed reduction and therefore likely underestimates the actual benefits for all assessed options.

Disclaimer: The authors' views expressed in this report are not necessarily official Wellington City Council policy positions.

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Bridge strikes in Victoria and New South Wales: trends and factors

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Abstract

Bridge strikes are costly, which can cause fatalities and injuries and incur substantial repair costs and traffic disruptions. This paper investigates bridge strikes in Victoria and New South Wales (NSW) using historical traffic crash data. Results show that, on average, there are 16.8 and 56 bridge strikes with casualties per year in Victoria and NSW, respectively. Fatal bridge strikes are much more frequent in NSW than in Victoria (i.e., 13 during the 2016-2020 period in NSW compared to 9 during the 2006-2020 period in Victoria). Results of the Chi-squared test show that bridge strikes tend to be associated with more severe outcomes, regional areas, high speed roads, heavy vehicles, and poor lighting conditions compared to other traffic crashes. While declining trends in bridge strikes in both Victoria and NSW are encouraging, future research should explore these issues in more depth and for more jurisdictions.

Background

A bridge strike is a traffic crash where a bridge is struck by a vehicle, which can cause fatalities and injuries. A bridge strike can also damage its structure or, in extreme cases, result in bridge failure, incurring substantial repair costs and traffic disruptions (Otter et al., 2012; Nguyen and Brilakis, 2018). Bridge strikes are often related to over-height/oversized vehicles or low clearance bridges (Horberry et al., 2002; Connolly et al., 2022). While bridge strikes can be frequent and costly, limited research has been conducted to explore bridge strike issues in Australia. For example, a few studies have looked at these issues for railway bridges specifically (Coleman et al., 2019; Shoghi, 2019). This paper, therefore, aims to investigate trends and factors associated with bridge strikes in Victoria and New South Wales (NSW).

Method

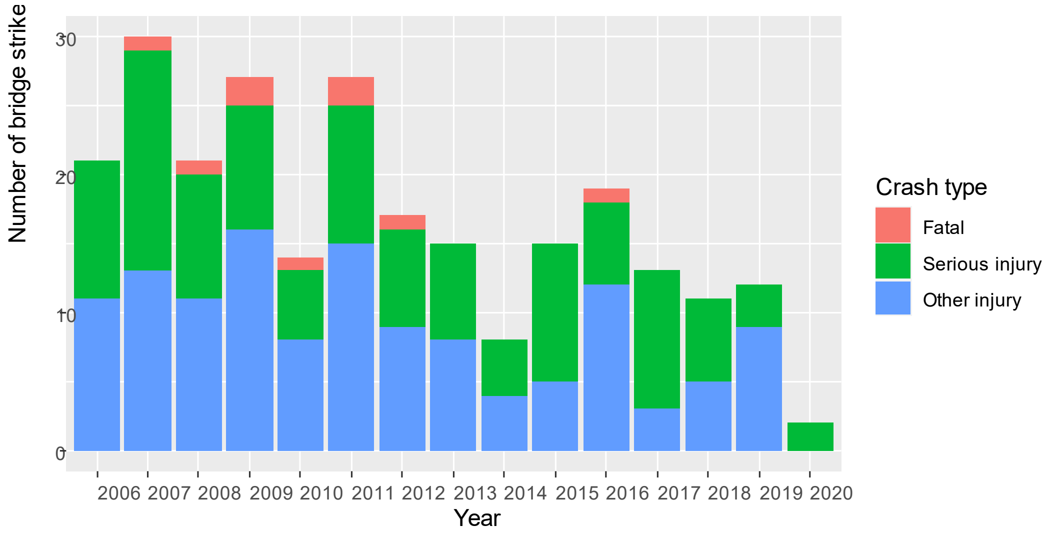
Crash data in Victoria (2006-2020) and NSW (2016-2020) were obtained from data.vic.gov.au and opendata.transport.nsw.gov.au, respectively. A bridge strike was identified when the object struck was a bridge (in Victoria) or bridge/underpass (in NSW). The Chi-squared test was used to test the associations between bridge strikes and factors such as speed limit and heavy vehicle involvement. Data processing and analysis were performed in the R statistical environment.

Results

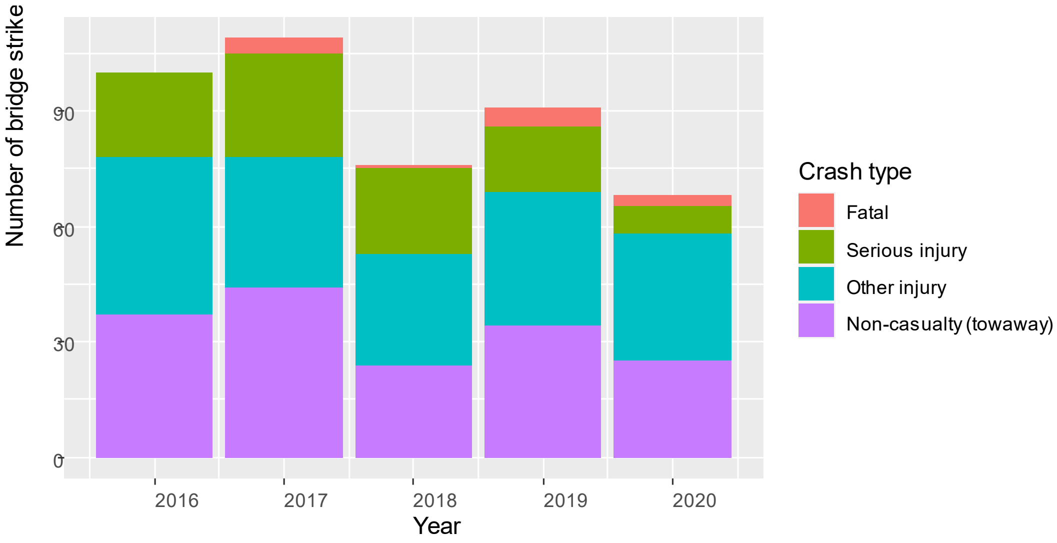
Figures 1a and b show bridge strikes trends in Victoria and NSW, respectively. It is noted that the Victorian dataset does not include non-casualty crashes. Between 2006 and 2020, there were 252 bridge strikes with casualties in Victoria, of which nine were fatal. While a decreasing trend in bridge strikes is evident, the sharp drop in 2020 would be attributed to the extended lockdowns in Victoria. Between 2016 and 2020, there were 444 bridge strikes in NSW, of which 13 were fatal. A slight decreasing trend is also evident in NSW. Overall, bridge strikes were much more frequent in NSW than in Victoria, even when non-casualty bridge strikes in NSW were excluded.

Table 1 presents comparisons between bridge strikes and other traffic crashes by various factors. Compared to other traffic crashes, in general, bridge strikes were more severe ($p<0.001$). Bridge strikes were more likely to occur on roads with a speed limit of 100km/h or above and in regional

Victoria/NSW ($p<0.001$). In addition, bridge strikes were more likely to be associated with a heavy vehicle (which is expected) and less likely to occur during daylight conditions compared to other



a) Victoria, 2006-2020 (casualty crash only)



b) New South Wales, 2016-2020

Figure 1. Bridge strike trends in Victoria and New South Wales

Conclusions

Bridge strikes were relatively frequent in Victoria and NSW, causing multiple fatalities and serious injuries. A preliminary analysis showed bridge strikes tended to be associated with more severe outcomes, regional areas, high-speed roads, heavy vehicles, and poor lighting conditions compared o other traffic crashes. While decreasing trends in bridge strikes in both Victoria and NSW are encouraging, future research should explore these issues in more detail and for more jurisdictions. An in-depth understanding of factors contributing to bridge strikes is critical to developing prevention and mitigation strategies.

Table 1. Summary of bridge strikes in Victoria and New South Wales

	Casualty crashes in Victoria (2006 - 2020)					**Crashes in New South Wales (2016 - 2020)**				
	Bridge strike		**Other**			**Bridge strike**		**Other**		
	n	%	n	%		n	%	n	%	
Severity										
Fatal	9	3.6%	3698	1.8%	= 21.442, df = 2, p<0.001	13	2.9%	1613	1.5%	= 18.152, df = 3, p<0.001
Serious injury	114	45.2%	68322	33.6%		95	21.4%	22778	20.8%	
Other injury	129	51.2%	131432	64.6%		172	38.7%	51437	46.9%	
Non-casualty (towaway)						164	36.9%	33759	30.8%	
Speed limit										
50 km/h	30	11.9%	45325	22.3%	=110.5, df=4, p<0.001	92	20.7%	40243	36.7%	=211.45, df = 4, p<0.001
60 or 70 km/h	87	34.5%	84251	41.4%		114	25.7%	42328	38.6%	
80 or 90 km/h	25	9.9%	28708	14.1%		87	19.6%	11828	10.8%	
≥ 100 km/h	102	40.5%	33289	16.4%		151	34.0%	15150	13.8%	
Other	8	3.2%	11879	5.8%		0	0.0%	38	0.03%	
Region										
Metro	106	42.1%	130111	64.0%	=51.343, df=1, p<0.001	149	33.6%	61718	56.3%	=92.151, df = 1, p<0.001
Other	146	57.9%	73341	36.0%		295	66.4%	47869	43.7%	
Heavy vehicle related										
Yes	51	20.2%	9197	4.5%	=139.87, df = 1, p<0.001	61	13.7%	6525	6.0%	=46.247, df = 1, p<0.001
No	201	79.8%	194255	95.5%		383	86.3%	103062	94.0%	
Road surface										
Dry	204	81.0%	160062	78.7%	*=0.649, df=1, p=0.42*	346	77.9%	92743	84.6%	=14.736, df=1, p<0.001
Other	48	19.0%	43390	21.3%		98	22.1%	16844	15.4%	
Weather										
Fine	210	83.3%	164014	80.6%	*=1.022, df=1, p=0.31*	340	76.6%	90115	82.2%	=9.285, df=1, p<0.01
Other	42	16.7%	39438	19.4%		104	23.4%	19472	17.8%	
Lighting condition										
Daylight	129	51.2%	136229	67.0%	=27.569, df=1, p<0.001	223	50.2%	71479	65.2%	=43.176, df=1, p<0.001
Other	123	48.8%	67223	33.0%		221	49.8%	38108	34.8%	
Total	**252**		**203452**			**444**		**109587**		

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Development of Media Guidelines for Reporting Road Incidents

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Abstract

Road trauma happens unexpectedly and can impact how we view the world. It is normal for individuals involved to experience a range of upsetting thoughts, feelings and reactions following a road incident. This recovery process can be impacted by the way in which road incidents are reported in the media. Following a comprehensive literature review and consultations with key media and road safety stakeholders, Injury Matters developed Media Guidelines to empower media personnel to report road incidents in a manner that has a positive effect on road safety and supports those affected by road trauma. The Guidelines include eight core elements to consider when reporting road trauma; describing the road incident, language, interviews and consent, comments from experts, imagery, help-seeking information and looking after yourself.

Background

Road trauma happens unexpectedly and can impact the way in which we view the world. It is normal for the individuals involved to experience a range of upsetting thoughts, feelings and reactions following a road incident. Most people will feel better within a few days or weeks, but for some it may take longer to recover.

This recovery process can be impacted by the way road incidents are reported in the media due to the poor reporting of traumatic events having the potential to sensationalise the incident, misdirect the audience's point of concern, obscure the solutions, frighten victims and increase distress (Maercker & Mehr, 2006; Skehan et al., 2013).

Research into the reporting of road incidents in the United States found that changing the editorial patterns of the reports can significantly affect the reader's perception of what happened, what should be done about it and how they attribute their blame of the incident (Goddard et al., 2019).

Purpose of Project

Due to the frequent occurrence of road incidents in Western Australia there is the potential for crashes to be normalised and for individuals involved in road incidents to be retraumatised by another incident (Breen et al., 2011), reinforcing the need for consideration when reporting the incident.

Owing to this impact and Road Trauma Support WA clients regularly reporting media-related distress, Injury Matters identified the need to advocate for improvement in the media’s reporting about road trauma via the development of tailored Media Guidelines.

Description of Project

To inform the development of the Guidelines a comprehensive literature review was undertaken to identify; key domains that cause harm whilst reporting traumatic events, the best practice for safe reporting of traumatic events and additional ethical reporting projects being conducted by external organisations.

Based on this collated evidence and consultations with key media and road safety stakeholders, Injury Matters developed a resource to empower media personnel to report road incidents in a manner that has a positive effect on road safety and supports those affected by road trauma. The Guidelines include eight core elements to consider when reporting road trauma; describing the road incident, language, interviews and consent, comments from experts, imagery, help-seeking information and looking after yourself.

Prior to the public release of the Guidelines, Injury Matters established an evaluation framework and collated a baseline measure of the reporting of road incidents in WA to enable ongoing monitoring of the impact of the Guidelines.

Conclusions

When the reporting of road incidents follows the Guidelines, the media can use its influence to help the audience understand the problem in focus, evoke positive behaviour change, remove barriers to accessing help, change cultural awareness that road incidents are a preventable public health issue and continue to be part of the solution to reducing the impact of road trauma.

Following the release of the Guidelines, Injury Matters will provide ongoing support to media personnel to grow their capacity to ethically report road incidents.

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Identifying and Explaining Changes in Motorway Crash Types and Causes

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Abstract

Changes in context in how the road network is used over recent decades has altered the quantity, types and causes of crashes on all roads, especially on roads with high traffic demand such as motorways. Vehicles now drive closer together and often the required reaction is now less than the average headway between vehicles. Vehicles are now heavier, wider, and taller, and in heavy traffic, drivers' forward vision is greatly reduced. Dynamic traffic (nucleations, shockwaves) and environmental factors are of greater influence due to the changing context, making driver tasks more complex and elevating crash risk. These result in conditions beyond human and vehicle capacity. In light of this, new questions were asked of the crash data which identified changes in crash types over time, especially in multi vehicle crashes. There are opportunities for road safety strategies to be expanded to address this changing context.

Introduction

Traffic safety is paramount in motorway operations. Crashes impact people's lives and operational efficiency of infrastructure. Although crash rates are much lower on Melbourne motorways compared to arterial roads, casualty crash numbers are increasing. This rise is explainable by context changes in road demand and usage over time.

Increasing Exposure to Complexity

Road transportation has changed considerably and is operating under more stress than in the past. Since 2000, traffic volumes have doubled with longer periods of high demand. This induces increased exposure to high-density traffic conditions, where "traffic-state" changes, shockwaves and nucleations occur, leading to increased driving complexity. Higher density traffic, together with more lanes, creates more interactions with less empty space between vehicles. Changes in society and increased affluence has altered traffic patterns and demands, especially increased consumption of goods and services, and grown business and social activity across the day.

Since 2000, many carriageways have been upgraded from 2-3 lanes to 3-6 lanes, resulting in non-linear increase in lane changes causing increased complexity for drivers. Empirical measurements indicate two-lane carriageways induce 800 lane changes (lc) per km/h and six-lane carriageways induce 4900 lc/km/h.

Context changes that increase the number and proportion of motorway crash types include:

- Larger, wider, heavier vehicle fleet, obstructing forward vison of events unfolding ahead.
- Increased exposure to higher density traffic, with vehicles travelling closer together more often. Average headways are often around one second (well below reaction time) giving less space for braking.
- Climate change and environmental factors, when combined with context changes, amplifies crash risk.

Traffic science tells us that traffic flow behaviour is chaotic, rapidly transitioning ‘traffic-states’ in seconds. Oscillations, shockwaves and nucleations, triggered by lane-changing events, cannot be seen nor perceived. Often the driver who crashes did not trigger the adverse conditions.

Changing Crash Trends and Patterns

Analysis of motorway crash data and real-time traffic data has shown:

- The ability to see ahead in high density and multi-lane traffic results in a high angle of blocked view. The obstructed view increases non-linearly when vehicle spacing reduces below 40m.
- Micro-traffic data shows that headways are often less than half of what is considered ‘safe driving’, and much less than driver’s reaction time (see Figure 1). When a disturbance occurs in the traffic flow, there is not enough time and space to brake or manoeuvre. However, in motorway design, adequate stopping distance and sight-distance is assumed, providing margin for error when disturbances occur.
- Context changes result in increased multi-vehicle, rear-end, lane-change and side-swipe crashes (supported by detailed descriptions in Police crash records). Crashes are closely linked to “traffic-states” and transitions (crash rates increase six-fold), rather than volumes.

Conclusion

Over recent decades the vehicle fleet has become safer when involved in a crash, however neither vehicles nor drivers have evolved to fully compensate for today’s driving conditions which require markedly shorter braking distances and considerable faster reaction times from a larger, heavier vehicle fleet. Road safety strategies need to evolve with increased emphasis on education and tool to reduce driver’s cognitive load, including greater intervention in real-time when crash risk rises (e.g., dynamic speed management and dynamically messaging drivers about changing conditions).

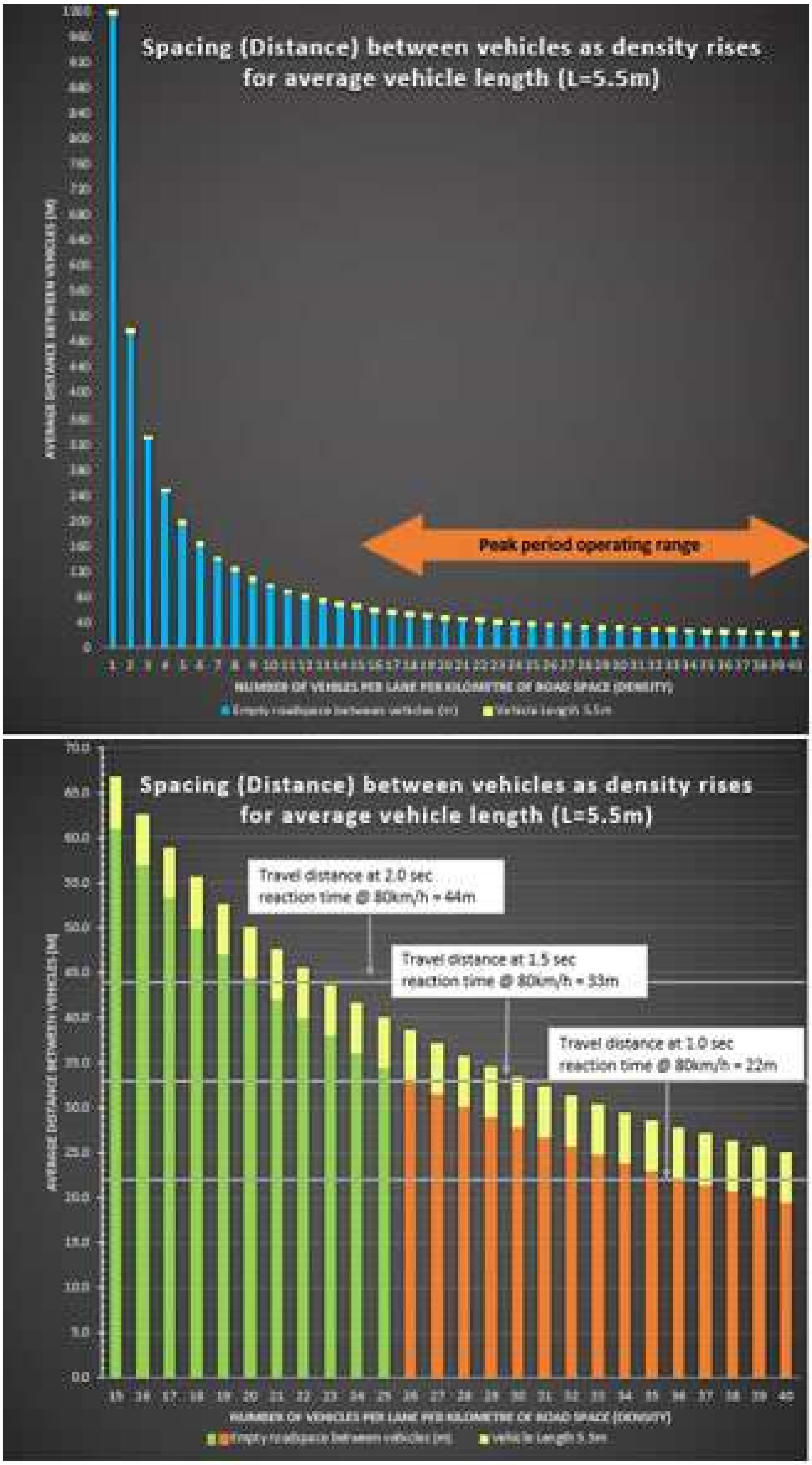

Figure 1. Reduction in empty road space as vehicle density rises (top) showing distance travelled during 1, 1.5 & 2 second reaction time for vehicles traveling at 80km/h (bottom)

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A Real-World Examination of Targeted and Randomised Roadside Drug Testing

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Abstract

This research examined the effectiveness of randomised and targeted roadside drug testing (RDT) operations to identify potential drug driving offenders. A total of 8 random operations and 8 targeted operations were conducted by Queensland Police officers in 2021. When operationalized randomly, 3.4% of drivers tested returned a positive drug result compared to the targeted testing which resulted in 25.5% of RDTs returning a positive result. The most effective indicators used to detect offenders are police intelligence (such as previous histories) and visual observations (e.g., tradesperson or indicators of drug use). The results highlight that targeted testing is an efficient use of a scarce resource. However, it is important to consider that this approach does not allow for the achievement and maintenance of a general deterrent effects.

Background, Method, Results and Conclusions

Several studies have attempted to quantify the prevalence of impaired driving in Australia and have typically used three primary methods of measurement; self-report driver data (Davey, Freeman, Lavelle, & Palk, 2008; Leal, King, & Lewis, 2006), coronial data (Davey, Armstrong, Freeman, & Parkes, 2020), and police data (Davey, Armstrong, & Martin, 2014; Drummer et al., 2007; Mills et al., 2021). While these methods contribute to the understanding of drug testing, each of these methods have their limitations.

Since the roll-out of roadside drug testing across Queensland in 2007, the testing has utilised a targeted, intelligence-led methodology focusing on particular driver profiles and individuals with previous convictions, as opposed to the randomised testing model used with random breath testing. Between July 2014 and June 2015, 20,389 RDTs were conducted in Queensland which resulted in 3,178 positive results, which is a detection rate of approximately 1 positive result in every 6.5 roadside drug tests, or 15.58% (Department of Transport and Main Roads, 2017). With the implementation of a targeted roadside drug testing program, it is difficult to determine the prevalence of drug driving among the driver population.

Method

In a world-first experimental trial of roadside drug enforcement, two methodologies (randomised and targeted testing) were operationalised by the Queensland Police. For the randomised drug testing, drivers were intercepted only on the basis of available space within the police checkpoint and whether they were the next vehicle travelling on the road. During the targeted testing phase, police used their own training and experience to select drivers from the RBT line for additional RDT screening (See Figure 1). Targeting could also occur before the RBT line with flagged vehicles detected using Automatic Number Plate Recognition (ANPR) being purposefully directed towards testing.

Results

The targeted roadside drug testing methodology resulted in a much higher average rate of positive drug tests (25.5%), compared to the randomised targeting method (3.4%). Specifically, a total of

490 RDT tests were conducted randomly, returning 16 positive results. A total of 102 RDT tests conducted using a targeted regime, returned 26 positive tests.

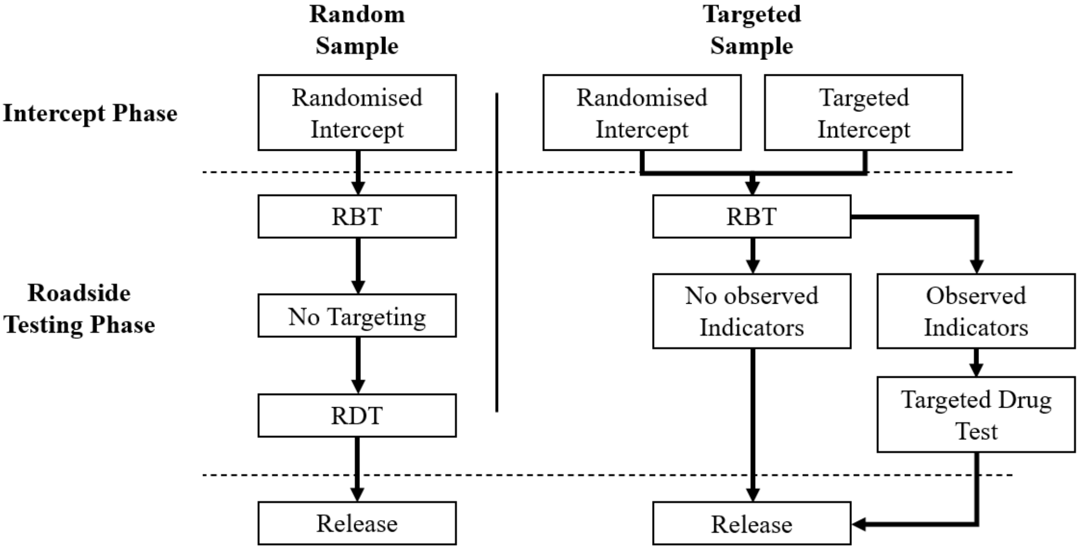

Figure 1. Diagram of Intercept and Roadside Testing Logic

Regarding the indicators used for targeting drug drivers, the results showed personal appearance was the most common indicator police used (Table 1). Use of a personal appearance indicator accounted for over half of the targeted tests. Targeting categories operationalised by police demonstrate that the use of police intelligence, specifically prior charges, were by far the strongest indicator of drug driving, with over half the tests involving this indicator yielding a positive result. Table 1 depicts the targeting categories, their frequency of use and the detection rate of drug drivers using these indicators.

Table 1. Frequencies and Detection Rates of Targeting Categories

Targeting Categories	Primary Indicator Count	Secondary Indicator Count	Total Count	Proportion Used	Detection Rate
Visual Appearance	59	15	74	53.6%	33.8%
Driver Age	21	2	23	16.7%	21.7%
Police Intelligence	9	8	17	12.3%	52.9%
Vehicle Appearance	7	8	15	10.9%	6.7%
Behavioural Cues	6	3	9	6.5%	22.2%
Total Indicators	**102**	**36**	**138**	**100%**	-

Conclusion

The ability for police to effectively target and apprehend drug drivers is vital for ensuring road safety. The results showed that targeted testing utilised up to seven times less tests proportional to traffic volume, but the positive detection rate was nearly eight times greater than that of randomised testing. An evaluation of targeting indicators demonstrated that some, such as police intelligence and visual appearance, were more effective at detecting a drug driver than others.

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The Cyclists Reporting of Incidents Tool (CRIT)

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ABSTRACT

Cyclist crashes and near miss incidents remain poorly understood. Further, anecdotal evidence suggests that cycling incidents are underreported and there is a lack data to support effective prevention. The aim of this study is to introduce and report on the initial dataset from a novel cycling incident reporting and learning system, the Cyclists Reporting of Incidents Tool (CRIT) app. Data reported from the first three months of the CRIT app by 319 registered users across Australia were analysed. In total, 59 incidents from 493 hours cycled were reported to the CRIT app. The overall incident rate was 120 incidents/1000hrs cycled, and reported contributory factors included the immediate road environment, driver behaviour, through to local councils. The findings demonstrate the utility of the CRIT app as an incident reporting tool and provide insight into the frequency and nature of cyclist crashes and near misses in Australia.

Background

Collisions between vehicles and cyclists remain a persistent and poorly understood road safety issue both worldwide and in Australia (English & Salmon, 2016; Goode et al., 2014). Globally, about 41,000 cyclists are killed every year, which makes up around 3% of the total number of road deaths (WHO, 2020), and in Australia, cyclists make up 1 in 40 of all road crash deaths (Garrard et al., 2010). Safety interventions designed to prevent cyclist crashes have not had the desired impact, partly because they are not based on a full understanding of the contributory factors involved (Salmon et al., 2022). One issue contributing to this is the lack of an incident reporting system for cyclists. The aim of this study is to describe a first-of-its-kind cyclist incident reporting system, the CRIT app, and report on the initial data gathered during the three months since its launch.

Methods

CRIT enables cyclists to report crash and near miss incidents that they experience whilst cycling. CRIT collects information regarding cycling incidents and the number of hours cycled per week which enables the calculation of crash and near miss incident rates (per 1000 hours cycled). Incident data submitted via the CRIT app forms a national incident dataset which is used to identify incident trends and characteristics including the date, time and location of incident, form of cycling activity (on-road or off-road), type of incident (crash or near miss), severity (potential severity for near misses) of incidents, a detailed incident description, and contributory factors. A key feature of CRIT is a contributory factor classification scheme which supports users in identifying the contributory factors they feel played a role in the incident or near miss being reported. Data in the current study are reported from the first three months of use from 319 registered user of CRIT across Australia.

Results

319 users reported 59 incidents from 493 hours cycled in the three months since CRIT was launched. Reported incident types included 8 crashes, 51 near misses. This equates to an overall incident rate of 120 incidents/1000hrs cycled (95% CI: 89.1-150.2), a crash incident rate of 16 crashes/1000hrs cycled (95% CI: 5.0-27.5), and a near miss incident rate of 103 near miss

incidents/1000hrs cycled (95% CI: 75.0-131.8). The most frequently reported contributory factors are reported (Table 1).

Table 1. Frequently reported contributory factors to CRIT.

High level Factors	Level 1 Sub-factors	Level 2 Sub-factors
Other road user	Driver behavior	Situation awareness
Environment	Driver knowledge, skills, experience	Failing to give way
Equipment	Road infrastructure	Non-compliance with road rules
Cyclist	Road rules	Pulling out in front of cyclist
Service providers	Cyclist infrastructure	Speed
Local councils	Cyclist behavior	Passing distance
Cycling groups	Driver mental condition	Pulling out in front of driver
	Surface, obstacles & debris	Lack of bicycle lane
	Driver education and training	Knowledge of road rules
	(Cycling) Group size	

Conclusion

The findings provide much needed insight into the frequency and nature of cyclist crashes and near misses in Australia. A novel finding is the reporting of contributory factors beyond the cyclists, road users, and immediate road environment, including contributory factors relating to local councils (Infrastructure maintenance and repairs), service providers (driver education and training), and cycling groups (size). The results demonstrate that cyclists perceive factors from the broader road transport system are contributing to their cycling incidents. As such, the initial data submitted to CRIT provides evidence to support idea that cyclist safety is a responsibility that is shared across multiple stakeholders within the Australian road transport system (Salmon et al., 2022).

Acknowledgement

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Bridge Crash Risk Screening

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Abstract

The risk of a serious or fatal crash is significantly greater at or near a bridge than on a typical road section. However, there has not been a standardised process to quantify the crash risk at structures on New Zealand roads. To achieve the safe system goal of a road system free of serious injuries and death, we must fully understand the factors that influence crash likelihood and severity. Through crash data analysis, reviews of past studies, and discussions with industry experts, WSP and Waka Kotahi have developed assessment criteria and an innovative methodology for screening networks of bridges. This standardised methodology identified hazardous structures on State Highway and local authority networks to prioritise safety improvements. Regional reviews with Structures Management Consultants determined that the tool provides accurate assessments of bridge crash risk and enables targeted spending to save lives and transform existing road safety approaches.

Background

The crash risk for vehicles is significantly greater at or near a bridge or large culvert than on a typical section of road. A review of the Crash Analysis System (CAS) data over the past decade indicated that 11% of fatalities and 12% of serious injuries occur on or close (with 100m on approaches) to a State Highway structure, equating to an annual crash-related social cost of $350 million on the State Highway network.

Purpose of Project

Waka Kotahi engaged WSP to develop and implement a screening framework to analyse 4700 bridges and major culverts on the State Highway network to quantify and address the disproportionate crash risk. This research involved determining the risk factors that influence crash likelihood and consequence and screening bridge networks to identify high-risk sites. By targeting cost-effective treatments to reduce the crash risk, this research enables the prioritisation of funds to reduce deaths and serious injuries (DSIs) at bridges. Additionally, the standardised methodology helps authorities assess the crash risk on their networks to transform structure management approaches and assist with funding applications.

Description of Project

The screening process outlined in Figure 1 commenced with a review of research papers, standards, and previous regional screenings to identify potential bridge crash risk factors. Trend analysis quantified the correlation between risk factors and DSI rates using crash and bridge databases. Weightings and scores were formulated for each crash risk factor. External reviews of outputs and processes by road safety experts, bridge experts and Structures Management Consultants iteratively improved the screening template. The template subsequently screened the State Highway bridge network and shortlisted high-risk structures that underwent further review.

The template has also been adopted and implemented across five local authority networks. These screenings proposed site improvements to decrease the crash risk at structures and assess cost-effectiveness. Works prioritisation helps councils apply targeted spending to save lives on road networks.

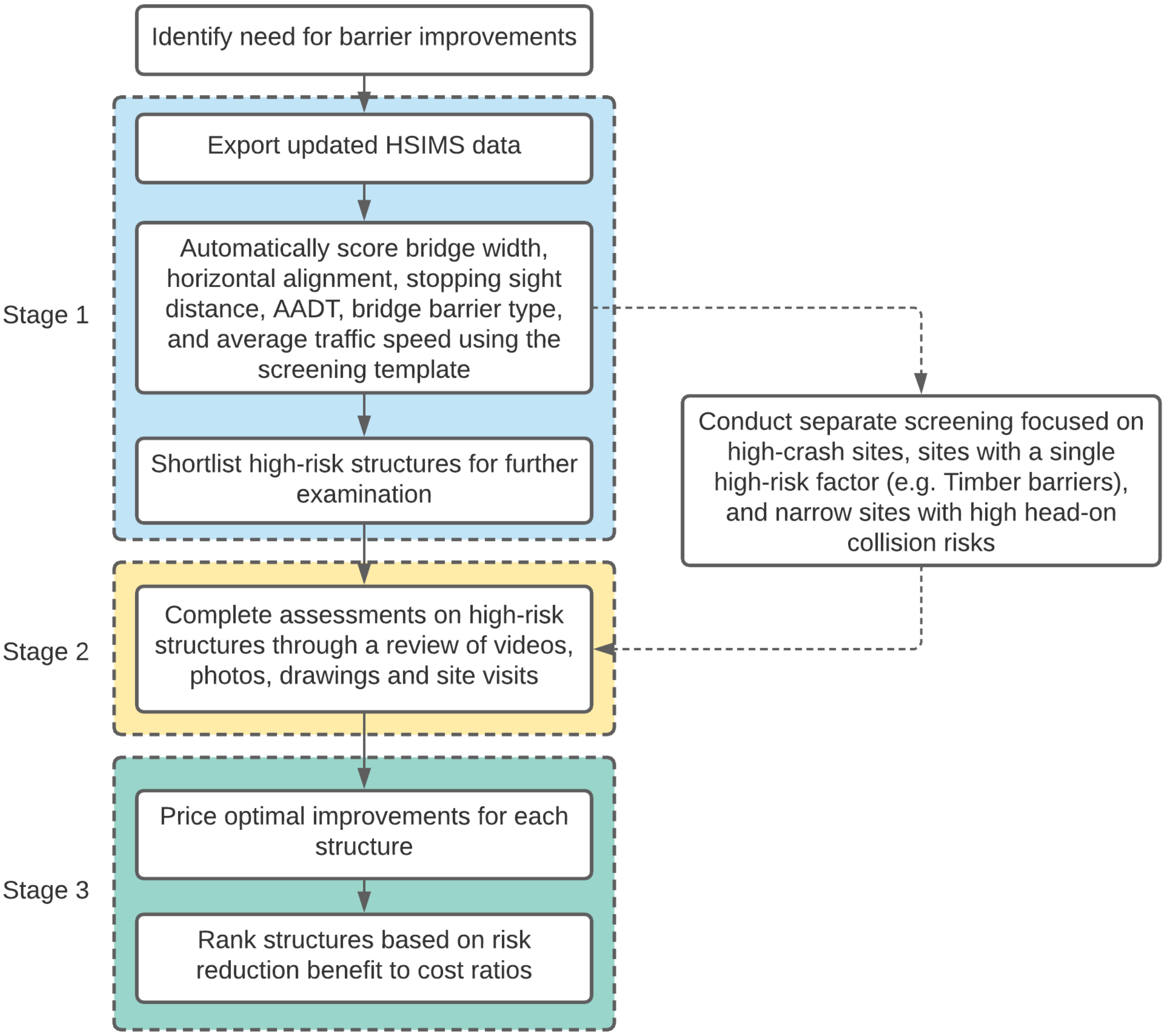

Figure 1. Bridge Crash Risk Screening Process

Evaluation and Effectiveness

The screening identified and scored multiple factors that significantly influence crash risk at sites, including structure width, road alignment and visibility, traffic volumes, barrier quality, vehicle speeds and surrounding hazards. The research determined that 16.5% of State Highway bridges pose a high crash risk to vehicles and a further 0.3% posed a critical risk. $40 million of targeted investment would significantly improve high-risk structures, saving an estimated 4.8 deaths and serious injuries annually.

Conclusions and Recommendations

After completing the screening, a scoring spreadsheet was distributed to the directors of previous studies, who determined that the new template provided an improved assessment of bridge crash risk. Consequently, the screening template is recommended to be adopted for network screenings to evaluate crash risk, prioritise funding requests and improve road user safety at bridges and large culverts. This research will reduce the crash risk at road structures and advance the vision of a safe road system free of serious injury or death.

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Speed Change & Community Sentiment

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Abstract

Speed limit changes are often complex and contentious among stakeholders; yet Safe Speeds are a key component of the Safe System and a critical lever to achieve a harm-free road transport system. Community perception is often cited as a key factor impeding changes, however, gaining an accurate picture of community views is difficult with traditional engagement-led approaches. Under these approaches, communities are invited to provide feedback on proposed changes, potentially leading to a biased sample and, therefore, results. This paper expands on an approach used to support the Mornington Peninsula Shire Council's Safer Speed Trial of reductions in speed limits on 33 high speed roads. For the first time in Victoria, a representative sample of over 1,000 residents of the trial area were approached to understand their perceptions and views of the trial. This reduced survey bias, and provided unique and enlightening results that can guide future speed changes.

Background

Mornington Peninsula Shire Council (MPSC) commenced a two-year trial of Safer Speeds in December 2019 following unprecedented road trauma experienced on its road network. The trial involved 33 high speed, low-medium volume sealed council roads set at 100 km/h or 90 km/h, and reduced to 80 km/h. The Department of Transport, as speed policy owners, evaluated the trial to understand:

- How the changes influenced driving and road trauma data including traffic volumes, travel speed and trauma statistics
- Community sentiment towards the speed zone changes

This paper outlines the approach and findings in relation to the community sentiment research.

Purpose

When undertaking speed limit changes, often community views are only sought in a way that community members must be proactive and motivated to provide input, potentially leading to biased responses that often don't reflect the broader community views. Traditionally, more engagement-based approaches are used which targets affected residents, or invites people to provide feedback on proposals via open-survey links.

The MPSC evaluation provided an opportunity to seek a broader and representative cross-section of views from residents to increase our understanding of community perceptions to speed limit changes.

Method

The evaluation approach used a represtantive sampling approach of MPSC residents. A total of 6,126 residents of MPSC residents were selected at random to participate in the survey, leading to 1,059 surveys being completed online or via telephone, and a response rate of 17%. This approach increased the representativeness of results compared with community engagement techniques or responses on social media.

The research objectives of the survey were to:

- Measure awareness of and familiarity with the Safer Speeds Trial
- Determine the level of understanding of which roads are affected by the trial
- Understand attitudes towards the trial
- Understand attitudes towards speed and speed limits
- Record reasons for support for and opposition to the trial
- Understand the perception of the level of road trauma on the Mornington Peninsula
- Identify the impact of the trial
- Capture opinions about the future of the trial.

Key Findings

By undertaking a more representative sample of the community, it was found that there was wider support for speed limit changes than initially perceived, specifically:

1. Residents were nearly three times as likely to support the reduction of the speed limits (59%) than they were to oppose them (22%), while 20% took a neutral stance.

2. Among the 59% supporting the trial, reasons for supporting the trial include that it is 'safer due to less accidents' (31%), that 'safer roads/slower speeds are safer' (27%) and that it is 'safer due to poor road condition/design' (18%).

Conclusion

This approach to understanding community sentiment for the MPSC Safer Speeds trial showed that traditional methods of understanding sentiment on speed limit changes are driving a perception that the community is more opposed to changes than was found. The findings also showed that those who understand the relationship between speed and safety are more likely to support changes, meaning further work on educating the community on this relationship will be crucial.

Acknowledgements

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Transforming the NSW Road Network through Vision Zero Modelling

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Abstract

NSW has an aspirational road safety target of zero fatalities and serious injuries on its road network by 2056. To understand the implications of this target, a Vision Zero backcasting methodology was employed to define a Safe System future state for every corridor and intersection across the entire State and Regional road network. Sophisticated safety modelling showed that implementation of a complete Safe System future state under the Safe Roads and Safe Speeds pillars could prevent around 1,600 (42%) deaths and serious injuries per annum. Several shorter term strategic programs of interventions were developed to show what could be achieved within specified budgets through to 2030. The scenarios applied the latest techniques in road safety infrastructure program development using combinations of top-down and bottom-up approaches. The scenarios showed that 30 - 40% of the full benefits could be achieved for 10% of the total implementation cost.

Introduction

Achieving an aspirational target in any aspect of life requires a set of well-considered and evidence-based steps to be implemented to move from the current position to desire future state. Road safety targets are no different. This project employs a Vision Zero (backcasting) methodology to model the gap between the current state and the desire future state, and supplements this long-term view with the development of a program of interventions to be delivered through to 2030. The project is fully aligned with the conference theme in that it defines what the network needs to look like tomorrow and identifies a series of steps that need to be implemented today to start on that journey.

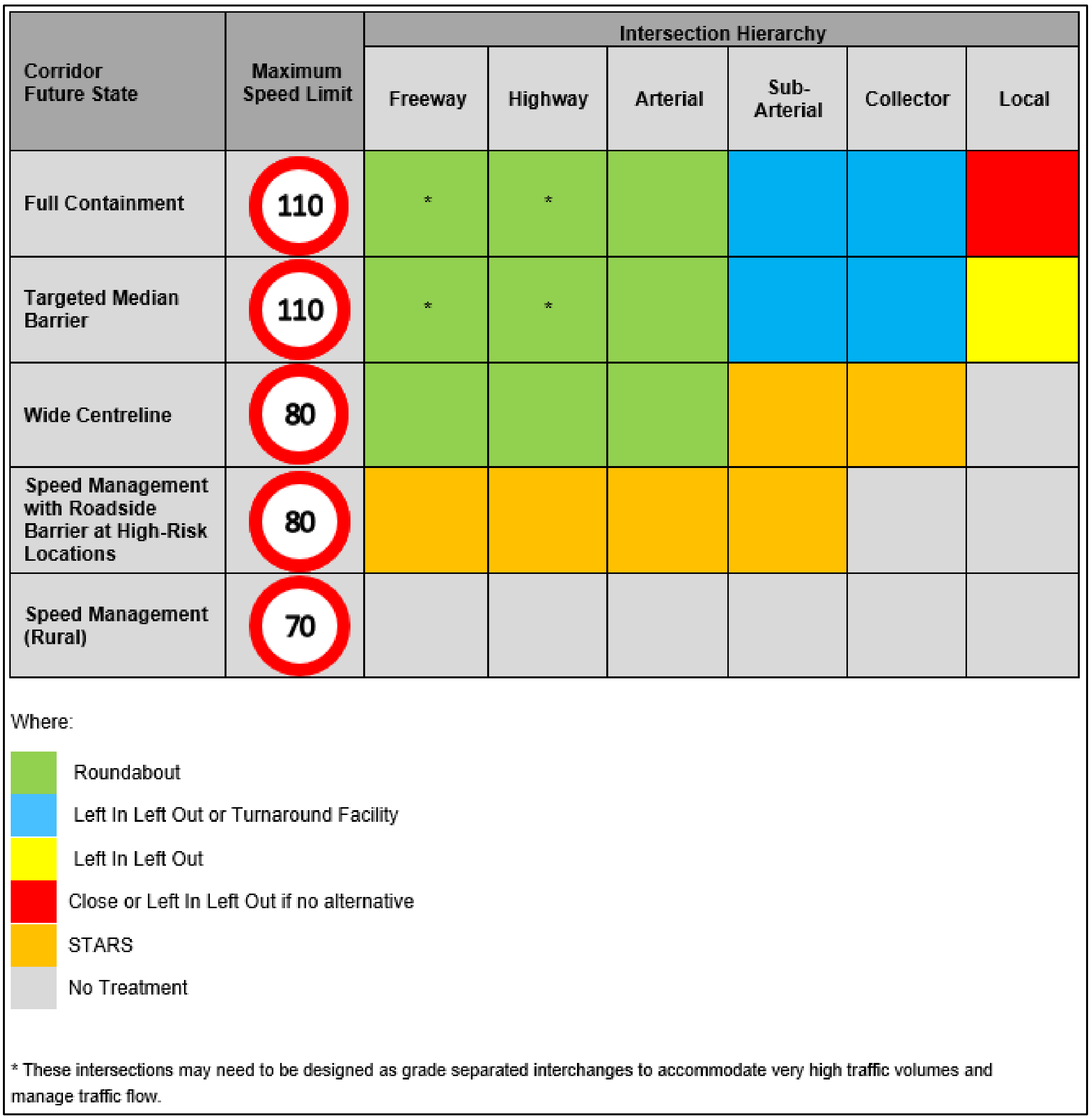
Current and Future State Analysis

The Vision Zero modelling was undertaken in a geospatial environment with Feature Manipulation Engine (FME) being used to bring together and attach a series of attributes necessary for network wide analysis to a road centreline. Crash data and road attributes were used to calculate a baseline level of safety performance for every part of the network by transforming all injury crash data into estimated fatal and serious injury (FSI) equivalents using severity indices and combining this with proactive risk modelling to estimate FSI outcomes.

Every corridor segment and intersection was assigned a future state based on key road attribute criteria. For corridors, the criteria centred on functional road classification, cross-section and traffic volume. The corridor future state and the then functional classification of the intersecting road were used to assign the intersection future state, as shown in Figure 1.

Gap and Benefit Analysis

The gap between the current state and the future state was measured and the degree of alignment classified into four bands ranging from full alignment to large misalignment. The benefits associated with bridging the gap were modelled using a combination of crash reduction factors and predictive modelling derived from changes in the risk rating score. Both methods were supplemented with a modified form of Nilsson’s Power Model to quantify the benefits associated with changes in speed limits.



Corridor Future State	Maximum Speed Limit	Intersection Hierarchy					
		Freeway	Highway	Arterial	Sub-Arterial	Collector	Local
Full Containment	110	🟩 *	🟩 *	🟩	🟦	🟦	🟥
Targeted Median Barrier	110	🟩 *	🟩 *	🟩	🟦	🟦	🟨
Wide Centreline	80	🟩	🟩	🟩	🟧	🟧	⬜
Speed Management with Roadside Barrier at High-Risk Locations	80	🟧	🟧	🟧	🟧	⬜	⬜
Speed Management (Rural)	70	⬜	⬜	⬜	⬜	⬜	⬜

Where:

🟩 Roundabout
🟦 Left In Left Out or Turnaround Facility
🟨 Left In Left Out
🟥 Close or Left In Left Out if no alternative
🟧 STARS
⬜ No Treatment

* These intersections may need to be designed as grade separated interchanges to accommodate very high traffic volumes and manage traffic flow.

Figure 1. Future State Assignment Criteria for Rural Intersections

Results and Outcomes

Full implementation of the future state was modelled to reduce FSIs by around 42% and save around 1,600 DSi per annum across the NSW road network. Strategic programs of interventions that could be delivered within nominated budgets in a shorter time horizon through to 2030 were then developed. Different scenarios were modelled using a combination of top-down and bottom-up prioritisation techniques. The scenarios showed that a combined top-down and bottom-up approach would be most beneficial in striking the right balance between transforming the network to the future state most rapidly and delivering the most cost-effective solutions. The three scenarios modelled indicated that between 490 and 680 FSI could be saved per annum from implementing the strategic program of interventions.

The analysis and findings of this project are now being used by the Centre for Road Safety as a critical evidence for the final NSW Safer Roads Program business case.

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Improving Rural School Bus Safety

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Abstract

Over the last 5 years there have been 84 reported crashes related to rural school bus service in New Zealand. Yet little recent research has been undertaken on this activity on our high speed rural road network. New Zealand has significantly improved the safety of workers on our rural network through improved traffic management practices but provides little more than a small yellow school sign on the rear of a bus to protect our most vulnerable children in this same environment. This paper will cover recent research into school bus safety using a safe system approach and detail safety improvement options. With the rapid raise in peri-urban housing in New Zealand this safety issue needs addressing. This research supports the conference theme of 'Changing Today for Tomorrow' and will not accept the common response that this issue is too hard to solve.

Background,

Waka Kotahi Upper South Region are investigating how to improve the safety of rural school bus stops on SH60, a high-risk crash corridor in Tasman District. This study is reviewing previous research is looking to apply a safe system approach to this safety risk. Currently in New Zealand motorist must pass a school bus displaying a school sign at 20km/hr. Refer Figure 1 below.

Figure 1. Rural Bus SH60 Tasman District Council

Compliance with this 80km/hr speed reduction on our rural State highway network is mixed and the passengers, once alighted from the bus are faced with crossing a high=speed road unprotected.

Purpose of Project

To develop appropriate interventions to reduce the rural school bus risk using a safe system approach, modern technology and international best practice. This project is a partnership with our Local Authority Tasman District Council, Waka Kotahi, Ministry of Education, NZ Police and local bus providers.

Description of Project

Our project has three distinct stages:

- We are currently collected data and researching international best practice
- The next stage is to workshop the current safety of the system of operation selection using a safe system approach. This will be informed by monitoring field data of driver behavior at current sites.
- We will then implement a trial of improvements and evaluate with field data the effectiveness of the improvements. This is expected to be completed and presented by September 2022.

Risk

The safety risk of vulnerable children catching buses on high speed rural roads is high.

Over the last 5 years in New Zealand a total 28 pedestrian crashes were identified in New Zealand involving children being struck by a passing vehicle before or after using the school bus. Of these 28 crashes, two were non-injury, 18 minor-injury, seven serious and one was fatal

There were also 56 separate crashes identified in New Zealand involving a school bus on open road. Of these 56 crashes, 26 were non-injury, 20 were minor-injury, eight were serious and four were fatal.

Next Steps

At the time of writing this Abstract we have only just started the field data collection phase and international best practice research. Our aim is present our field data, recommended improvements and the results of our field trials at the September 2022 conference. We have $200,000 budget to trial and implement improvements.

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AGRD03-16-Ed3.4 | Austroads

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Speeding Varies as a Function of Exposure to the Behaviour

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Abstract

Speeding remains a major road safety issue, despite widespread efforts to combat the behaviour. An emerging body of research suggests that repeated exposure to speeding (e.g., via one's peers or social and mass media platforms) can increase the likelihood of someone speeding themselves. However, the extent to which motorists believe that they are exposed to speeding across these sources, and whether this differs between speeders and non-speeders is yet to be investigated. This exploratory study examined: (a) perceptions regarding how often a sample of Queensland motorists (*n* = 628) were exposed to speeding behaviour via social media, mass media and their peers, and (b) whether their self-reported speeding behaviours varied as a function of exposure to this content. The findings revealed that participants believed they were exposed to speeding behaviour at least one-third of the time via these mediums, with exposure levels being significantly higher in speeders compared to non-speeders.

Background, Method, Results and Conclusions (*please use these proposed section headers*).

This manuscript was accepted for publication in *Traffic Injury Prevention* on the 2nd of March, 2022. Stefanidis, K.B., Truelove, V., Nicolls, M., & Freeman, J. (accepted March 2022). Perceptions matter: Speeding behavior varies as a function of increasing perceived exposure to content encouraging the behaviour. *Traffic Injury Prevention. Doi:TBC.*

Background

Speeding is a high-risk behaviour that accounts for a significant number of crashes and fatalities across the globe. Prior research indicates that a relationship exists between exposure to speeding behaviour (via one's peers or mass media) and subsequent engagement in the behaviour. However, no study to date has quantified the perceived extent to which individuals are exposed to such content. Further, the impact of social media content on speeding behaviour, relative to peer engagement and mass media sources, has not been investigated. Accordingly, this exploratory study aimed to: (a) quantify the self-reported extent to which the sample believe they were exposed to content encouraging speeding on social media, mass media and peer engagement in the behaviour, and (b) examine whether speeding behaviour varied as a function of increasing exposure to the behaviour via these mediums.

Methods/Results

A total of 628 Queensland motorists with a Facebook account were included in this study. Participation involved completing an online survey of 20-25 minutes duration. Consistent with previous research, half of the sample reported speeding more than 10% of the time they drive (n = 315). On average, participants believed they were exposed to content encouraging speeding behaviour 40% of the time via mass media (e.g., television, movies or gaming) and 29% of the time on social media. In addition, they perceived their friends to exceed the speed limit 39% of the time. Finally, self-reported speeding behaviour varied as a function of exposure, such that exposure levels were significantly higher in speeders than non-speeders.

Conclusions

The findings from this study suggest that perceptions concerning the frequency with which individuals are exposed to material encouraging speeding via mass media or social media, and their perceptions regarding their peers' engagement in the behaviour, all correspond with engagement in speeding behaviour. Future research is needed to disentangle the relative impact of such mediums on speeding behaviour, and the levels of exposure required to induce behaviour change on the road.

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Rider and Non-rider Knowledge of E-scooter Rules in Brisbane

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Abstract

The Queensland Government introduced rules governing the use of shared and private e-scooters and other rideables in late 2018 but there has been public concern about compliance levels and observational evidence of low rates of helmet use by riders of shared e-scooters. This paper analyses online survey responses by 329 "riders" (who reported riding at least once per month in the last year) and 157 "non-riders" (who reported never having ridden an e-scooter) to measure knowledge of the rules by both groups. Riders and non-riders differed in their knowledge of rules regarding speeds and locations for riding e-scooters. Knowledge was high for rules related to mobile device use and drink riding. Despite low observed helmet wearing rates, knowledge of this rule was high.

Background

In Queensland, e-scooter riders must be at least 12 years (supervised if <16 years), wear a securely fitted bicycle helmet, show front and rear lights and rear reflector when travelling at night or in hazardous conditions, and not: carry passengers, use a mobile device, or drink and ride (Queensland Government, 2022). Riding over 25 km/h, on roads with speed limits >50 km/h, centre line or median strip, or 1-way road with >1 marked lane is prohibited. Giving way to pedestrians on footpaths and shared paths, and bicycles on bike paths, is required. Observational studies in central Brisbane (Haworth, Schramm & Twisk, 2021a, b) reported that about one-third of shared e-scooter riders were not wearing helmets.

Method

An online survey of e-scooter riders and non-riders in Brisbane was conducted from 5 July to 21 September 2020. COVID-19 restrictions probably reduced e-scooter use. Participants were recruited by paid Facebook advertisements and could win one of five $100 gift cards. This paper compares "riders" (who reported riding at least once per month in the last year) with "non-riders" (who reported never having ridden an e-scooter).

Results

Table 1 shows that non-riders were more likely to respond that the on-road speed limit was lower than 25 km/h and riders were more likely to respond that they are not allowed to ride on the road (largely true). Non-riders were more likely to respond that riding on the footpath is banned or limited to 10 km/h. Riders were somewhat more likely to know of the requirement for lights. Riders and non-riders gave similar responses regarding the remaining rules.

Conclusions

Riders and non-riders differ in their knowledge of rules regarding speeds and locations for riding e-scooters. Knowledge is high for rules related to mobile device use and drink riding. Low helmet wearing rates do not appear to be the result of low levels of knowledge.

Table 1. Responses to e-scooter rules questions by riders and non-riders (%). Correct responses italicised.

	Riders (n=329)	**Non-riders (n=157)**
On-road speed limit is..		
10 km/h	3.0	21.9
15 km/h	0.0	13.2
18 km/h	2.4	0
20 km/h	5.2	11.9
25 km/h	*45.3*	*29.1*
There is no speed limit for e-scooters on the road	1.8	23.8
Not allowed to ride on the road	42.2	0.0
Riding on the footpath is allowed..		
in any situation	19.7	22.9
when the road is congested with traffic	0.6	1.3
when there are no pedestrians	1.8	1.3
at no more than 10 km/h	17.8	22.3
it is always forbidden	0.6	5.1
unless there is a sign forbidding it	*59.4*	*47.1*
Riding on a bike path is..		
mandatory	8.8	9.0
allowed	*76.3*	*78.8*
forbidden	14.9	12.2
Riding with BAC>.05 is		
forbidden	*94.1*	*88.3*
allowed	5.9	11.7
Using hand-held phone is		
forbidden	*96.9*	*96.8*
allowed	3.1	3.2
Wearing a helmet is		
mandatory for any user	*96.4*	*96.8*
mandatory for children less than 12	2.4	1.3
not mandatory	1.2	1.9
Use of front and rear lights in low light conditions is		
mandatory	*77.2*	*82.6*
not mandatory	22.8	17.4

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Profiling head-on crashes using mass data and in-depth crash investigations

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Abstract

The aim of this paper was to provide a profile of head-on crashes in South Australia. Two complementary data sources were used: mass data, and data from in-depth crash investigations. The mass data showed head-on crashes are different to other crashes, in their severity, the characteristics of the locations where they occur, and the types of vehicles they involve. The in-depth crash investigations revealed that there were two distinct modes of head-on crashes; drift off path, and loss of control. Most involved a frontal impact, but some involved side impacts, or a side swipe. The majority of frontal impacts had a low overlap. The main contributing factors were a medical condition, fatigue, drugs, and speed. To prevent head-on crashes, uptake of lane keep assist could be encouraged, and wide medians or centre barriers installed wherever possible. The introduction of low overlap crash tests should be considered.

Background

Recent research has shown that head-on crashes are one of the most severe crash types (Doecke, Baldock, Kloeden & Dutschke, 2020; Fitzharris *et al.* 2020). The aim of this paper was to provide a profile of head-on crashes in South Australia.

Method

Head-on crashes were profiled using two complementary data sources: data from the South Australian Traffic Accident Reporting System (TARS), and the Centre for Autmotive Safety Research's (CASR) at-scene in-depth crash investigations. TARS data for head-on crashes from 2013 to 2018 was analysed and compared to all other crashes in TARS. Head-on crashes were identified in TARS using the Definition for Coding Accidents (DCA). Head-on crashes investigated as part of the current series of CASR's at-scene in-depth crash investigations that began in October 2014 were examined to provide further insight. For detail on the methodology of these investigations see Doecke, Thompson & Stokes (2020).

Results

There were 1,584 head-on crashes in South Australia between 2013 and 2018. Table 1 shows a selection of the characteristics of the head on crashes in South Australia based on TARS. Head-on crashes are much more likely to result in serious (admitted) and fatal injuries. They are more common in high speed zones, rural areas, on a curve, when the road is not level, on unsealed roads, and when the road is wet, than other crashes. They are also more likely to involve a motorcycle or a truck than other crashes.

The TARS data also showed that of the head-on crashes, only 5% involved an overtaking maneuver.

Table 1. Selected characteristics of South Australian head-on crashes.

		Head-on crashes		Other crashes		Ratio
		Number	Percentage	Number	Percentage	
Injury severity	Non-injury	757	47.8%	59102	65.5%	0.73
	Doctor	65	4.1%	8603	9.5%	0.43
	Hospital treated	476	30.1%	18842	20.9%	1.44
	Hospital admitted	198	12.5%	3311	3.7%	3.41
	Fatal	88	5.6%	438	0.5%	11.45
Speed	<50	17	1.1%	1707	1.9%	0.57
	50	346	21.8%	24247	26.9%	0.81
	60	407	25.7%	43188	47.8%	0.54
	70-90	404	25.5%	12137	13.4%	1.90
	100	246	15.5%	5233	5.8%	2.68
	110	164	10.4%	3784	4.2%	2.47
Area	Metropolitan	889	56.1%	73098	81.0%	0.69
	Rural	695	43.9%	17193	19.0%	2.30
Horizontal alignment	Straight	801	50.6%	79635	88.2%	0.57
	Curve	782	49.4%	10586	11.7%	4.21
Vertical alignment	Bottom of hill	42	2.7%	1095	1.2%	2.19
	Crest of hill	97	6.1%	1448	1.6%	3.82
	Level	981	61.9%	77812	86.2%	0.72
	Slope	458	28.9%	9714	10.8%	2.69
Surface	Sealed	1474	93.1%	87868	97.3%	0.96
	Unsealed	110	6.9%	2421	2.7%	2.59
Road moisture	Dry	1290	81.4%	78263	86.7%	0.94
	Wet	290	18.3%	11860	13.1%	1.39
Lighting	Daylight	1262	79.7%	69678	77.2%	1.03
	Night	322	20.3%	20618	22.8%	0.89
Motorcycle involved	Yes	153	9.7%	4702	5.2%	1.85
	No	1431	90.3%	85594	94.8%	0.95
Truck involved	Yes	200	12.6%	5959	6.6%	1.91
	No	1384	87.4%	84337	93.4%	0.94
Total		**1584**	**100.0%**	**90296**	**100.0%**	**1.00**

Note: some categories may not add up to the total due to a small number of unknowns

There were 26 head-on crashes investigated by CASR since 2014. These revealed that there were two distinct modes of head-on crashes, drift off path (15), and loss of control (11). When considering the impact configuration for head-on crashes that did not involve a motorcycle, most were a frontal impact (15), but some involved side impacts (4), or a side swipe (3). Of the frontal impacts, the majority involved an overlap of less than 25%. The in-depth crash investigations also revealed occupants of vehicles involved in a head-on crash can be seriously injured even if they are in a 5-star vehicle. Figure 1 shows an example of a 5-star vehicle involved in a low overlap head-on crash that resulted in serious injuries (MAIS 4, ISS 21).

In-depth crash investigations revealed that the main contributing factors were a medical condition, fatigue, drugs, and speed. The top interventions for mitigation were; centre barriers, speed limit reductions, and wide centre medians. For prevention, the top interventions were lane keep assist, wide centre medians and ESC.

Figure 1. Damage suffered in a low overlap head-on crash on a high-speed road.

Conclusions

Head-on crashes in South Australia are different to other crashes, most notably in their severity, but also in the characteristics of the locations where they occur and the types of vehicles they involve. To prevent head-on crashes, uptake of lane keep assist could be encouraged, and wide medians or centre barriers installed wherever possible. The introduction of low overlap crash tests should be considered.

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Pathway to Zero by 2050 – Wide Median Intersection Treatments

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Abstract

In 2004, Victoria adopted the Safe System approach. Victoria's Road Safety Strategy 2021 – 2030 continues the State's commitment to the Safe System to achieve zero road deaths by 2050. Wide Median Treatments (WMTs) were first used in Victoria during the 1980s as a means of controlling side-road traffic movements at intersections with high-speed, divided rural roads. Understandably, WMTs were not originally designed to align with the principles of the Safe System. To eliminate the risks of severe injuries and deaths at WMTs, the Victorian Department of Transport (DoT) has recently implemented a policy prohibiting new WMTs and seeking to transform existing WMTs with Safe System-aligned designs, using kinetic energy management as the principal design philosophy. This new policy, which aims to transform at-grade intersections on divided rural network, illustrates the concept of ultimate Safe System end-states that help to define the pathways to Zero by 2050 – changing Today for Tomorrow.

Background

While having the general appearance of a roundabout, WMTs are more commonly controlled by give way signs, applicable to traffic on the side roads and to major road traffic undertaking right-hand or U-turns. In recent times, the real-world safety performance of WMTs has increasingly come to public attention (Brooks, 2021), yet there does not appear to have been any comprehensive studies or evaluations of this design in recent times. DoT gathered an inventory of its WMTs on rural high speed duplicated highways and developed Safe System solutions with a transformative approach, supported by policy.

Safe System Principle

The Safe System principle is to adequately manage energy such that no one is seriously injured or killed at a high-speed duplicated highway intersection when a road user makes a routine performance mistake. The principle is measured in terms of the likelihood of serious injury/death when measured by kinetic energy (analysis).

Image 1 - An example of a Wide Median Intersection Treatment

WMTs do not accord with Safe System design principles – the geometric layout and high speed limits combine to permit extreme impacts when a driver makes an error in choosing a safe gap

Crash history analysis

Approximately 220 WMTs exist on Victoria's rural network, with 92 fatal and serious injuries recorded between 2014 and 2018. Since the inception of WMTs in the 1980s, traffic volumes have significantly increased and, by the mid-1990s, their safety performance started to come to notice. Figure 1 shows the ratio of fatalities to serious injuries (F:SI) for a number of intersection design types and indicates, relative to other design forms, a high chance of severe injuries when a crash occurs. The F:SI ratio per intersection in each design category indicates the average spatial concentration of trauma and generally indicate more efficiencies to treat.

Purpose of Policy

In response to the analysis, Road Safety Victoria introduced a new organizational policy to ensure this issue is considered early in project initiation. The purpose of the policy is to ensure that new projects are as closely aligned to the Safe System as possible, and leave a minimal legacy of fatal and serious injuries. The new policy requires that:

- The construction of new WMTs is disallowed on the duplicated rural road network
- In place of WMTs, Safe System aligned alternatives are to be installed

The Policy will be applied to any planning projects including the review of rural duplicated roads and intersections or corridor planning to ensure future infrastructure aligns with this policy.

Next Steps

A hierarchy of alternative treatments to suit differing network attributes has been developed. The hierarchy considers a range of factors, including demographics, traffic growth, cost and movement to define alternative design forms to WMTs (Figure 2). Innovative designs are being developed to provide practical, Safe System-aligned alternatives, based on the safe management of kinetic energy.

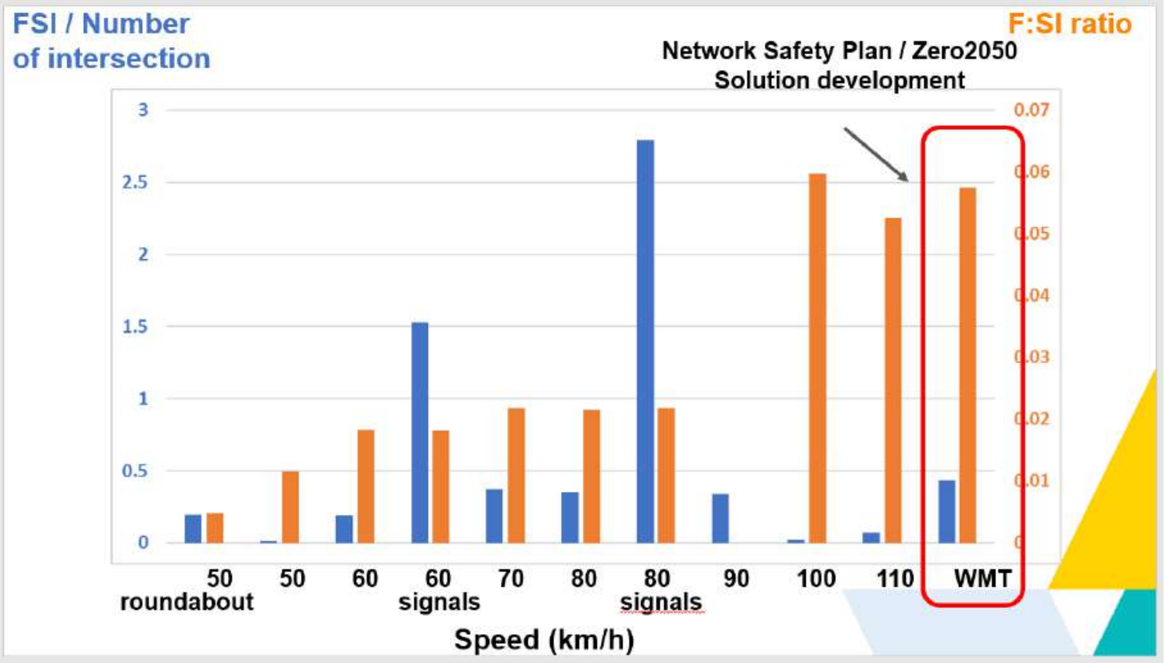

Figure 1 – trauma information.

The ultimate aim is to prevent death or serious injury when human error inevitably occurs.

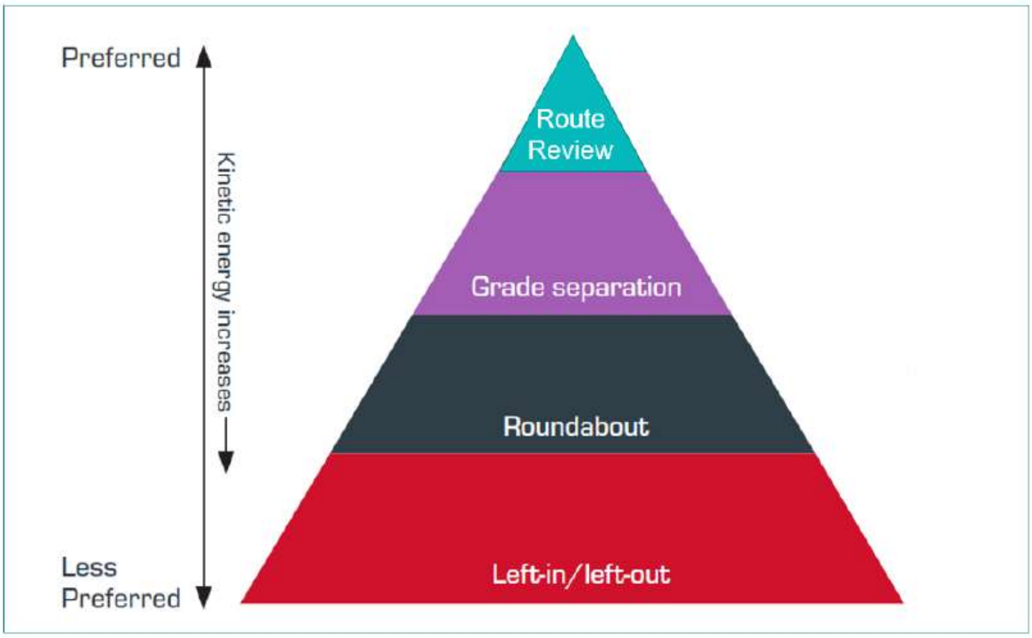

Figure 2 – Typical hierarchy of WMT alternatives

Acknowledgements

Zita Ultmann, Amir Sobhani, Carly Hunter, Nicole Denton, Carl Muller

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Changing the Drink-Driving Culture: Evaluating the OFTR group intervention

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Abstract

Impaired (Drink/Drug) driving remains a serious problem in New Zealand (NZ). In 2019 alcohol/drugs were a factor in 37% of road deaths (NZTA, 2021), with 47% being repeat offenders (Waters, 2013). Preventing recidivists from re-offending is likely to have the greatest impact on alcohol-related crashes (Roadsafe Auckland, 2001). One for the Road (OFTR) is a New Zealand (NZ) based group therapy intervention for repeat drink/drug drivers. Since 2008 this programme has been developed to achieve a best practice approach unique to NZ. Recently an online component has been developed to assist access. Attendees through the justice or licensing system. A rigorous matched control group evaluation (Waters, 2019) supported programme effectiveness with a 20.2% reduction in reoffending over 3 years, providing validation and an opportunity for and programme development. This presentation offers an overview of the OFTR group content and process, highlighting learnings regarding best practice in Drink Driver Rehabilitation.

Changing the Drink Driving 'Culture': One for the Road Development

Attitudes are based on subgroups and family systems, which serve to integrate individuals into existing structures of beliefs, practices, values and codes of behaviour (Sue & Sue, 2012). In working with repeat drink drivers (an average of 4 convictions), OFTR has sought to create, within a New Zealand context, a culturally appropriate, 'non impaired driving' peer group to promote societal change. This group has evolved from an initial 10 hour workshop style programme, to a 22 hour 8 week programme, while retaining the therapeutic focus addressing change in attitudes and behaviour. Since 2020 there has been the development of an innovative online component to the group via the medium of zoom. This has presented challenges but also some positive outcomes in developing new features of the group in establishing cohesion, therapeutic presence, and therapeutic alliance online. Research does indicate that online group psychotherapy interventions can be effective (Weinberg, 2020).

Best practice in Drink Drivers Rehabilitation Programmes

OFTR has sought to incorporate the 'best practice' themes for successful DDR programmes as identified by Waters (2012), Fergusson et al (1999), Terer and Brown (2014), and Austroads (2020) which include: targeting high risk offenders, initial assessment and screening, ocating interventions in the community, focus on cognitions and behaviours, take into account learning styles, and utilizing interactive techniques, focus on relapse prevention, delivering programmes with appropriately qualified leaders, promoting supportive relationships within offender's whanau (family) and friends., incorporating a culturally appropriate approach, and conducting evaluations that involve multiple measures.

The independent 'matched control group' outcome evaluation of *OFTR* by RIDNZ

Rather than just focusing on 're-offending rates' of graduates, or involvement in subsequent drink driving related crashes (Waters, 2019; Freeman et al, 2005), the *OFTR* group was subjected to a matched control group. The outcome comparison featured the use of logistic regression analysis to predict probability of re-offending by comparing *OFTR* graduates with a 'control group' of convicted drink drivers who did not attend *OFTR*. This control group was closely matched on variables such as age, gender, type of offence, and offending history. (Repeat Impaired Drivers New Zealand- Waters, 2019)

Evaluation Findings

- 'The *OFTR* (20hr) programme appears to be an effective intervention for repeat and high level first time detected drink drivers', with a 20 per cent less likely to reoffend over the 3-year period when compared with the control group. This reduction in re-offending and relatively low re-conviction rate is promising, given the often 'pre-contemplative' attitude of the typical group member, and the fact that the programme has, as often as not, existed as a 'stand alone' intervention not mandated by the Justice System.
- It is likely that the programme is cost-effective given the outcome results and relatively low cost of the programme compared to custodial sentencing.
- The majority of the detected *OFTR* reoffenders showed some level of alcohol dependency at the time of completion, indicating the need to address alcohol use behaviours and addiction within an intervention programme of this nature.

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Tasmania's New Graduated Licensing System: Introduction & Preliminary Findings

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Abstract

Graduated licensing systems (GLS) for new car drivers are known to be effective in reducing the high crash rate experienced by young novice drivers. Tasmania introduced a revised GLS in December 2020 with the aim to further decrease novice driver road crashes and related trauma. This presentation details the key changes and preliminary survey results from young people of eligible licence age (N=510) and parents (N=120) across Tasmania regarding their perceptions of the changes following their announcement but prior to full implementation. Most changes were well received, notwithstanding concerns that some young people would struggle to achieve the increased learner logbook hours requirement. Additional surveys are being conducted at 12 months following the changes to particularly capture the first year of the new learner stage and at 24 months for the first year of the new provisional stage, with longer term evaluations planned.

Background

Graduated licensing systems (GLS), those that include one or more learner and provisional stage before full licensure, are associated with significant reductions in young novice driver related road crashes and trauma; including in New Zealand (Begg & Stephenson, 2003) and across Australia (e.g., Imberger et al, 2017; Senserrick et al., 2018). In keeping with the conference theme, 'Changing Today for Tomorrow', and stream, 'Implementing Change', this presentation reports on the introduction of a new GLS model in Tasmania and preliminary perceptions from young people and parents leading up to the changes.

Description of Policy

From 1 December 2020, Tasmania introduced several GLS changes, including:

- reducing two learner phases to one,
- an increase in mandated supervised driving practice for learners from 50 hours to 80 hours, including 15 hours of night driving,
- a peer passenger restriction during the first provisional licence (P1) stage – only one passenger (aged 16-21 years) for drivers aged <25 years (with exemptions to passengers that are family members, travelling for education or employment, and for medical or hardship purposes),
- no phone use while driving for learner and P1 drivers,
- increased maximum speed restrictions of 90 km/h for learners and 100 km/h for P1s, and
- introduction of an automated Safe Driver Reward (free 3-year full licence) when P1 and P2 provisional phases are offence-free.

Introduction of a hazard perception test for the P1 licence was also announced, which is due to be in place from March 2022.

Evaluation

To assess pre- and post-introduction perspectives of young people of eligible driving age and parents potentially impacted by the GLS changes, an on-line survey was conducted during November 2020. Recruitment was by a research panel established by Myriad Research. The overarching finding was that the proposed GLS was well accepted with good recognition of likely safety benefits reported by young people (N=510) and parents (N=120). A significant, staged public education campaign was rolled out prior to the commencement of the GLS changes and is believed to have contributed to the largely positive reception the changes received.

Young people perceived barriers to learning including the cost of professional lessons and access to a vehicle and supervisor for as much driving practice as they preferred. Costs of learning and licensing were identified as particularly challenging among participants who spoke a language other than English at home. Night driving practice and increased maximum speeds were welcomed changes, with night driving recognised as safety critical. Parents similarly perceived the cost of professional lessons to be a barrier. Dissimilarly, parents were most supportive of the introduction of phone restrictions and the hazard perception test. Passenger restrictions were identified by both cohorts to be the most confusing of the changes.

Next Steps

Additional surveys were conducted 12 months following the changes to particularly capture the first year of the new learner stage and will be repeated at 24 months to particularly capture the first year of the new P1 stage. A longer-term follow-up is also planned, including analysis of police-recorded crash and offence data.

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Assessing the Safety Impact of Attachments on Motorcycle Helmets

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Abstract

Transport for NSW (TfNSW) commissioned research to assess the safety impacts of aftermarket camera and communications devices attached to motorcycle helmets, after finding that conventional impact (drop) test method specified in UNECE22.05 were not ideal to replicate head and neck injury risk likely to occur in a real world motorcycle crash. Testing was conducted at TfNSW's Crashlab using an oblique impact test, where test helmets hit a moving striker plate, which created a more biofidelic test. The use of an instrumented headform, rather than an external anvil, provided results that better reflected impact injury risk. This method was used to assess and compare injury risk across 220 different scenarios with selected helmets and attachments. The study found that attaching a device to a motorcycle helmet does not typically increase the risk of head or neck injury to the person wearing the helmet in a crash.

Background

Motorcycle riders have been requesting allowance to attach light weight camera and communication devices to their helmets. It has been assumed that mounting a device to a motorcycle helmet compromises its safety performance, as it was not designed and certified for the device.

Devices could only be attached to a helmet if they were tested as an accessory during the type approval procedure.

To better understand the risk associated with helmet attachments, TfNSW commissioned a project to assess:

- Whether the drop test method or the oblique impact test was suitable for measuring potential loads and injury risks.
- The nature and extent of changes in head and neck loads and injury risks resulting from attaching devices to motorcycle helmets.

Method

Initial testing used the drop test method. When tests were videoed and an instrumented headform used, there was no observable correlation between head kinematics and loads on the anvil. It was concluded that this method was not a biofidelic test suitable for assessing injury risk associated with helmet attachments.

Following these tests, testing was conducted on an oblique impact test rig. A helmet is placed on an instrumented Hybrid III head and neck assembly, and then dropped onto a moving anvil. This method better simulates the impact of a rider who has fallen off the motorcycle during a crash.

220 impact tests were conducted using this method, considering:

- four impact sites on the helmet

- six helmet models
- three impact surfaces
- five devices
- three drop heights
- three device fixation methods.

Results

Tests found that attaching a device to a motorcycle helmet does not typically increase biomechanical loads and estimated head or neck injury risk compared to a matched helmet only impact. This is likely a result of the device separating from the helmet upon impact.

When the head injury risk from helmet attachment tests were compared with matched helmet only reference tests, on average there was a 5 percentage point reduction (SD=5%) in the likelihood of serious head injury with an attachment, based on linear head acceleration. There was a 2 percentage point reduction (SD=29%) in the risk of moderate to critical head injury with an attachment based on angular head acceleration, compared with matched helmet only reference tests.

Neck injury risk was assessed in a subset of the tests, with impact tests on helmets with attachments (n=128) compared with matched helmet only reference tests (n=60). The tests showed on average no change or a reduction in magnitude of greatest neck forces and moments in helmet attachment tests when compared with helmet only reference tests. There was a 16% average reduction (SD=21%) in the greatest force applied to the neck, and a 0% change (SD=17%) in the greatest moment applied to the neck.

Conclusion

This study found that when attached appropriately, motorcycle helmet attachments do not pose a substantial hazard to riders. Based on these findings, TfNSW have permitted devices to be attached to helmets, so long as the attachments do not compromise the structure and integrity of the helmet.

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Community Engagement Regarding Graduated Licensing System Revisions: Tasmania's Experience

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Abstract

Tasmania introduced a revised graduated licensing system in December 2020. This presentation details the forward planning and steps taken to engage with the community in the lead up to the changes. A public education campaign was rolled out across social media, radio, and television. Correspondence was sent to affected licensees and other stakeholders and detailed webpages and fact sheets were developed. A dedicated email address was set up for comments and inquiries. While prepared for a large response, only 138 messages were received. Thematic analysis identified that most sought clarifications only, with few perceived as aggressive (n=12). Additional themes focused on communications and perceived contradictions, including financial concerns, accessibility concerns, particularly relating to employment, and perceived safety concerns (n=2). Evaluation of the outcomes of the changes is ongoing. This presentation will share Tasmania's overall positive experience and lessons learned regarding community engagement leading up to major policy changes.

Background

There is a wealth of research demonstrating road crash and trauma reductions following introduction of new and revised graduated licensing systems (GLS), those that include one or more learner and provisional stage before full licensure. This includes in New Zealand, the first jurisdiction to implement GLS (Begg & Stephenson, 2003), and Australia (e.g., Imberger et al, 2017; Senserrick et al., 2018). A key component of achieving successful outcomes from any policy change is community compliance with the new policies.

A revised GLS was announced in Tasmania well in advance of its introduction on 1 December 2020, with several initiatives undertaken to engage with the community to increase acceptance and compliance. This especially include those most likely to be impacted, including young people, parents and driving instructors. This presentation follows the conference theme, 'Changing Today for Tomorrow', and stream, 'Implementing Change', with a focus on lessons learned regarding this community engagement.

Description of Policy

The revisions to Tasmania's GLS included:

- reducing two learner phases to one,
- an increase in mandated supervised driving practice for learners from 50 hours to 80 hours, including 15 hours of night driving,
- a peer passenger restriction during the first provisional licence (P1) stage – only one passenger (aged 16-21 years) for drivers aged <25 years (with exemptions to passengers that are family members, travelling for education or employment, and for medical or hardship purposes),

- no phone use while driving for learner and P1 drivers,
- increased maximum speed restrictions of 90 km/h for learners and 100 km/h for P1s, and
- introduction of an automated Safe Driver Reward (free 3-year full licence) when P1 and P2 provisional phases are offence-free.

Introduction of a hazard perception test for the P1 licence was also announced, which is due to be in place from March 2022.

Engagement Activities and Response

A public education campaign was rolled out across social media, radio, and television in the lead up to the changes. Letters with tailored information were sent to all novice car and heavy vehicle licence holders (impacted) and motorcycle counterparts (not impacted), and emails were sent to driving instructors, key course providers, interpreters and other key stakeholders. These and detailed webpages, including fact sheets and detailed FAQ information, including specific information for learner driver mentor and assistance programs, advised of a dedicated email address for comments and inquiries. While prepared for a large response, only 138 emails were received. Respondents were mostly parents or young drivers. Thematic analysis (Braun & Clarke, 2012) identified only 12 perceived as aggressive. Most sought clarifications and two expressed safety concerns. Figure 1 presents a mind map of the themes that emerged.

Conclusions and Next Steps

Overall, Tasmania experienced positive community engagement during the transition to the revised GLS. Additional research is being undertaken to gauge perceptions of young people, parents and driving instructors in more depth.

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Collisions involving older pedestrians and motor vehicles in South Australia

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Abstract

This study examines collisions between motor vehicles and older pedestrians in South Australia. Police-reported data between 2008 and 2017 were analysed, along with data from the state's major trauma hospital on admissions between January 2008 and November 2010 and June 2014 and August 2017. Fewer older pedestrians (65 and over) were hit by motor vehicles between 2008 and 2017 than pedestrians aged 18 to 64. However, they had higher rates of being seriously or fatally injured and those aged 75 and over had higher rates of being hit per 100,000 population. Older pedestrians were less likely than younger adult pedestrians to have consumed alcohol and be responsible for the crash. They were also more commonly walking on the footpath when hit. The two age groups of seriously injured pedestrians did not differ in injury severity, but older pedestrians were more likely to spend longer than 10 days in hospital.

Background

Walking is beneficial for personal health and wellbeing (Gordon-Larsen et al., 2009; Hamer & Chida, 2008; Netz, Wu, Becker, & Tenebaum, 2005; Oxley, 2009; Wen et al., 2011). However, older pedestrians have an increased risk of serious and fatal injuries if they are struck by a vehicle or fall due to their fragility (Baldock et al., 2016; Oxley, 2009; Uddin & Ahmed, 2018). They may also have an increased risk of being involved in pedestrian crashes due to declines in physical, cognitive, perceptual, and functional abilities necessary for safely negotiating the road environment (Dommes & Cavallo, 2011; Oxley, Ihsen, Fildes, Charlton, & Day, 2005; Tournier, Dommes, & Cavallo, 2016). This study investigated the extent of pedestrian versus motor vehicle crashes in South Australia (SA) for older (65 years and over) and younger adult (18 to 64 years) pedestrians, along with the characteristics of the collisions and the pedestrian injury outcomes.

Method

Police-reported data for crashes in SA between 2008 and 2017 were analysed, along with data from the Royal Adelaide Hospital (RAH) in SA for admissions from crashes for January 2008 to November 2010 and June 2014 to August 2017. Data included crashes in which a pedestrian collided with a road-based motor vehicle. Falls and collisions with bicycles, wheelchairs, trains, or trams were excluded. SA population data were obtained from the Australian Bureau of Statistics. Data were organised by age into 18 to 64 years, 65 to 74, and 75 and over.

Results

Overall crash involvement of pedestrians

Figure 1 presents police-reported data for the total numbers of pedestrians hit by motor vehicles (a), rates of pedestrians hit per 100,000 population (b), and proportions of pedestrians seriously or fatally injured (c). Fewer older pedestrians were hit between 2008 and 2017 than younger adult pedestrians. However, they had higher rates of being seriously or fatally injured and those aged 75 and over had higher rates of being hit per population.

(a)
(b)
(c)

Figure 1. Total pedestrians hit by motor vehicles (a), pedestrians hit per 100,000 population (b) and proportions of pedestrians seriously or fatally injured (c) in SA by age group between 2008 and 2017.

Crash characteristics

Police-reported data showed that older pedestrians were less likely than younger adults to have consumed alcohol (75 and over = 5.2% of known and 65 to 74 = 9.1% of known, compared to 18 to 64 = 37.1% of known) and be responsible for the crash (75 and over = 35.6% and 65 to 74 = 29.7%, compared to 18 to 64 = 48.1%). Table 1 shows that older pedestrians were more commonly walking on the footpath when hit, while younger adults were more commonly on the road. Crashes involving older pedestrians were overrepresented during 6am to 6pm, while crashes involving younger adult pedestrians were overrepresented between 6pm and 6am.

Injury patterns and severity

RAH data showed that seriously injured older pedestrians did not differ from seriously injured younger adult pedestrians in injury severity (Kruskal-Wallis $\chi^2(2)=5.6, p=.062$). However, they were more likely to spend longer than 10 days in hospital ($\chi^2(6)=13.9, p=.031$).

Conclusions

Older pedestrians are not a risk-taking road-user group; they are less likely to consume alcohol, be responsible for the crash, or be walking at night or on the road when hit. However, they are vulnerable, with increased risks of serious and fatal injury and being hit per population. They also take longer to recover from serious injury. Raised zebra-crossings, metropolitan speed management, vehicle-free zones and improvements in vehicle pedestrian protection could improve their safety.

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Table 1. Characteristics of crashes involving pedestrians in three age groups

Variable	**75 and over**	**65 to 74**	**18 to 64**
Pedestrian error			
Disobey – traffic lights	5 (1.5%)	9 (3.3%)	80 (3.9%)
Drunken pedestrian	3 (0.9%)	3 (1.1%)	144 (6.9%)
Inattention	114 (33.2%)	68 (25.3%)	774 (37.3%)
Other	0 (0.0%)	0 (0.0%)	2 (0.1%)
No errors	221 (64.4%)	189 (70.3%)	1,077 (51.9%)
Pedestrian movement			
Alighted from parked vehicle	12 (3.5%)	16 (5.9%)	92 (4.4%)
Crossing with traffic signals	30 (8.7%)	36 (13.4%)	276 (13.3%)
Crossing without control	171 (49.9%)	114 (42.4%)	883 (42.5%)
On pedestrian crossing	16 (4.7%)	10 (3.7%)	68 (3.3%)
Playing on roadway	0 (0.0%)	0 (0.0%)	16 (0.8%)
Pushing or working on vehicle	4 (1.2%)	11 (4.1%)	67 (3.2%)
Walked from between parked vehicles	5 (1.5%)	7 (2.6%)	28 (1.3%)
Walking on footpath	59 (17.2%)	41 (15.2%)	216 (10.4%)
Walking on road	27 (7.9%)	23 (8.6%)	306 (14.7%)
Walking on road – against the traffic	3 (0.9%)	1 (0.4%)	14 (0.7%)
Within 30 m of pedestrian crossing	5 (1.5%)	3 (1.1%)	15 (0.7%)
Other (e.g., police on traffic control)	11 (3.2%)	7 (2.6%)	96 (4.6%)
Day of week			
Sunday	20 (5.8%)	20 (7.4%)	294 (11.8%)
Monday	48 (14.0%)	39 (14.5%)	305 (14.7%)
Tuesday	49 (14.3%)	41 (15.2%)	282 (13.6%)
Wednesday	48 (14.0%)	50 (18.6%)	301 (14.5%)
Thursday	59 (17.2%)	31 (11.5%)	309 (14.9%)
Friday	78 (22.7%)	54 (20.1%)	336 (16.2%)
Saturday	41 (12.0%)	34 (12.6%)	298 (14.3%)
Time of day			
00:00 to 05:59	1 (0.3%)	7 (2.6%)	243 (11.7%)
06:00 to 11:59	153 (44.6%)	109 (40.5%)	473 (22.8%)
12:00 to 17:59	148 (43.1%)	104 (38.7%)	723 (34.8%)
18:00 to 23:59	41 (12.0%)	49 (18.2%)	638 (30.7%)
Speed limit			
10	2 (0.6%)	2 (0.7%)	10 (0.5%)
15	0 (0.0%)	1 (0.4%)	1 (>0.1%)
20	1 (0.3%)	2 (0.7%)	10 (0.5%)
25	2 (0.6%)	1 (0.4%)	20 (1.0%)
40	9 (2.6%)	7 (2.6%)	52 (2.5%)
50	151 (44.0%)	139 (51.7%)	1034 (49.8%)
60	171 (49.9%)	108 (40.1%)	800 (38.5%)
70	2 (0.6%)	0 (0.0%)	30 (1.4%)
80	3 (0.9%)	3 (1.1%)	68 (3.3%)
90	1 (0.3%)	0 (0.0%)	8 (0.4%)
100	0 (0.0%)	3 (1.1%)	23 (1.1%)
110	1 (0.3%)	3 (1.1%)	21 (1.0%)

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Prevalence and role of fatigue in South Australian crashes

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Abstract

This study explores the prevalence and role of fatigue in casualty and fatal crashes in South Australia. Data from two sources were examined: in-depth at-the-scene investigations of casualty crashes (2014 to 2019) by the Centre for Automotive Safety Research and coroner reports on fatal crashes (2014 to 2015). Fatigue-related crashes were identified through clear evidence (e.g., from crash participant/witness interviews, events preceding the crash). Fatigue contributed to 4.3% of casualty crashes and 11.5% of fatal crashes. Most fatigue crashes occurred during daylight hours, on high-speed roads, and midblock and most involved the driver falling asleep, departing their lane, and either rolling or colliding with a roadside object or oncoming vehicles. The most common risk factors for fatigue were long distance driving, no/reduced/broken sleep, illicit drug use, and abnormal work/sleep routines. Vehicle technologies (lane keep assist, lane departure warnings, drowsiness detection/warnings) could have prevented up to 79.3% of these crashes.

Background

Determining whether fatigue was involved in a motor vehicle crash is difficult (Connor, Whitlock, Norton, & Jackson, 2001; Dawson, Reynolds, Van Dongen, & Thomas, 2018). Consequently, there is high variability in estimations of the contribution of fatigue to crashes (Dawson et al., 2018). One of the few studies to examine fatigue in Australian crashes (Australian Transport Council, 2011) found it contributed to 20 to 30% of casualty crashes. The role that fatigue plays (e.g., driver fell asleep and departed lane) in crashes is also often unclear, as are the risk factors that lead to fatigue (working night shifts). Both are important to understand, however, to prevent fatigue-related crashes. This study explored the prevalence of fatigue in casualty and fatal crashes in South Australia (SA), as well as the role that it played, the risk factors that led to it and the countermeasures that could have prevented the crashes.

Method

Detailed crash investigations from two sources were examined: in-depth at-the-scene investigations of casualty crashes in SA (2014 to 2019) by the Centre for Automotive Safety Research (CASR) and coroner reports on fatal crashes in SA (2014 to 2015). Fatigue-related crashes were identified through clear evidence of the involvement of fatigue (e.g., from crash participant/witness interviews, background information, details of preceding events).

Results

Prevalence of fatigue in SA crashes

Fatigue contributed to 11 (4.3%) of 254 casualty crashes investigated by CASR between 2014 and 2019 and 18 (11.5%) of 156 fatal crashes between 2014 and 2015 detailed in coroner reports.

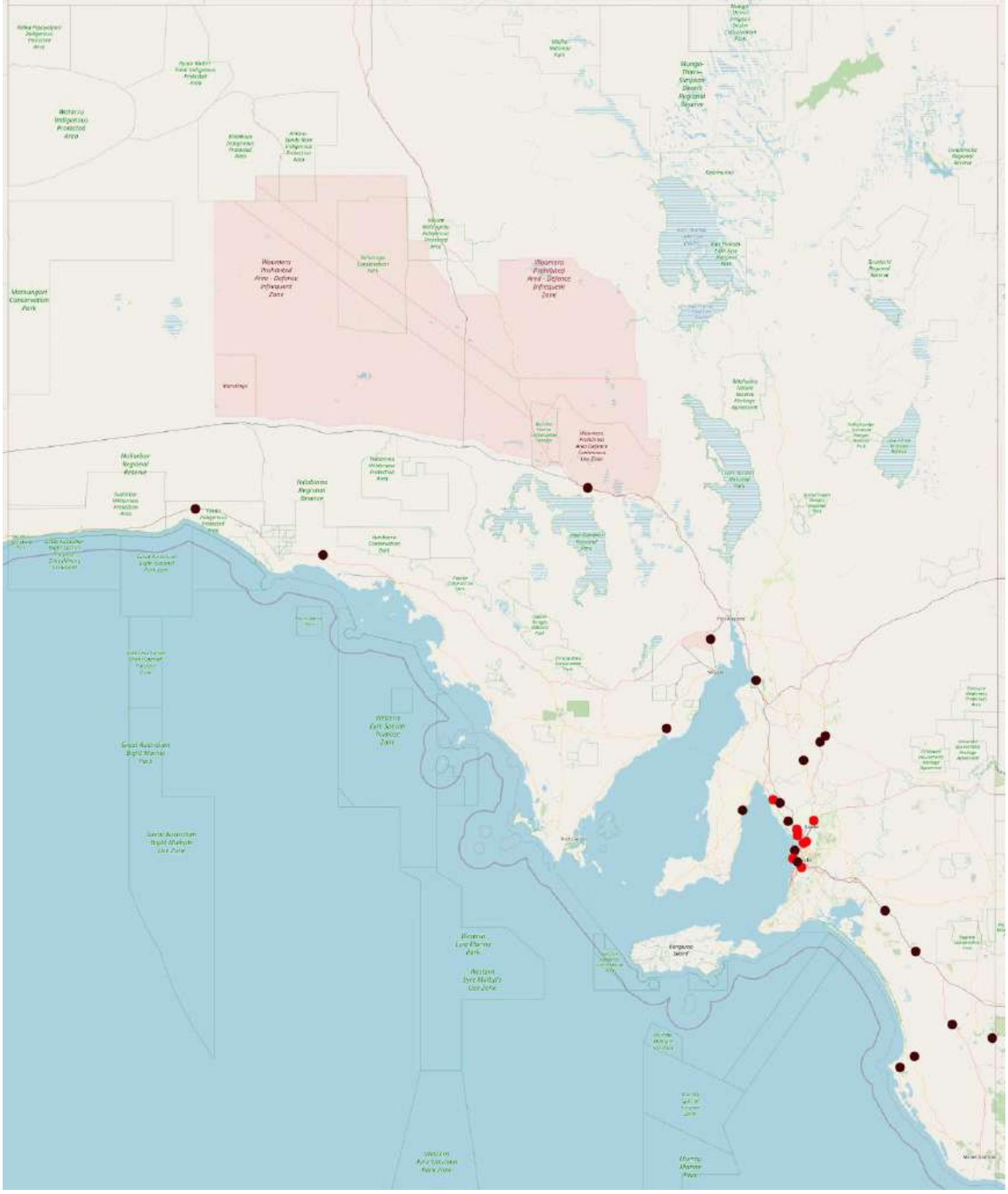

Figure 1. Map of South Australia showing locations of casualty (red dots) and fatal (black dots) fatigue-related crashes. Note: two CASR in-depth investigations were fatal and were included as black dots on this map, therefore, the number of fatal black dots is 20.

Role of fatigue and related risk factors

Most fatigue crashes occurred during daylight hours, on high-speed roads and midblock (Table 1). Casualty (in-depth) fatigue crashes were more likely to involve a single vehicle compared to non-fatigue casualty crashes (more likely involve multiple vehicles). Fatal (coroner) fatigue crashes were more likely to occur on rural roads than non-fatigue fatal crashes.

Most (82.8%) fatigue crashes involved the driver falling asleep, departing their lane, and either rolling or colliding with a roadside object or oncoming vehicle. Most common risk factors for fatigue were long distance driving (17 crashes), no/reduced/broken sleep (8 crashes), illicit drug use (5 crashes), and abnormal work/sleep routines (5 crashes).

Table 1. Characteristics of casualty and fatal fatigue crashes, compared to non-fatigue crashes

Variable	**Fatigue crashes – in-depth**	**Non-fatigue crashes – in-depth**	**Fatigue crashes – coroner**	**Non-fatigue crashes – coroner**
Time of day				
00:00 to 05:59	0 (0.0%)	2 (0.8%)	2 (11.1%)	13 (9.4%)
06:00 to 11:59	3 (27.3%)	66 (27.2%)	7 (38.9%)	35 (25.4%)
12:00 to 17:59	4 (36.4%)	140 (57.6%)	7 (38.9%)	48 (34.8%)
18:00 to 23:59	4 (36.4%)	35 (14.4%)	2 (11.1%)	42 (30.4%)
Chi-square test	Not conducted		$\chi^2(3) = 3.3, p = .345$	
Speed limit				
80 to 110	7 (63.6%)	107 (44.0%)	18 (100.0%)	88 (64.5%)
50 to 70	4 (36.4%)	136 (56.0%)	0 (0.0%)	50 (35.5%)
Chi-square test	$\chi^2(1) = 1.6, p = .201$		$\chi^2(1) = 9.6, p = .002$	
Single or multiple vehicle[a]				
Single	7 (70.0%)	74 (32.2%)	7 (38.9%)	61 (54.0%)
Multiple	3 (30.0%)	156 (67.8%)	11 (61.1%)	52 (46.0%)
Chi-square test	$\chi^2(1) = 6.1, p = .013$		$\chi^2(1) = 1.4, p = .234$	
Intersection or midblock				
Intersection	1 (9.1%)	103 (42.4%)	2 (11.1%)	31 (22.5%)
Midblock	10 (90.9%)	140 (57.6%)	16 (88.9%)	107 (77.5%)
Chi-square test	$\chi^2(1) = 4.8, p = .028$		$\chi^2(1) = 1.2, p = .267$	
Location				
Rural	5 (45.5%)	104 (42.8%)	18 (100.0%)	92 (66.7%)
Metropolitan	6 (54.5%)	139 (57.2)	0 (0.0%)	46 (33.3%)
Chi-square test	$\chi^2(1) < 0.1, p = .862$		$\chi^2(1) = 8.5, p = .003$	

Note: chi-square test not conducted when frequency count less than 5 in more than 25% of cells

[a] Crashes involving pedestrians and wheelchairs excluded. Crashes in which a vehicle collided with a parked vehicle categorised as single vehicle

Countermeasures

While reviewing the crashes the authors nominated countermeasures that could have at least plausibly prevented the driver’s fatigue from resulting in the crash. Those that could have prevented the most crashes were:

- Lane keep assist – prevent 23 crashes (79.3%).
- Lane departure warning – prevent 19 (65.6%).

- Drowsiness detection/warning – prevent 16 (55.2%).
- Audio tactile centre lines – prevent 12 (41.4%).
- Autonomous emergency braking – prevent 10 (34.5%).

Vehicle technologies were four of the five most common countermeasures.

Conclusions

The contribution of fatigue to crash involvement in SA was low for casualty crashes (4.3%) but considerable for fatal crashes (11.5%). Limitations of CASR in-depth investigations (mostly daylight hours Monday to Friday, do not cover many rural areas of SA) may have lowered the estimate for casualty crashes. Also, the criteria for identifying fatigue – clear evidence that it was involved – was stringent. Therefore, these estimates are conservative. This study is an important starting point for future research and a broader understanding of the prevalence and nature of fatigue-related crashes.

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Upskilling professional young driver instructors: what are we waiting for?

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Abstract

Decades of research and development to address the over-involvement of young drivers in road crashes has led to critical improvements in understanding and interventions, yet mostly focused on young drivers themselves or also parents. Driving instructors have a key role in the young driver safety system yet substantially less attention has been paid to their accreditation and professional development. This presentation showcases a series of research studies that show: (a) instructors seek and are willing and able to be upskilled in young driver specific training needs; (b) adept higher-order professional instruction improves young driver safety behaviour; and (c) young drivers currently lack adequate training in new vehicle features that can enhance their safety. This presentation will argue we know how to innovate and transform the driver training industry to improve young driver safety, yet current trends are working against rather than towards this. Now is the time to implement change.

Background

Increased understanding of neurobiological developments during adolescence in recent decades have led to tailored, highly successful interventions to reduce the over-involvement of young drivers in road trauma, particularly graduated licensing policies and supporting initiatives (Senserrick, Oviedo-Trespalacios, Rodwell, Kaye, 2021). Most interventions target young drivers directly or also parents, whereas professional driving instructors also have a key role in the young driver safety system (Scott-Parker, Goode, Salmon & Senserrick, 2016), given most youth indicatively undertake some professional lessons prior to licensure (Bates, Watson & King, 2006; Scott-Parker et al., 2011). Despite this, comparatively limited attention has been paid to upskilling instructors with these latest insights. Furthermore, a common instructor accreditation requirement is currently being amalgamated with equivalent requirements for heavy vehicle and motorcycling instruction, substanitally reducing car-specific content. The objective of this presentation is to demonstrate research support for the need to increase, not decrease, instructor competence in developmentally-appropriate training.

Methods

A series of mixed methods studies were conducted, including observational (120 learner lessons) and self-report (21 instructors, 650 learners and 589 provisional drivers) studies specific to professional instruction (Scott-Parker et al, 2014; Watson-Brown, 2020), as well as surveys (N=217) regarding Advanced Driver Assistance Systems (ADAS) and interviews (N=32) regarding In-Vehicle Information Systems (IVIS) of licensed drivers of vehicles with these features (Kaye et al., unpublished; Oviedo-Trespalacios, Nandavar & Haworth, 2019).

Results

Driving instructors report desire to learn and apply latest insights to training young drivers, but lack such professional development opportunities. They experience commercial and parental pressure to teach young learners how to pass the practical driving test for licensure over in-depth experience for safety. Learner driver experiences of higher-order instruction are inconsistent, with more received during early rather than later logbook hours, with many missed opportunities observed. Improved higher-order instruction aids development of a self-regulated safety orientation, which in turn is associated with reduced risky driving as a Provisional driver. Many drivers of vehicles with ADAS and IVIS, including young people and their parents, lack awareness, understanding or training of key features. This risks misuse and increased rather than decreased crash risk, particularly among young people developmentally prone to distraction. Ways to upskill driving instructors within the current industry train-the-trainer model based on these findings have been identified and preliminary tools developed, yet universal, consistent ways to share these and on-going learnings with the driver training industry are yet to be established.

Conclusions

Driving instructors desire and need support to optimise their role in reducing young driver crash risk, yet currently this fails to be realised. There is compelling need to tailor accreditation and provide professional development opportunities to ensure instruction is developmentally appropriate for young drivers. We know how to do this, so what are we waiting for?

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Practical Safety Interventions for Regional and Remote Road Safety

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Abstract

Approximately one third of Australians live in regional and remote areas but these areas account for two thirds of fatal crashes. Austroads commissioned a project to provide practitioners with guidance on evidence-based road safety interventions that can prevent fatal and serious injury crashes in regional and remote areas. A literature review was conducted to identify effective evidence-based road safety countermeasures for regional and remote areas, based on the Safe System pillars. Findings from this review and a series of workshops with stakeholders guided the development of a framework for prioritising these interventions and practitioner advice for implementation. An evaluation framework was also developed for evaluating implemented countermeasure effectiveness. Importantly, the project delivered factsheets designed for practitioners based on key road safety interventions/issues in regional and remote areas. Each factsheet contained a summary of the intervention, target behaviour and/or road user, application tips, implementation considerations, and intervention effectiveness.

Background

Approximately one third of Australians live in regional and remote areas but these areas account for two thirds of fatal crashes. The fatality rate is five times greater in regional and remote areas than in major cities (Wundersitz et al, 2019). The purpose of this project was to provide practitioners with guidance on evidence-based road safety interventions that can prevent fatal and serious injury crashes in regional and remote areas. Additionally, the project provides practitioners with a framework for prioritising road safety interventions and a framework for evaluating the effectiveness of implemented countermeasures.

Process

Firstly, a literature review was conducted to examine recent literature concerning evidence-based countermeasures and their effectiveness in regional and remote areas, based on the Safe System pillars.

Secondly, a prioritisation framework was developed based on the collective experience of the project team who have backgrounds in the academic and practitioner field. The aim of the prioritisation framework was to assist practitioners with prioritising interventions, especially with scenarios where a number of effective interventions exist for an identified road safety issue. The framework encourages and enables practitioners to systematically examine potential interventions by working through a number of steps, referred to as phases in the prioritisation framework. These phases include understanding the specific problem, potential intervention selection, cost estimation, benefit calculation and prioritisation, and implementation.

Thirdly, an evaluation framework was developed based on the collective experience of the project team. The evaluation framework guides practitioners through a four-stage evaluation process. The stages are (a) concept (b) planning (c) data collection and (d) data analysis and reporting. The evaluation framework considers evaluation rigour required by the practitioner by dividing evaluations into three levels - Level 1, Level 2, and Level 3, where Level 1 is a basic level of rigour while Level 3 is the most rigorous. Further, an example of an evaluation performed using the framework is presented.

Stakeholder consultation was an integral element for this project. The findings from the literature review, draft prioritisation framework, and draft evaluation framework were discussed with stakeholders via a series of workshops. These workshops assisted with refining the literature review, prioritisation framework, and evaluation framework. Additionally, the stakeholders also identified key road safety interventions/issues in regional and remote areas. Based on this research, a series of brief factsheets designed for practitioners was produced which contained a summary of the intervention, target behaviour and/or road user, application tips, implementation considerations, and intervention effectiveness.

Conclusions

The outputs of this project are two reports. The first report, the Project Report, contains the literature review, prioritisation framework with associated commentary on its use and application, and an evaluation framework and associated commentary on its use and application. The second report, the Practitioners Report, contains the factsheets, the prioritisation framework table, and the evaluation framework table. It has been kept brief so that practitioners have quick and easy access to key information. These reports will assist practitioners to effectively select, prioritise, implement and evaluate interventions to prevent road fatalities and serious injuries in regional and remote areas.

Acknowledgements

This project was funded by Austroads. The project team would like to thank Mark Ellis (Project Manager), Terri-Anne Pettet, Sarah Mewett, Christopher Davis, Paul Gottke, Matt Hollamby, and Daniel Bacon for their contributions as the Project Working Group. We also thank the 29 workshop stakeholders who provided their time, insights, and recommendations to this project.

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Seeking Sensation:
A segmentation study of Victorian drivers

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Abstract

Traditional demographic data strata – age, gender, and location, have been used to inform and predict likelihood of specific road safety related behaviours among different groups. While this may give a broad picture of the person most likely to engage in these behaviours, it does not allow room for any nuanced understanding of behaviour. This study investigates segmentation of Victorian drivers using a psychometric sensation seeking scale, coupled with a set of attitudinal positions, to classify Victorian drivers into five segments (three law-abiding, two less so). Results from this study will be used to inform segmentation of Victorian drivers in other studies, and to inform and design interventions such as targeted communications for different segments.

Background

The Transport Accident Commission (TAC) uses the Public Education Evaluation Program (PEEP) to evaluate advertising, and monitor changes in attitudes and behaviours related to campaign messaging. Traditionally, drivers were segmented based on gender, age and location. This research project aimed to broaden the customary segmentation approach to develop a set of groups that represent Victorian drivers in a more nuanced way to better understand their behaviour on the road.

Methodology

Utilising PEEP, 488 Victorian drivers aged 18+ were surveyed to conduct a behavioural segmentation using attitudinal and psychometric data on 'sensation seeking' to develop a set of segments that could be used to categorise groups of Victorian drivers. Additional attitudinal and behavioural data were used to describe the segments. Data were weighted to be broadly representative of the Victorian driver population.

The segmentation was based on a psychometric sensation seeking scale (The Brief Sensation Seeking Scale - BSSS) and a set of general attitudes relating to road safety. The BSSS is an adaptation of the Zuckerman Sensation Seeking Scale (Hoyle et al, 2002) and measures attitudes across four components:

- Experience seeking
- Boredom susceptibility
- Thrill and adventure seeking
- Disinhibition

The BSSS provides the foundation of the segmentation, separating respondents based on their appetite for risk[i]. Further nuance is provided by driver attitudes toward a range of road safety issues including:

- Intentional speeding
- Drink driving

- Drug driving
- Fatigued driving
- Distracted driving

Results

Victorian drivers were segmented into five broad categories - two categories were more risk taking, and the remainder more law-abiding:

Risk takers:

- Risk Seekers (19%) – Younger, most likely to engage in risky driving behaviours, care less about road safety
- Fast and Fatalistic (11%) – Exhibit speeding behaviour, more likely to live in the country and only speak English at home

Law Abiders

- Egocentric (16%) – mainly older, law abiding, believe it is the actions of other people that cause road safety issues
- Disgruntled (27%) – relatively law abiding, middle-aged, and tend to disagree with government policies and road safety measures
- Aligned (28%) – law abiding, older, and agree with government policies and road safety measures

Discussion:

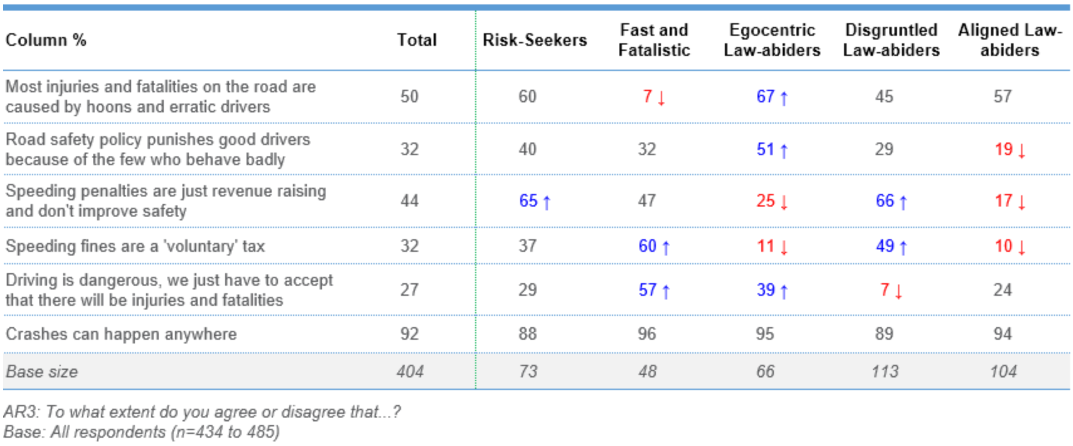
From Table 1 below, younger drivers (aged under 40) are significantly[ii] more likely to "Risk Seekers", with middle-aged drivers falling into the "Disgruntled" segment. Older drivers (aged 60+) are significantly more likely to be classed as "Egocentric" or "Aligned".

Table 1 Risk and attitudes segmentation by demographic

Column %		**Total**	**Risk-Seekers**	**Fast and Fatalistic**	**Egocentric Law-abiders**	**Disgruntled Law-abiders**	**Aligned Law-abiders**
Age	18-25	15	33 ↑	14	18	2 ↓	12
	26-39	26	37 ↑	28	26	24	18 ↓
	40-59	34	29	42	19 ↓	44 ↑	31
	60+	26	1 ↓	16 ↓	37 ↑	30	38 ↑
Gender	Male	48	53	60	52	41	45
	Female	52	47	40	48	59	55
Location	Melbourne	76	83	64 ↓	77	81	70
	Other Victoria	24	17	36 ↑	23	19	30
LOTE[iii]	Yes	23	30	12 ↓	22	21	24
	No	77	70	88 ↑	78	79	76
Base size		*488*	*87*	*57*	*77*	*131*	*136*

Table 2 shows there are some significant differences between the segments. Interestingly, both “Risk Seekers” and the “Disgruntled” are significantly more likely than other segments to agree that speeding penalties are just revenue raising. The “Fast and Fatalistic” are most likely to agree that driving is dangerous, and at the same time are significantly less likely to agree that injuries and fatalities are caused by hoons.

Table 2 Levels of agreement about general attitudes toward road safety by risks and attitudes segmentation



Column %	Total	Risk-Seekers	Fast and Fatalistic	Egocentric Law-abiders	Disgruntled Law-abiders	Aligned Law-abiders
Most injuries and fatalities on the road are caused by hoons and erratic drivers	50	60	7 ↓	67 ↑	45	57
Road safety policy punishes good drivers because of the few who behave badly	32	40	32	51 ↑	29	19 ↓
Speeding penalties are just revenue raising and don't improve safety	44	65 ↑	47	25 ↓	66 ↑	17 ↓
Speeding fines are a 'voluntary' tax	32	37	60 ↑	11 ↓	49 ↑	10 ↓
Driving is dangerous, we just have to accept that there will be injuries and fatalities	27	29	57 ↑	39 ↑	7 ↓	24
Crashes can happen anywhere	92	88	96	95	89	94
Base size	*404*	*73*	*48*	*66*	*113*	*104*

AR3: To what extent do you agree or disagree that...?
Base: All respondents (n=434 to 485)

Future directions:

It is intended that this research will be extended to a larger sample to determine the generalisability of these segments. It is expected, however, that the high/mid/low risk segments are likely to hold true, while attitudinal variations to the base segmentation may result in novel segmentations.

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Sharrow marking in roundabouts: A simulator study

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Abstract

Sharrows have been suggested as having the potential to improve cyclist safety within roundabouts. Sharrows are an advisory lane marking that consists of two white arrows with a bike logo below, located in the centre of a lane. The aim of sharrow marking is to reinforce that cyclists have the right to ride in that lane and to signal to cyclists that they should position themselves within the centre of the lane and claim the lane. This study utilized a bicycle simulator to compare roundabouts with and without sharrows to investigate if the presence of sharrows lead to such lane positioning by cyclists. The study failed to find evidence that sharrows induce cyclists to ride further towards the centre of the road than would otherwise be the case.

Background

While roundabouts may be associated with increased vehicular safety (Jurewicz *et al.* 2015), the opposite can be true for cyclists (Cumming, 2011). Entering drivers failing to give way to circulating cyclists is the most common crash type between vehicles and cyclists at roundabouts (Wilkie et al., 2014). Bicycle lanes within roundabouts appear to increase the risk to cyclists, possibly because drivers are focussing their attention on other vehicles to the right and do not expect a bicycle to the left of the circulating vehicles (Cumming, 2011). For this reason, peripheral cycle lanes within roundabouts are not recommended as a cyclist safety countermeasure for roundabouts (Wilkie et al., 2014).

One treatment that has been suggested as having the potential to improve cyclist safety within roundabouts are '*sharrows*'. Sharrows are an advisory lane marking that consists of two white arrows with a bike logo below (Figure 1), located in the centre of a lane (FHWA, 2012).

Figure 1 : Sharrow

Sharrows are designed to encourage a positive culture between cyclists and vehicles. The aim of sharrow marking is to reinforce that cyclists have the right to ride in that lane. Critically, they are designed to signal to cyclists that they should position themselves within the centre of the lane and claim the lane. Provided that cyclists behave in this way such lane positioning removes cyclists from the risky ’far left’ location and positions them directly in front of drivers in a way that makes them more conspicuous. The current study investigated whether cyclists respond to sharrows and position themselves further towards the centre of the road when sharrow markings are present compared to roads without sharrows at the entrance to a roundabout.

Method

The study utilized a bicycle simulator (Figure 2) to compare cyclist positioning behaviour when entering a roundabout with and without sharrows.

Figure 2: Western Australian Centre for Road Safety bicycle simulator

Participants rode through a four-way, single lane roundabout, in a 50 km/h speed zone, with a bicycle lane on approach that terminated 20 metres before the roundabout holding line. Participants experienced two versions of the roundabout, a standard roundabout and one with sharrows (Figure 3). The order in which the two roundabouts were encountered was randomly selected. The outcome measure was the ‘lane position’ of the bicycle on entry to and through the roundabout.

Figure 3: Scenario without and with sharrows

Results

A total of 21 participants completed the study before it was cut short by the COVID-19 restrictions. One participant was unable to complete the assessment due to simulator sickness and was removed from the study. Therefore, the final sample included a total of 20 participants. The socio-demographic characteristics of participants are summarised in Table 1.

Table 1: Socio-demographic characteristics

Characteristic	N	%
Gender		
Female	9	45.0
Male	11	55.0
Age Group (years)		
18-25	9	45.0
26-40	3	15.0
41-65	6	30.0
>65	2	20.0
Driver's License		
No	1	5.0
Yes	19	95.0

Table 2 summarizes the riding characteristics of participants.

Table 2: Riding characteristics

Characteristic	N	%
Riding Frequency (times per week)		
<1	8	40.0
1-3	8	40.0
4+	4	20.0
Riding Frequency (kilometres per week)		
<10	7	35.0
10-50	7	35.0
51-200	3	15.0
200+	3	15.0
Main Riding Purpose		
Recreation	11	55.0
Commuting/Transportation	5	25.0
Fitness/Training	4	20.0
Crashes (requiring medical treatment)[a]		
None	14	70.0
1+	6	30.0

[a] In the last three years

The distance measured from the left curb when entering the roundabout was not significantly greater in roundabouts with sharrows compared to roundabouts without sharrows (p=0.34). The values are summarised in Table 3.

Table 3: Distance from left curb

Roundabout	**Mean (metres)**	**SD**	**Range**
No sharrows (control)	1.38	0.45	0.75-2.29
Sharrows	1.51	0.62	0.68-2.78

The results of the GEE linear regression models on the distance (metres) from left curb when entering the roundabout are summarised in Table 4. The presence of sharrows was not associated with the distance from the left curb when entering the roundabout. However, females rode 0.44 metres further away from the left curb when entering the roundabout compared to males (95% CI=0.02-0.85; p=0.04). Riders aged between 26 and 40 years rode 0.61 metres further away from the left curb when entering the roundabout compared to riders aged 18-25 years (95% CI=0.18-1.05; p=0.01). Riding frequency and main riding purpose were not significantly associated with the riding distance from the left curb when entering the roundabout.

Table 4: GEE linear regression model of the impact of socio-demographic and riding characteristics on distance from left curb when entering roundabout

Variable	**Parameter Estimate**	**95% CI**		**P-value**
Roundabout Entry				
No Sharrows				
Sharrows	-0.14	-0.36	0.08	0.21
Gender				
Male (reference)				
Female	**0.44**	**0.02**	**0.85**	**0.04***
Age Group (years)				
18-25 (reference)				
26-40	**0.61**	**0.18**	**1.05**	**0.01***
41-65	0.22	-0.20	0.65	0.30
65+	0.43	-0.35	1.21	0.28
Riding Frequency (per week)				
<1 time (reference)				
1-3 times	0.08	-0.32	0.47	0.70
4+ times	-0.22	-0.78	0.34	0.44
Main Riding Purpose				
Recreation (reference)				
Commuting/Transportation	0.07	-0.40	0.55	0.76
Fitness/Training	-0.39	-0.80	0.02	0.06

Conclusions

Sharrows are designed, in part, to encourage cyclists to ride in the centre of the lane. It has been suggested that such behaviour has the potential to reduce the risk of vehicle-cyclist crashes within roundabouts. This study failed to find evidence that sharrows induce cyclists to ride further towards the centre of the road than would otherwise be the case. One explanation for the failure to find a significant effect may be the small sample size of the study. However, other significant effects were apparent (for example, gender differences) so it is plausible that sharrows do not have a strong effect on influencing where riders position themselves on the road.

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Development of a process to audit vehicle safety technology prevalence

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Abstract

To determine the prevalence of vehicle safety technologies in the active vehicle fleet, a process was developed and trialled in a small area of South Australia. In-vehicle cameras were used to capture number plates of passing vehicles while driving in different areas. The captured number plates were matched to vehicle makes, models, and manufacture years, then matched to ANCAP listed safety technologies. A preliminary mapping analysis showed the prevalence of vehicle safety features seemed to decrease as the distance from the city centre increased, based only on the limited sample. ANCAP 5-star-rated vehicle proportions detected in metropolitan areas and rural areas were 72% and 73% respectively, and as the vehicle manufacture year increased, so did the proportions of ANCAP 5-star ratings. A large potential exists for this process to be scaled to a statewide or national level.

Background

A common strategy to reduce road trauma in Australia is to increase the prevalence of modern vehicle safety technologies within the fleet. Registration records may list locations of vehicle residence, but it is unknown where each vehicle is being driven and how much it is being driven. The purpose of this project was to develop and trial a method to determine the prevalence of various vehicle safety technologies in the South Australian active vehicle fleet.

Method

A camera system equipped with Automatic Number-Plate Recognition (ANPR) software was mounted internally on the windscreen of a data-collection vehicle. While the system was active, any number plate recognised by the camera would be recorded along with GPS location. The data-collection vehicle was driven throughout a small section of metropolitan and rural areas close to Adelaide.

Each number plate collected was matched to registration data listing the vehicle make, model, manufacture year, and number plate type provided by the Department for Transport and Infrastructure (DIT). Each vehicle make, model, and manufacture year was then matched to safety technologies using vehicle data provided by the Australiasian New Car Assessment Program (ANCAP).

Results

Of the 11,372 unique number plates captured, 8,333 of them were matched to both registration data and ANCAP data. Of those, 72% were detected in metropolitan areas, compared to 28% in rural areas (based on the GPS locations and ABS Remoteness Areas map).

ANCAP star ratings (a score based on the protection the vehicle provided to its occupants and vulnerable road users, as well as the presence and performance of on-board safety features and technologies) were used as an indication of overall vehicle safety.. The proportions of 5-star ANCAP-rated vehicles (highest safety rating) detected in metropolitan areas and rural areas were 72% and 73% respectively. A small analysis showed that as the manufacture year of vehicles increased, the proportion of 5-star vehicles also increased. Of vehicles manufactured from 2016 to 2021 in the collected sample, 96% had an ANCAP 5-star rating.

Table 1 shows the range of vehicle safety technologies assessed, split by metropolitan and rural areas. The difference between vehicles detected in rural areas and metropolitan areas seemed to be minimal.

Table 1. Safety technologies equipped in collected sample of vehicles, split by metropolitan and rural regions

Vehicle technology	Standard		Optional/ higher variant only		Not equipped		Unknown	
	Metro	Rural	Metro	Rural	Metro	Rural	Metro	Rural
Three-point seatbelts for all forward-facing seats[1]	92%	92%	0%	0%	4%	4%	4%	5%
Seatbelt pretensioners (front)	97%	98%	1%	0%	0%	0%	1%	1%
Intelligent seatbelt reminder (driver)	82%	83%	0%	0%	12%	11%	6%	6%
Intelligent seatbelt reminder (front passenger)	73%	74%	0%	0%	20%	19%	7%	7%
Airbag – Frontal (driver)	99%	100%	1%	1%	0%	0%	-	-
Airbag – Frontal (front passenger)	96%	96%	4%	4%	0%	0%	-	-
Airbag – Sides (front row)	68%	69%	21%	20%	11%	11%	-	-
Airbag – Curtains (front row)	69%	71%	19%	19%	12%	11%	-	-
Airbag – Knee (driver)	32%	31%	2%	3%	65%	66%	-	-
Anti-lock Braking System (ABS)	89%	90%	7%	6%	4%	4%	-	-
Electronic Brakeforce Distribution (EBD)	81%	82%	3%	3%	1%	1%	16%	14%
Emergency Brake Assist (EBA)	65%	66%	1%	1%	3%	3%	31%	30%
AEB – City	13%	13%	19%	20%	15%	17%	53%	51%
AEB – Interurban	11%	11%	8%	9%	17%	19%	64%	62%
AEB – Vulnerable road users	9%	9%	5%	5%	22%	27%	64%	62%
AEB – Backover	0%	0%	0%	0%	2%	2%	98%	98%
AEB – Junction assist	1%	1%	0%	0%	1%	1%	99%	99%
Headlights – Daytime running	24%	25%	9%	10%	2%	2%	65%	63%
Headlights – Automatic	19%	22%	13%	12%	1%	1%	67%	66%
Headlights – Adaptive	2%	3%	5%	5%	6%	6%	87%	87%
Electronic Stability Control (ESC)	72%	74%	8%	8%	6%	6%	14%	13%
Fatigue detection	6%	6%	6%	6%	3%	3%	85%	85%
Fatigue reminder	7%	7%	1%	1%	5%	5%	87%	87%
Forward collision warning	8%	7%	4%	4%	1%	1%	88%	88%
Lane Departure Warning (LDW)	8%	9%	22%	22%	14%	15%	57%	54%
Lane Keep Assist (LKA)	7%	7%	3%	3%	16%	19%	74%	71%
Speed assistance – auto / intelligent speed limiter	4%	4%	1%	1%	18%	20%	77%	75%
Speed assistance – speed sign recognition & warning	5%	5%	1%	1%	15%	18%	79%	77%
Blind spot monitoring	6%	6%	16%	17%	5%	6%	73%	71%

[1] Note: Some centre-rear seats may have two-point waist seatbelts, not three-point seatbelts

Figure 1 shows a map of the proportions of 5-star vehicles in each Local Government Area where number plates were detected (red dots). Similar maps could be created for individual vehicle safety technologies.

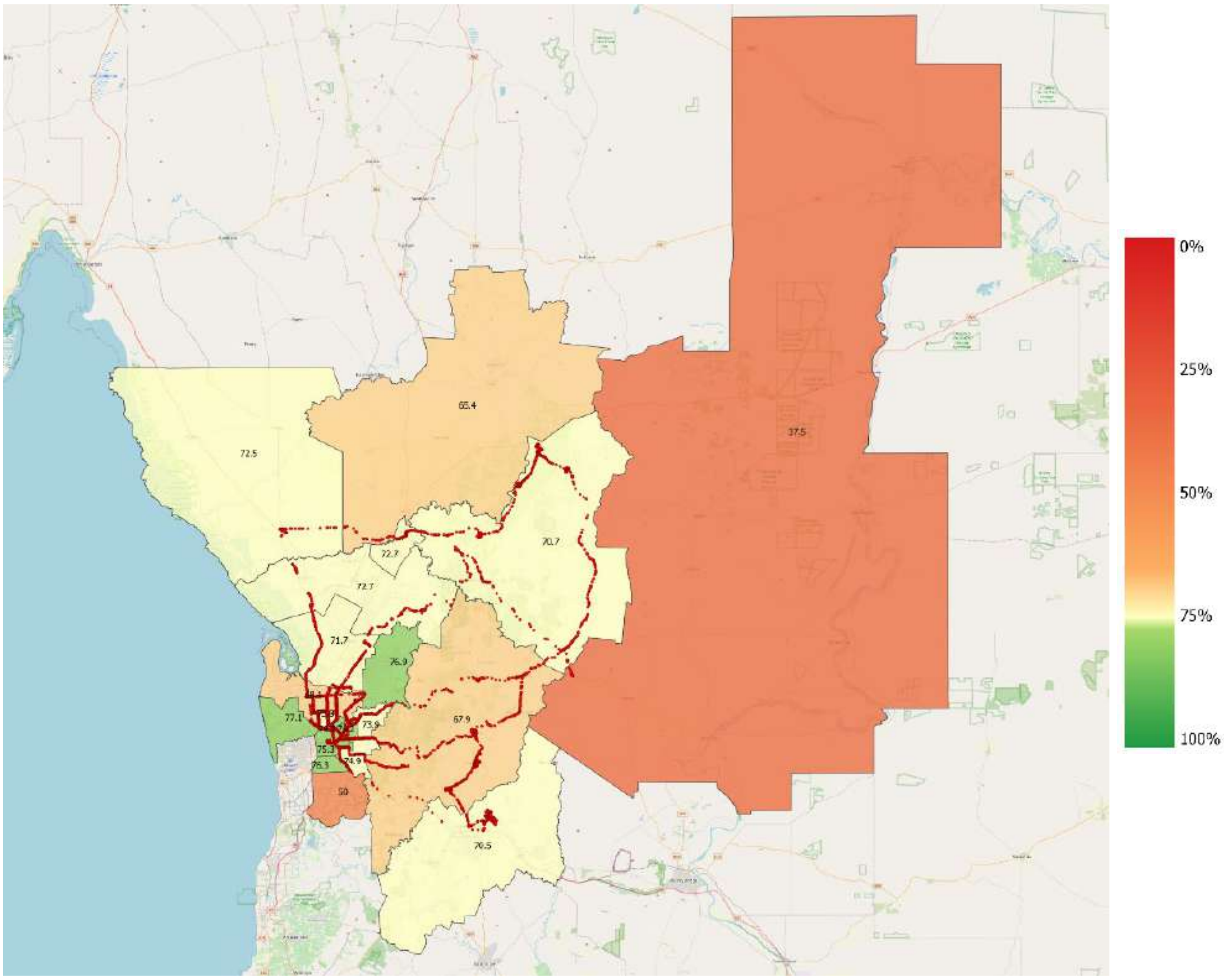

Figure 1. Proportion of ANCAP 5-star vehicles in each LGA of collected sample.

Alternative methods and datasources were identified, emphasising the possibility of improving the rate and accuracy of assigning vehicle safety technologies to detected number plates.

Conclusions

The project was successful in developing and trialling a method whereby the prevalences of vehicle safety technologies in the active fleet were quantified. There is large potential that scaling this trialled method to a statewide or national level would provide extremely useful data and insights for many areas of road safety.

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When services close due to COVID what do you do!

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Abstract

We have many vulnerable communities in Tasmania. We often see low literacy levels and hesitance to ask professionals for advice and or help. We also have many parents and carers who rely on child and family case services to look after their children while they work or participate in learning. In 2020, many services in Tasmania stopped. This submission discussed what to do when such services close.

Introduction

Child restraint fitting services came to a standstill. Children continued to be driven around, of course, so we became very concerned about the safety of children in cars during this time. We know only too well that there are too many people who have little idea about how to confidently and correctly fit a restraint. New parents who are using child restraints for the first time are most vulnerable. This was a time of community anxiety and uncertainty. The effects of the COVID-19 pandemic increased the dangers to children (The Age).

We started a service of providing parents with face-time calls so our fitter could guide them through solutions to some of the simpler problems they had. The need for this was shown by data we had collected over the past three years that had shown 80-90% of all seats checked needed some form of adjustment to make them safe.

Kidsafe Tasmania also wanted to provide a safe, one-on-one individualised child restraint service that was both COVID safe and provided the support, reassurance and confidence people needed, especially for new mothers.

How could we meet this challenge?

We had existing funding to do free child-restraint session with community groups. We asked the Tasmanian Road Safety Council if we could re-purpose this funding to support parents and carers in need on an individual basis. We appreciate their willingness to listen and respond quickly.

Our new service, which started later in 2020 and continues, required us to change. We developed new policies and procedures including risk management as well as equipment kits for our staff to ensure that client and staff were protected against infection during the fitting. The gratitude of the many parents who took advantage of this service was very welcome.

We are now better able to deal with similar situations in the future.

Reference

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Road Safety Communications for Food Delivery Platforms and Riders

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Abstract

Food delivery riders provide many goods and services to the community, but can face risks when working on our roads. From 2019-2020, there were 74 food delivery rider casualty crashes on NSW roads, resulting in five food delivery rider fatalities (Transport for NSW, 2022). Of these fatalities, three were cyclists and two were motorcyclists. In December 2020 the Joint Taskforce: Food Delivery Rider Safety was established to address the increase in food delivery rider casualties in NSW and improve food delivery rider safety. Transport for NSW led the development of communications targeting both riders and food delivery platforms to educate and encourage the uptake of safer equipment and practices.

Crashes involving Food Delivery Riders

Transport for NSW commenced classifying food delivery riders in its crash data in January 2019. Between January 2019 and June 2021, there were 87 food delivery riders involved in casualty crashes reported to NSW Police. Of these crashes 92 per cent were in the Sydney Metropolitan Area and 50 per cent occurred between 5pm and 9pm. A field inspection analysis conducted by SafeWork NSW in February 2021 showed that food delivery riders were predominantly under the age of 30 (88 per cent) and are male (92 per cent). It also found that 99 per cent of riders were not born in Australia (SafeWork NSW, 2021).

Empowering platforms to create a culture of road safety

In order to improve road safety for food delivery riders, both the riders and food delivery platforms must understand and accept their role in keeping riders safe. The communications approach by Transport for NSW focused on key areas of risk for food delivery riders, including visibility and safe riding behaviour. This approach was based on recommendations from the Taskforce, and supported by research into the commonly misunderstood road rules and best practices that food delivery riders encounter while working. In response to these issues, a dedicated webpage on the Centre for Road Safety website, downloadable factsheets, frequently asked questions, flyer and social media posts were all developed to target both platforms and riders.

To further instill road safety within food delivery platforms culture and with the understanding that the vast majority of riders are not from Australia, an education basics document was created to assist including road safety information in on-boarding and rider learning. Along with this, platforms were provided a Communications Toolkit with all available materials and suggested communications to disseminate important safety information directly to their riders. The educations basics document includes information on general NSW road rules and key road safety issues to help educate riders who may not be very familiar with NSW road rules.

Seven prominent food delivery platforms received this education and communications package, and have direct access to Transport for NSW as an ongoing relationship to continue to work together to build a culture of road safety within their organisations.

Since the materials were published on the Centre for Road Safety website, there have been over 1,300 combined downloads (at 18 February 2022). Social media posts have also reached over 1.6 million people.

Road safety is a shared responsibility and in order to improve food delivery rider safety and reduce death and serious injuries on our roads, both riders and food delivery platforms must be engaged and educated. This can be achieved by maintaining collaborative relationships and ongoing support provided by Transport for NSW.

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Potential applications of SafeView: A forward visibility model

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Abstract

A safe road system is one that allows users to clearly see and be seen by others. Unfortunately, some drivers may attempt to overtake other vehicles without a safe view ahead. This can result in high-speed crashes with a chance of serious injury and death. Intermediate Sight Distance (ISD) is the minimum sight distance required for an overtaking manoeuvre to be performed safely. The availability of ISD can be limited due to road curvature. Higher traffic volumes, especially heavy vehicles, increase the demand for overtaking and reduce the ability to do so. SafeView is a forward visibility model developed by Abley that uses geospatially-referenced data to classify where ISD is available along a road section. It could help to assess whether adequate overtaking opportunities are provided and to prioritise high-risk areas for treatment. This could reduce crash occurrence and severity, aligning with the Safe Systems approach and decreasing travel times.

Background

Overtaking and head on crashes on high-speed rural roads are causing significant harm in New Zealand. Between January 2000 and May 2021, they have led to at least 1,500 deaths and 4,600 serious injuries. Work is being undertaken to improve road safety outcomes (Te Manatū Waka, 2020).

Intermediate Sight Distance (ISD) is the minimum sight distance required for an overtaking maneouvre to be performed safely. SafeView is a forward visibility model developed by Abley that uses geospatially-referenced data to determine where ISD is available along a road section.

This project investigated why the ability to overtake is important, the the extent of harm caused by overtaking, the contributing factors and the areas most at risk. It also tested whether SafeView could be a useful tool for assessing overtaking opportunities across the road network.

Method

An initial literature review was completed to describe the importance of being able to overtake, key causes of overtaking demand, sight distance measurements and the best engineering practices for overtaking and passing.

Crash Analysis System (CAS) data was then analysed. Injury counts, crash severity and the impact of known factors were visualized using tables and graphs. Text features describing the factors in each crash were processed to find the most frequently occurring words. Overtaking crashes were also mapped to compare regional risk and to find hotspots that may have been related to poor forward visibility.

Finally, SafeView was used to test the available sight distance along road sections with hotspot locations (an example is shown in Figure 1). The outputs were validated using GIS tools.

Results

The review found that an inability to overtake can lead to driver frustration and risky behaviour (Koorey et al., 1999; Thrush, 1996). The main contributors to overtaking demand are limited visibility due to road curvature, traffic volume (Koorey et al., 1999) and traffic composition

(Transit New Zealand, 2003).Where ISD cannot be provided, passing facilities may be necessary to reduce pressure (Austroads, 2021).

CAS data showed that overtaking crashes were most likely to occur on straight road sections and at higher average traffic volumes than most other crash types. Trucks, excessive speed, wet conditions, narrow roads and alcohol were commonly described in both overtaking and head on crashes. Waikato had the most overtaking crashes, but the West Coast and Nelson had the highest rates per capita.

On the road sections tested, SafeView was found to accurately classify whether was ISD available or not. The results often aligned with the corresponding road markings.

Figure 1. An example output from SafeView, as viewed in ArcGIS Pro. The section shown is from State Highway 6 in the South Island.

Conclusions

A lack of overtaking opportunities can lead to drivers attempting maneouvres at unsafe locations. Overtaking ability is influenced by the available sight distance, which may become restricted due to road curvature. Higher traffic volumes, especially heavy vehicles, increase the demand for overtaking and reduce the ability to do so.

SafeView could be used to help ensure that there are adequate overtaking opportunities over a road section and to help prioritise high-risk areas for treatment across the network. This could reduce crash occurrence and severity, which aligns with the Safe Systems approach (Austroads, 2019), while also offering economic benefits through travel time reductions (Koorey et al., 1999).

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Indonesia Road Safety Priorities and Analysis Tools

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Abstract

The road safety challenges in Indonesia are significant, given the large population, the high prevalence of vulnerable 2 and 3 wheelers, the poor state of many roads and the rapid motorisation. As with many LMICs the full extent of the road safety problem is difficult to measure from the historical crash data due to incomplete crash reporting. The new national road safety strategy 2021-2035 adopts the safe system approach and the United Nations road safety targets - in this second decade of action in road safety. This presentation will discuss the key road safety issues facing Indonesia in lowering the number of fatal and serious injury crashes. It will also discuss several road safety analysis tools and processes, including InaRAP, a blackspot analysis tool and a predictive analysis tool, that are now available to assist the agency in charge of the national highway network to effectively target road safety treatments.

Background

Indonesia has the world's 4th largest population and a high number of road deaths, averaging over 35,000 fatalities per year. This is exacerbated by a high population growth and a large increase in motorcyclists registrations year on year. Like in many LMICs the majority of crashes involve vulnerable road users, especially 2 and 3 wheelers (75%) and pedestrians (16%). Designing roads to be safe for motorcyclists is very challenging and often requires different types of treatments in comparison to countries having a large proportion of cars, and also a greater focus on operating speeds and inter-visibility. As in most LMICs the infrastructure for pedestrians, especially outside the main cities is also poor. A major challenge is where to focus attention, given the large number of safety issues.

Description and Purpose of Road Safety Improvement Initiatives

The road safety improvement initiatives profiled in this presentation are part of a larger project (IRAMS-DC project) that is focused on improving the national highway infrastructure in Indonesia and is funded by the Australian Government through the Indonesia Australia Partnership for Infrastructure (or *Kemitraan Indonesia Australia untuk Infrastrktur* - KIAT). The purpose of the improvement initiatives are to assist the national highway agency (DGH) in achieving the national road safety targets for 2030 as specified in the national road safety strategy, by enhancing the measurement of road safety performance and by developing suitable safety analysis tools to increase the safety effectiveness of its road works program.

DGH Road Safety Program

To reduce the number of fatal and heavy (serious) injury crashes, DGH is currently focusing on eliminating crashes at blackpots and improving the star rating of as much of the the national highways as possible to a minimum of three stars. There are currently in excess of 900 blackspots across the country where there is the equivalent of at least three deaths in a two-year period (in a 300m highway section). Around 8,000 kilometers of the network have also been star rated, as part of the InaRAP program. There is a large proportion of the surveyed highway network that has a star rating of less than three stars, especially for motorcyclists and pedestrians.

KIAT Support to DGH Safety Program and Next Steps

KIAT support to DGH's road safety program has so far led to the development and introduction of new safety performance indicators and of innovative and adaptive safety analysis tools. More specifically, the adoption of both a reactive and proactive approach to road safety was highly promoted. The development of a comprehensive set of safety performance functions (a first we believe in a LMIC) now allows the validation of high risk locations that are showing up, or not, in the historical crash data. This is important given the inacuracies in the existing crash reports and the very low level of reporting of serious injury crashes (it is estimated that less than 1 in 10 are reported). A combination of both historical crash data and predicted crashes rates therefore enables the highest risk locations to be readily identified and treated. The next steps in this project are to consolidate DGH's capacity in blackpots analysis and in the use of the predictive tools, in the development of additional road safety performance indicators that specifically account for vulnerable road users, such as motorcylists and pedestrians, and to support the expansion and improvement of the InaRAP program.

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Reframing Low Level Speeding – Casual Speeding, Every K Counts

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Abstract

Speeding remains the biggest contributor to road trauma in NSW, contributing to around 41 per cent of fatalities and 24 per cent of serious injuries each year. However, despite acknowledging speed as a crash risk, few NSW motorists view their own speeding as a problem. There was therefore a need to develop a behavioural campaign to highlight the risks and consequences of speeding, even at lower levels. Research into NSW motorists' attitudes towards speeding, and NSW crash data, were used to inform campaign development and provide new, impactful key messages. The campaign – 'Casual Speeding: Every K Counts' – launched on 31 October 2021 – aims to reframe how drivers view 'everyday' speeding and encourage them not to speed, even at lower levels. Initial results show the campaign message is clear, believable and resonating with the audience, and is positively impacting attitudes and risk perceptions of lower-level speeding amongst campaign viewers.

Background

Speeding remains the biggest contributor to road trauma in NSW, contributing to around 41 per cent of fatalities and 24 per cent of serious injuries each year. During 2016-2020, 727 people were killed and 6,134 were seriously injured in speed-related crashes in NSW (Transport for NSW, 2021). While most people acknowledge speeding as a key crash contributor, few motorists view their own speeding as a safety risk. There was therefore a need to develop a campaign to reduce speeding in NSW.

Research insights

Findings from quantitative and qualitative research into NSW motorists' attitudes and behaviours towards speeding were used to inform the campaign. Relevant findings included:

- Generally, NSW drivers believe that driving 1-10km/h over the limit is not unsafe and socially acceptable, and most admitted to speeding on a regular basis (Ipsos Social Research Institute, 2016; Snapcracker Research and Strategy, 2019).
- Speeding is not seen as the biggest road safety issue (Ipsos Social Research Institute, 2017).

Crash data analysis also informed development of the campaign and new, impactful and believable key messages.

Campaign development

The campaign aim was to reinforce that speeding is the biggest contributor to road trauma in NSW, and reframe how motorists view 'everyday' speeding, by getting them to reconsider the risk and severity of a crash, even at lower levels of speeding.

‘Casual Speeding: Every K Counts’ was launched on 31 October 2021. Research found this concept had strong potential to address the aims, and the key messages were new, relatable, and engaging (Snapcracker Research and Strategy, 2021).

Campaign executions include 60, 30 and 15 second television advertisements showing a range of motorists engaging in ‘casual’ speeding and travelling less than 10km/h over the speed limit, and ending with an implied crash. Various endings show the impact on the driver/rider, their family, or friend, to address motorists’ different motivators. Radio, social media, digital and billboard content were also developed. Additionally, bespoke concepts were developed for Aboriginal audiences and different channels were used to reach Aboriginal and culturally and linguistically diverse audiences. The campaign is running on television, in cinemas, online, radio and out-of-home (e.g., billboards).

Key messages included:

- Casual speeding is the biggest cause of deaths and serious injuries on NSW roads
- Let’s all stop being so casual about speeding
- Casual speeding. Every K counts.

Campaign success and next steps

The initial phase aims to reset culture and educate motorists on the risks and consequences of casual speeding. Initial tracking results show the campaign message is clear, believable and relatable. While it is too early to evaluate behaviour shifts, results suggest that the campaign is positively impacting attitudes and risk perceptions of lower-level speeding. For example, campaign viewers are more likely to strongly agree that ‘small changes in speed can have a big impact on the outcome of a crash.’ Continuing analysis will be conducted to monitor campaign impact and make modifications as required. Future phases can build on this foundation with the aim of normalising the behaviour to not speed, even at lower levels.

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Alcohol-Related Crash Trends in New Zealand

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Abstract

The consumption of alcohol impairs driving abilities, increasing the risk and severity of crashes. Good quality data on alcohol-related crashes and interventions is essential for policy makers and researchers to inform decision making, and to refine strategies and tactics aimed at reducing alcohol-related road trauma. This research examined how 'fit for purpose' alcohol-related crash data and other associated data are in New Zealand, and studied trends in these crashes and their connection with contributing factors. The research focused on the period between 2010 and 2020, which spans several changes in drink driving policy and enforcement including the introduction of legislation in December 2014 to reduce the blood alcohol concentration limit for drivers aged 20 years and over from 80 mg/dl to 50 mg/dl. The research yielded several recommendations for improving the collection and reporting of alcohol-related crash and enforcement data and identifies areas for further research.

Background and context

The majority of adults in New Zealand drink alcohol, and many do so responsibly and in moderation (Ministry of Health, 2015). However, alcohol consumption is also associated with a wide range of harms, including drink driving. Consuming alcohol before driving impairs driving skills, and impaired drivers are a danger to themselves and other road users. Previous research identified alcohol as a primary factor in recent increases in road fatalities, which had been decreasing up to 2013 (Walton, Jenkins, Thoreau, Kingham & Keall, 2020). This was a concern given blood alcohol concentration limits for drivers aged 20-plus were reduced in 2014 to bring New Zealand in line with international best practice. Alcohol-related deaths and serious injury crashes were expected to decrease following the change in limit.

Project description

An investigative study into New Zealand alcohol-related crash data and related datasets was undertaken by Abley in 2021 and 2022 on behalf of Waka Kotahi NZ Transport Agency. The research included a review of New Zealand, Australian and international literature, a comparison of practice among comparable international jurisdictions, and engagement with stakeholders from relevant New Zealand organisations. Several alcohol-related crash and enforcement datasets were identified and analysed, including detailed breath testing, blood testing and offence datasets. Drug-related crashes were specifically excluded from the scope of the work.

Observations and recommendations

The research highlights that policy around alcohol and driving is a continually evolving area, even for jurisdictions that are considered best practice leaders as they adapt to changing societal attitudes and behaviours. To be effective, policy must be supported by public education and prevention programmes, highly visible enforcement, and penalties that are predictably and swiftly applied. Drink driving falls within the wider issue of alcohol harm, and drivers with substance abuse problems must be screened and treated to address the root cause.

In New Zealand, police officers attend all fatal and serious crashes as well as many minor or non-injury crashes. Drivers involved in crashes of any severity are tested for alcohol. However, the research uncovered inconsistencies in how this is brought through into national datasets. When attending crashes, police officers are understandably focused on recording crash data for the purpose of charging drivers and may not be aware of how it is used by road safety practitioners. It is essential that effective communication and data sharing is in place between police, public health and transport authorities.

The research also identifies opportunities afforded by recent improvements in breath test data collection. NZ Police recently rolled out new testing devices for passive, screening and evidential breath tests. These devices record every test administered along with their time and date, result, and GPS coordinates. This enables advanced analysis of enforcement activities, including the ability to evaluate effectiveness of breath-testing strategies.

The outcomes of this research will be used to inform approaches to future collection and analysis of alcohol-related crashes, thereby leading to interventions which seek to encourage safe choices and behaviours, and ultimately reducing alcohol-related road trauma.

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Supporting Older Drivers With Decisions About Driving

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Abstract

Driving is important for both practical and psychosocial reasons, such as reinforcing feelings of independence and sense of identity (Sanford et al., 2018). Therefore, retiring from driving can lead to psychosocial declines, especially if it happens suddenly. Navigating conversations about driving with older adults to ensure the safety of themselves and others is often complex and emotive. Guided by co-design principles, a decision aid was developed to engage older drivers early and inform and support decisions about whether to continue driving, modify driving routines, or retire from driving. The aid was informed by multiple stages comprising academic review; consultation with expert advisory groups; piloting; and reiterative revision based on feedback. The majority of older adults found the aid 'useful' and would recommend it to others. The resulting aid offers a person-centred solution to support older drivers with decisions about driving, and contribute to enhanced psychosocial and road safety outcomes.

Background

For older adults, loss of driving privilege can lead to psychosocial and mental health declines, especially if it happens suddenly (Chihuri et al., 2016). This is because driving provides a sense of independence, freedom, identity and control. Yet age-related changes in physical and cognitive functioning can lead to reductions in driving performance; and older adults are at higher risk of injury or death if involved in a crash (Ang, Chen & Lee, 2017). Therefore, conversations about driving with older adults to address safety while also maintaining their independence can be difficult. To better support older drivers, there is a need for person-centred resources to engage them early to make informed decisions about driving.

Purpose and description

This project aimed to develop a decision aid to support older drivers to make informed decisions about driving. Three stages informed the development of the aid. First, formative research included systematic literature reviews, and examination of international decision aid guidelines and best practice guidelines for co-design research. This stage also included consultation with road safety officers, driver-trained occupational therapists, eye professionals and general practitioners, as well as interviews with older drivers. Stage two comprised workshops and meetings to inform the purpose, content and format of the aid with two expert advisory groups – (i) older drivers and (ii) multi-disciplinary practitioners from eight professional domains and industry partners. Stage three involved the development of the aid including review and acceptability testing with older adults, practitioners and family members. Modifications to the aid were made based on the findings from the review. The finalised aid is being disseminated across NSW through a multi-faceted promotion strategy.

Evaluation/Lessons Learnt

Engagement with multiple and diverse groups to develop the aid was a strength of this study. The collaborative co-design approach ensured the views of older drivers and other key stakeholders were reflected in the content, presentation and format of the aid. Overall, the majority of older adults who participated found the aid 'useful' and 'balanced' and would recommend it to other older drivers. The presentation, interactive format, example quotations and comprehensive content were highlighted as positive features of the aid. The co-design process enabled strong engagement from the target end users, which ensured the final resource authentically integrates the views of older drivers.

Conclusions

Engaging older drivers in conversations about future driving decisions is important for both psychosocial and road safety outcomes but can be challenging and emotive. The older driver decision aid offers a unique solution to support older drivers with decisions about continuing safe driving or transitioning to driving retirement. The use of a co-design process enhanced the utility of the aid and ensured it remained person-centred. The aid provides a new and unique opportunity to support conversations regarding driving retirement, that may lead to enhanced psychosocial and road safety outcomes.

Next Steps

Future evaluations will be useful to determine the uptake of the aid, and whether it increases knowledge, enhances decision making, reduces decisional conflict or facilitates a smooth transition to driving retirement.

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Mornington Peninsula Speed Management Evaluation

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Abstract

The Mornington Peninsula Shire Council (MPSC) adopted safer speed limits across the Council's higher speed road network in early 2020, as part of their speed management program. This included reducing speed limits on the majority of their 100km/h and 90km/h roads to 80km/h. A before and after assessment has been undertaken on the effectiveness of this program using quasi-experimental methods. Before data was collected in November/December 2019. For both 'after' survey periods (in May 2020 and November 2020) there was a significant drop in mean speeds and an increase in the number of drivers travelling below the safe system speed of 80km/h. However, the compliance with the new speed limit was worse than with the old speed limit, indicating that further speed management interventions are required to encourage drivers to comply with the lower limits. The expected savings in FSI crashes were estimated using Elvik et al. (2004) speed-power curves.

Background

During 2019 the Mornington Peninsula Shire Council (MPSC) roading network experienced an unusually high number of fatal and serious injury (FSI) crashes (12 fatalities and 100 serious injury crashes). This was the highest number of FSI crashes of any municipality in Victoria and well above the two deaths in MPSC in the preceding year. Given the strong political and council officier support for the safe system approach, the Council were able to swiftly respond to this crisis in early 2020 by dropping speed limits on the majority of their high speed roads. Working with MPSC and Road Safety Victoria (RSV), the Safer Roads team within the Victorian DOT undertook a short term evaluation of this program.

Methodology

To understand the effectiveness of the MPSC speed management program, an initial (short term) evaluation framework was prepared. The intention of the evaluation was to assess the change in mean speed, and compliance with the speed limit, before and after the lower speed limits were introduced. Spot speed data was collected (using tube counts) on both treated and control sites before and after the speed limit change. In addition to operating speed changes the expected change in Fatal and Serious Injury (FSI) crash risk going forward was also estimated using research (by Elvik etal. 2004) on the relationship between speed and various serverities of crash risk.

Results

In this study the more robust analysis was for the 100km/h to 80km/h routes (20km/h speed limits drop), where treated and controlled paired sites were available. The reduction in speeds was found to be greater in the first After 1 period (May 2020) than in the second After 2 period (November 2020). The mean (free) speed reductions were 5km/h and 3-4km/h respectively for the two periods. Both After periods were influenced by the Covid lockdowns that reduced traffic volumes and After 1 also included speed limit change signage. The mean speed reductions of 3km/h in the 90km/h to 80km/h assessment were less robust as there were no suitable control sites available. The analysis also showed that overall there was better compliance with the 80km/h safe system speed when the speed limit was dropped from 100km/h or 90km/h to 80km/h. The crash analysis indicated that there should be at least a 20% reduction, most likely higher, in FSI.

Conclusions and Next Steps

This research showed that there was a significant drop in operating speeds as a result of the speed limit changes in MPSC in both after periods, even though these were affected by changes in traffic volume due to Covid. There is more confidence in the paired comparison approach used for the100km/h to 80km/h sites, while the result for 90km/h sites should be considered an interim result. Following the ‘before’ speed data collection an improved evaluation framework was developed for local roads by the Safer Roads team. This framework provides details on more robust analysis methods that could be applied in future studies. The next steps in this work is the analysis of data for a third after period.

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A new level of intelligence to optimise enforcement

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Abstract

Optimising the efficiency of finite road policing resources requires sophisticated, high-quality intelligence. Victoria Police seeks to influence road user behaviour through a combination of specific and general deterrence. Victoria Police developed a strategically focussed Tasking & Coordination (T&C) model to inform a general deterrence response plan that incorporates best practice and active engagement with key Road Safety Partners. To support T&C initiatives, a sophisticated, multi-layered intelligence process has been developed to identify the state's highest risk areas. The analysis incorporates a people behaviour centric approach. This enables T&C to leverage local resources with state resources within high risk areas. The deployment methodology generates a highly visible policing presence focused on strategic policing priorities.

Background

Whilst road trauma stems from system-wide factors, it is well accepted that road user compliance remains a fundamental element of the Safe System. The main role of the T&C model is to reduce road trauma through influencing behaviour. The model ensures an intelligence led approach is used across all road policing activity. To inform T&C, the intelligence analysis uses a behaviour-centric approach that goes beyond collision data. Further, the analysis assesses the risk of identified areas and priorities. This enables planners to deploy resources more effectively and coordinate activities with other Road Safety Partners.

Methodology

Behaviour centric approach

People behaviour centric approach requires analysis to understand unsafe behaviour aligned with road safety priorities. This approach recognises certain offending can be either journey-based or localised, and offending behaviours (such as speeding or drink driving) need to be individually considered. Traditional collision analysis is therefore supplemented by other sources to better understand road user journeys and expected behaviours. Intelligence incorporates three core elements: proactive, strategic intelligence and sophisticated geospatial analysis.

Risk assessment

The risk level is assessed based on the likelihood of a collision occurring. The outcome of each analysis is combined to identify overlapping areas. A combined risk assessment is performed, enabling the prioritisation of areas and themes. The risk is highest when there are high volumes of movement and high rates of poor behaviour occurring in areas where greater concentrations of offending drivers reside.

Enforcement

Enforcement activities are based on multi-layered analysis identifying key road safety themes to be addressed across relevant timeframe, along with high-risk priority Areas of Operation. An additional layer of response is also considered where a specialist response is required, specific risk is identified. The T&C process develops a holistic response plan, utilising best practice, evidence-based enforcement methodology, media activity and education to respond to the risks identified. Engagement with internal and external Road Safety Partners enhances the overall response and community safety particularly when considering the finite police resources available. These stakeholder partnerships enable additional road safety activities to occur, including coordination of media and messaging strategies and facilitation of joint operations.

Results

Policing resources are deployed in a highly visible, coordinated manner supported by the Road Safety Partners through media and education. This combined approach primes, enhances, and extends the effect of enforcement activity in line with general deterrence theory. While implementation of this model is still in its infancy, anecdotally the large-scale impact of considerable resources into high-risk areas has been acknowledged by local communities and influenced road user behaviour (e.g. cancellation of events known to contribute to drink driving).

Conclusion

By understanding behaviour beyond collisions an environmental context provides intelligence with an edge in identifying high risk areas and times. Visual representation is also important to convey the intelligence insights to planners. Throughout the T&C process, maintaining engagement with key partners is fundamental to effectively coordinate road policing activities to positively influence driver behaviour. As the process matures and progresses, a full evaluation will be undertaken to assess longer term impacts.

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Health in Gear: Improving Health and Wellbeing for Truckies

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Abstract

Truck driving is one of the most challenging jobs in the country. Not surprisingly, heavy vehicle drivers carry a higher burden of chronic disease, injury, and poor mental health, in comparison to other occupations. Truck drivers represent the second highest occupational group, after construction workers, at risk of suicide. The Health in Gear program is a health and wellness initiative for truck drivers, developed in collaboration with drivers, for the driving community. Health in Gear is an initiative of the OzHelp Foundation, a national suicide prevention organisation and has been funded by the National Heavy Vehicle Regulator's (NHVR) Heavy Vehicle Safety Initiative (HVSI). The program supports drivers in achieving optimal wellness through access to key information in accessible health tips. The program also includes the 'Truckies Tune Up' (TTU) - a physical roadside health check with follow up support, counselling, and referrals to other services as required.

Objective

OzHelp developed the *Health in Gear* program to deliver a mental health and wellness program to address and target the industry-specific challenges around mental and physical health for workers in the heavy vehicle industry, with the aim to contribute to improved driver health and wellbeing and improved road safety outcomes.

Project design

To support the design and development of *Health in Gear* OzHelp commissioned a literature review, *Physical and Mental Health and Wellbeing of Heavy Vehicle Drivers in the Road Transport Industry: Risks, Issues and Impacts*. Additionally OzHelp undertook extensive Industry consultation to ensure the voices of many drivers were heard alongside experts in road safety and mental health.

The project was co-designed with input from the following contributors:

- A **project steering committee** comprising of a range of industry representatives who met bimonthly to provide industry advice, ensure delivery of the project outputs and the achievement of project outcomes.
- A **working group of 20 Owner Drivers** were central to the co-design stages of consultation, with additional working groups established during program design.
- Industry representatives and drivers **(ambassadors)** who aligned with the values and objectives of the project and their capacity to reach the target audience.

Project content

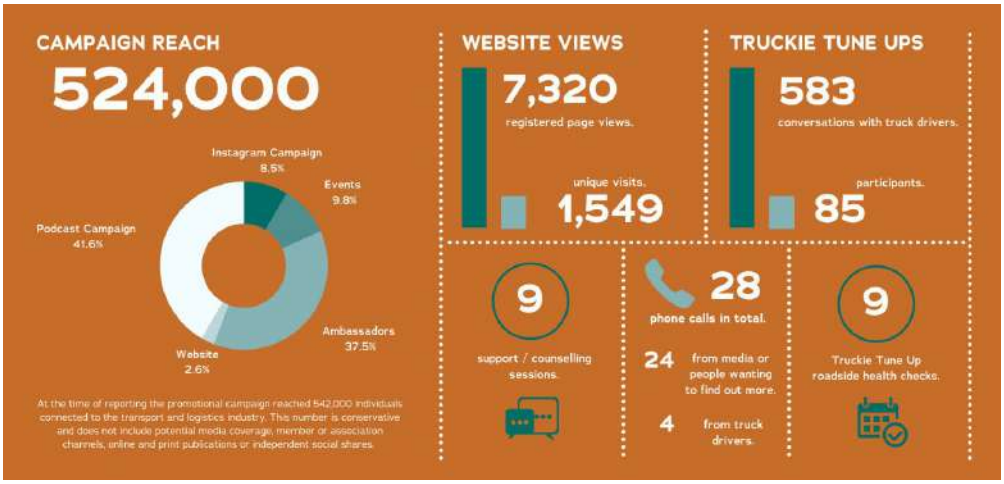
- **The Truckie Tune Up:** A roadside early intervention/prevention health check led by a nurse and wellbeing support worker to connect with drivers and provide information, support and referrals.
- **Support and Counselling:** The telephone support line 1800 IN GEAR and access to free counselling from experienced clinicians with training and induction to understand the industry specific risk factors.

- **Website:** Resources for self-paced learning, delivering "wellness in small chunks" in the form of Health Tips.
- **Ambassadors:** To promote the program and amplify the importance of help-seeking behaviours. The creation of the **Podcast** series, "Share the Load" as a way for key industry people to share their stories with the transport and logistic community

Project outcomes

During the pilot phase *Health in Gear* delivered across the ACT, New South Wales and Queensland a program that:

- connected with 583 drivers and delivered 78 Truckie Tune Ups (TTUs) at key roadside hubs
- reached 524,000 people connected to the transport and logistics industry through an information campaign
- provided accessible online information at www.healthingear.com.au accessed by 1549 visitors
- established a telephone support line 1800 IN GEAR to provide after hours supports
- created 'Share the Load' podcast, downloaded 573 times, that drivers could listen to while on the road.



At the time of reporting the promotional campaign reached 542,000 individuals connected to the transport and logistics industry. This number is conservative and does not include potential media coverage, member or association channels, online and print publications or independent social shares.

Figure 1. Break down of Health in Gear project outcomes

Next Steps

Over the coming months *Health in Gear* will deliver Truckie Tune Ups at three key locations (hubs) along the Hume Highway. From the pilot we learned the importance of an increased presence on the road to increase awareness of the program. The *Health in Gear* team will visit each location three times during the service period for three days at a time to increase visibility. In addition to the hubs, we will also extend our service delivery to major distribution centres including all transport and logistics workers.

It also became evident that the 1800 support line needed to expand to a 24/7 service so we have partnered with an organisation to provide this extended support to transport and logistic workers, and their families.

Conclusion

Our goal is to have a deep engagement with drivers to improve the mental and physical health and wellbeing of workers in the transport industry, ultimately keeping drivers healthier and safer on the road.

Great Ocean Road and Inland Routes Road Safety Assessments

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Abstract

The Great Ocean Road and Inland Routes in southwest Victoria, Australia serve as major corridors connecting several townships in the state. In the past five years, over 400 crashes were recorded along these corridors. In light of the Department of Transport's (DoT) commitments to the Victorian Road Safety Strategy and Road Safety Action Plan, there is a need to strategically assess these crashes to determine and prioritise road safety treatments and ensure federal funding is realised. Recorded crashes were mapped to determine where 'crash clusters' occurred. These clusters have three or more crashes with similar crash types where common treatments may apply. Site inspections were undertaken, and stakeholders engaged to determine areas of concern within their jurisdiction. Upon finalising the cluster locations, road safety improvements were conceptualised. Multi-Criteria Analysis was conducted for the treatments of each cluster to determine which treatment packages would be prioritised in the next 10 years.

Background

The Great Ocean Road is one of Australia's most recognised tourist destinations with around

2.7 million visitors every year. The 240 km corridor located in southwest Victoria is connected to Princes Highway, another major corridor, via several Inland Routes that combine for 320 km in length.

Over 200 crashes involving over 600 people occurred along Great Ocean Road in five years between 2016 and 2020, with a similar number recorded along the Inland Routes. These crashes incur costs that impose a burden to the community – in this case, over $270 M based on DoT rates.

Road Safety Analysis

Recorded crashes were mapped using geographic information systems (GIS) and analysed to identify clusters. Figure 1 shows the crash location summary. A cluster was defined as locations where crashes were of similar types based on DCA classifications and occurring close together. Approximately 34% of total crashes were considered within clusters. Consultations with local Councils were undertaken to provide additional context and feedback on areas within their jurisdictions known to have "near misses" and areas of concern to these stakeholders. Completed, ongoing, and planned DoT projects for the next financial year were mapped to determine if projects have already or will attempt to remedy the recorded crash types within the clusters identified.

Collision diagrams were prepared for each cluster to visualise the crashes occurring. Site investigations were undertaken for each cluster to understand existing conditions (including sight distance, signage, road surface condition, lighting, travel speed etc.) that may have contributed to crashes.

Strategic Prioritisation

Based on analyses and findings, a series of road safety treatments were development for each cluster to address different road safety aspects relating to the crash history. Each cluster could have one or multiple treatments, varying from simple treatments such as improvements in line-marking and signage, to more complex ones such as kerb/drainage works, adding turn lanes or safety barrier installation. High-level cost estimates were calculated for individual treatments and packaged for each cluster.

Figure 1. Location of crashes and identified clusters

To understand which crash clusters should be prioritised, each treatment was assessed through a Multi-Criteria Analysis (MCA) framework. A set of MCA definitions were developed based on an Investment Logic Map (ILM) to assess how funding should be distributed to improve safety outcomes. Weightings for treatment prioritisation primarily focused on road safety improvements and secondary considerations were costs and constructability, potential impacts to community and changes to access, and potential impacts to environment and cultural heritage. Treatment packages for each cluster were then ranked based on scores from the MCA in order of priority.

Conclusion and Recommendations

Actual conditions and problems along the Great Ocean Road and Inland Routes were used to identify crash clusters and conceptualise potential road safety treatments. An MCA process was used to prioritise these treatments for funding. Subject to funding, the recommended treatments will be developed further by DoT. It is recommended that DoT undertake further analysis of the effectiveness of any treatments that are implemented to understand the impacts that these have on safety (e.g. reduction in crashes).

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The NSW Mandatory Alcohol Interlock Program and drink driving re-offending

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Abstract

Alcohol interlock systems have increasingly been introduced as a measure to address drink driving and alcohol related road trauma, which remain at stubbornly high levels. A growing body of evidence suggests that interlocks are effective in reducing drink driving reoffending while installed in the vehicle, but there is less evidence of their longer-term effectiveness, once the device is removed (Blais et al., 2013). This evaluation examines the effectiveness of the Mandatory Alcohol Interlock Program (MAIP), introduced in NSW in 2015, for high-range and repeat drink drive offenders. It considers the take up and completion rates for the program and its impact on drink driving reoffending, involvement in alcohol related crashes and drive whilst disqualified offences. The evaluation draws on a linked data set comprising licensing, crash and program data from Transport for NSW (TfNSW) and reoffending data from the NSW Bureau of Crime Statistics and Research.

Background

Despite considerable reductions in drink driving since the introduction of Random Breath Testing (RBT) in 1982, and through continuing education campaigns, enforcement activity, strengthening of penalties for drink driving and the introduction of a zero-alcohol limit for novice drivers, drink driving remains a serious problem in NSW. There were approximately 13,500 proven drink driving offences in NSW in 2020, with around 3,500 for high range or repeat offences (Transport for NSW, unpublished data, 2022). Alcohol remains a significant contributor to road trauma, with alcohol involved in 54 (19%) fatalities and 303 (7%) of serious injuries on NSW roads in 2020 (Transport for NSW, 2022).

The Mandatory Alcohol Interlock Program (MAIP) was introduced by the NSW Government and commenced in February 2015. It was legislated through the Road Transport Act 2013 and operates as a mandatory court-ordered penalty for drivers convicted of repeat or high range drink driving offences (and was later extended to include mid-range drink driving offences in 2018). It aims to reduce drink driving reoffending and the incidence of crashes, injuries and fatalities on NSW roads resulting from drink driving.

Early indications, based on self-report data from a process evaluation undertaken (Transport for NSW, 2019), suggested that the interlock was helping interlock participants to separate their drinking and driving. The current evaluation represents the first comprehensive outcome evaluation of MAIP in NSW and is based on drink driving offences detected by police.

Evaluation aims and methodology

The aims of the evaluation are to examine the -

- extent to which high range and repeat drink driving offenders are issued with interlock orders
- take up and completion rates for MAIP
- impact of MAIP on drink drive re-offending, involvement in alcohol related crashes, drive whilst disqualified and other driving offences

The primary data source for the evaluation is a linked data set comprising licensing, crash and program data from Transport for NSW and reoffending data from the NSW Bureau of Crime Statistics and Research. The evaluation sample includes all drink driving offences between 2015 and 2018.

The evaluation utilises an intention-to-treat design to examine program impact. Drink driving offenders who are eligible for MAIP form the treatment cohort and drink driving offenders who are not eligible for MAIP (low, special, novice range and first-time mid-range offenders) form the control cohort. A difference-in-differences approach is used to track whether there are any differences in the behavior of the two cohorts over time.

In addition, a fuzzy regression discontinuity design approach is to estimate the impact of MAIP on individuals who opt to take up the interlock device. It compares outcomes for first-time offenders who are just above the high-range PCA threshold and opt into the program with similar offenders just below the high-range PCA threshold, who were ineligible for MAIP.

The findings will provide Transport for NSW and key program stakeholders with valuable evidence about the effectiveness of the program in reducing drink-driving reoffending and alcohol related crashes and will help inform future program design and delivery.

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Participant experiences of the NSW Mandatory Alcohol Interlock Program

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Abstract

Alcohol interlock systems have increasingly been introduced as a measure to address drink driving and alcohol related road trauma, which remain at stubbornly high levels. Evidence suggests that interlocks are effective in reducing drink driving reoffending while installed, but there is less evidence of their longer term effectiveness (Blais et al., 2013), or among Aboriginal people. Low participation rates in interlock programs are not uncommon. This evaluation will examine the Mandatory Alcohol Interlock Program (MAIP), introduced in NSW in 2015, for high-range and repeat drink drive offenders. It will explore participant and stakeholder experiences with the program, including Aboriginal participants, and aims to identify areas where the program can be improved to better achieve its objectives of making NSW road safer, while minimising negative impact on participants. The evaluation will draw on surveys, focus groups and interviews with key stakeholders and program participants, as well as program data.

Background

Despite considerable reductions in drink driving since the introduction of RBT in 1982, and through ongoing education campaigns, enforcement activity, strengthening of penalties for drink driving and the introduction of a zero-alcohol limit for novice drivers, drink driving remains a serious problem in NSW. There were approximately 13,500 proven drink driving offences in NSW in 2020, with around 3,500 for high range or repeat offences (Transport for NSW, unpublished data, 2022). Alcohol remains a significant contributor to road trauma, with alcohol involved in 54 (19%) fatalities and (7%) of serious injuries on NSW roads in 2020 (Transport for NSW, 2022).

The Mandatory Alcohol Interlock Program (MAIP) was introduced by the NSW Government and commenced in February 2015. It was legislated through the Road Transport Act 2013 and operates as a mandatory court-ordered penalty for drivers convicted of repeat or high range drink driving offences (and was later extended to include mid range drink driving offences in 2018). It aims to help participants separate their drinking and driving to reduce drink driving reoffending and the incidence of crashes, injuries and fatalities on NSW roads resulting from drink driving.

An earlier process evaluation undertaken (Transport for NSW, 2019), suggested that while the program was being delivered effectively and early findings provided some evidence that the program was helping interlock participants separate their drinking and driving, it also highlighted that there were areas for improvement. These included take up rates for the program, accessibility of the program in some areas, the need for improved communication about the program and the financial support provisions available, with cost a concern for many participants. The evaluation presented in this abstract builds on this earlier work and further explores these issues and participant experiences with the program six years on.

Evaluation aims and methodology

The aims of the evaluation are to -

- Examine participant experiences with the program, with a particular focus on barriers and enablers to take up and completion of the program, and whether Aboriginal participants experience the program differently
- Identify areas where the program could be improved and formulate actionable recommendations to increase the program's effectiveness with regards to achieving its targeted outcomes

The primary data source for the evaluation will be surveys, focus groups and interviews with key stakeholders and program participants, including Aboriginal participants. The findings from these primary data sources will be presented alongside program data on participation rates across different participant characteristics, collected by NSW Transport, to ensure the findings can be considered within their context

The evaluation will complement a separate, but related, evaluation of MAIP based on detected drink driving offences. The findings will provide Transport for NSW and key program stakeholders with valuable evidence about the participants' experiences with the program and its effectiveness in reducing drink-driving reoffending and alcohol related crashes and will help inform future program design and delivery.

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An Evidence-Based Approach to Reduce Speed in School Zones: Vietnam

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Abstract

Speed is a major contributor to road crashes in Vietnam – with particular risks posed to students in their daily commutes to school. This abstract aims to explore the impact of the *Slow Zones, Safe Zones* program – which utilizes a multi-faceted, evidence-based set of speed-reduction interventions to improve the safety of student journeys to school. Phase 1 of the *Slow Zones, Safe Zones* program was implemented by the AIP Foundation in Pleiku, Vietnam from 2018-2020 with broad support from a coalition of public-private stakeholders, including Fondation Botnar, Global Road Safety Partnership, Fédération Internationale de l'Automobile, and Vietnamese government agencies at the local and national levels. The program incorporates community and school-based education and awareness raising activities, road modifications, stakeholder engagement and capacity-building, and strategic policy advocacy – which has resulted in substantial improvements to the status of road safety at target school sites and across Vietnam.

Background

Road injuries account for the second highest number of deaths in Vietnam for children aged 5-14, who are particularly at risk on their commutes to school (WHO, 2010). There are many contributing factors to Vietnam's road safety crisis, but one in particular stands out: 25% of road crashes are caused by speeding. In Vietnam, 64% of drivers surveyed felt it was understandable to drive at speeds above the legal limit (Hung et al, 2011). Speed reductions lower the potential for pedestrian collisions and likelihood of serious injury or death from crashes. While pedestrians have a 90% chance of survival when struck by a car travelling at 30km/hr or less, they have a 90% chance of death when struck at 60km/hr (WHO, 2004).

Project Approach

The *Slow Zones, Safe Zones* program aims to reduce road crash injuries and fatalities in school zones in Pleiku by improving the road safety environment and culture for students commuting to school through a comprehensive set of interventions to limit speed.

Components include:

- Improving school zones safety in Pleiku by installing road modifications and conducting public awareness campaigns
- Developing and piloting a nationally-applicable road safety e-curriculum
- Supporting provincial government to develop legislation to enforce reduced speed in school zones in Gia Lai province.

Furthermore, the program focuses on building the capacity of relevant stakeholders throughout Pleiku and Gia Lai province, providing strategies to be shared with stakeholders nationwide, and advocating for improved legislation and enforcement to ensure lasting impact.

Methodology and Results

Slow Zones, Safe Zones interventions were measured pre-and post-intervention using a diverse set of quantitative and qualitative methods to evaluate the effectiveness of program interventions:

Table 1. Monitoring and Evaluation Framework

Intended Outcomes & Impacts	Evaluation Methodology	Sample Size	Selected Results
Decrease crashes among students near school zones	Questionnaire (self-reported)	• 2,071 students	Reduction from 34.1 to 30.4%
Raise knowledge of students and community members toward road safety behaviors and speed reduction	Knowledge Surveys	• 355 students • 2,202 community members	% of people who correctly identified the speed limit increased from 15.9% to 65.8%
Create safer road infrastructure in school zones	Star Rating for Schools – Infrastructure Assessment	• 2 test schools	5-star post-intervention rating for all test schools
Reduce speed of road users at target school zones	Speed Measurement Surveys	• 2 test schools	Reduction in average driving speed by 18-21 km/h
Obtain Pleiku City's approval for speed reduction	Issuance of official government decision	n/a	Passage of legislation to reduce speed limits to 30-40 km/h in all Pleiku City school zones

Conclusion

Slow Zones, Safe Zones has demonstrated strong pilot resuts in improving the road safety environment and public knowledge toward reducing speed in school zones. Furthermore, the program has resulted in the passage of local and national legislation on school speed limits, demonstrating the effectiveness of the program's approach to stakeholder engagement and policy advocacy. Evidence suggests that the program model can be replicated for future interventions to improve school zone road safety in other regional contexts.

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Development of a 'National Definition of Categorising Accidents' code

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Abstract

Road crashes in Australia are classified differently depending on jurisdiction. While translatable across jurisdictions, having different crash codes makes national reporting of crashes more confusing than it needs to be. We therefore developed a new, standard set of crash types for analysing national crash statistics: the 'National Definitions of Categorising Accidents (N-DCA)' code. The new N-DCA code was developed from a review of the existing jurisdictional crash type codes, and incorporates 87 individual crash types, with an associated chart of descriptive images. We started with the Austroads 2015 DCA chart and added/removed codes to account for additional or duplicate codes between jurisdictions to produce the N-DCA. The N-DCA will be used as a consistent national standard for analysing national road safety data. This will support the implementation of the National Road Safety Strategy 2021-30 (NRSS 2021-30) and associated safety performance indicators and enable evidence-based investment decision on road safety infrastructure.

Background

The NRSS 2021-30 was released on 22 December 2021, following endorsement by Infrastructure and Transport Ministers. The National Road Safety Data Hub was established in 2020, as part of the Office of Road Safety in the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications. The Data Hub's role is to support delivery of the NRSS 2021-30 and its associate performance indicators. A national set of crash type definitions facilitates both measures of outcomes and changing priorities for interventions.

Challenge

Between 2010 and 2021, the national annual fatality rate per 100,000 population decreased from 6.1 to 4.4 people (-28 per cent); while the Australian population has grown approximately 15%[1] throughout this period, the annual number of road deaths has fallen slightly to near 1,000 people. Interventions by all levels of government contributed to this, including infrastructure and vehicle safety improvements. 1,000 road deaths per year is still way too many.

The new strategy and performance indicators present an opportunity and challenge to improve the collection and collation of jurisdiction road safety data to help improve the road safety culture and further reduce road death in line with the Vision Zero principles.

One of the biggest challenges for producing national road crash measures are the differences between reported crash information from the jurisdictions. Each have similar but different onsite reporting templates and crash code definitions. Indeed, jurisdictions throughout Australia share use of established codes, with three jurisdictions using Road User Measurement (RUM) codes and four using Definition of Categorising Accidents (DCA) codes. While fit-for-purpose within that jurisdiction, their usefulness when aggregated at the national level declines. In order to address the current strategy, data needs to be specific, measurable, accurate, relevant and timely, hence the need for a national set of crash types. A national set of crash types enables the consistent identification of crashes for suitable infrastructure treatments.

Result

Staff from the BITRE and ORS road safety teams worked together to explore differences in interpretation of the existing jurisdiction coding of crash types. Meticulous discussion of the merits of individual codes resulted in an agreed set of 87 standardised unique crash type codes for analysing road crash data nationally. A **sample** of the National DCA chart, with unique code classification numbers, descriptions and images is shown below.

Applying the new code to 'head-on' crashes, we found what had previously been represented by two codes specifically titled 'head-on' could more correctly be attributed to six codes showing vehicles colliding from opposing, though not necessarily completely opposite, directions.

Conclusion

We are now applying this national DCA code to future national analysis to provide a higher degree of consistency in national reporting of fatal and serious injury crashes. This information is feeding into the evidence-based decision-making process around road safety infrastructure investment and implementing improved vehicle and road safety treatments to continue to lower the national road toll.

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Analysis of crash/casualty unit costs used in investment appraisal models

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Abstract

The importance of crash/casualty unit costs in the economic appraisal of road safety countermeasures cannot be overemphasized. Accordingly, their computation has largely created debates and arguments among scholars. This paper analyses published unit costs in the most widely used road safety investment appraisal models. The results show that casualty unit costs computed using International Road Assessment Programme (iRAP) methodology are comparable to those recommended by the Economic Efficiency Evaluation (E^3). However, the crash unit costs in SafetyAnalyst and E^3 models are incomparable due to methodological differences in computing human costs. There are no differences regarding cost components in all models except iRAP model that does not include economic costs in their estimation and thus appears to be unrealistic and more so the methodology for computing the value of a serious injury. This paper recommends a more detailed methodological review of the iRAP approach to improve the accuracy of the results.

Background

The importance of crash or casualty unit costs in the economic appraisal of road safety countermeasures cannot be overemphasized and their computation has largely created debates and arguments among scholars. These unit costs are used in a cost benefit analysis (CBA) to express the road safety effect of policy measures as a monetary value and balanced against the cost of countermeasures (SWOV, 2020; Wijnen and Stipdonk, 2016). The failure to accurately determine the monetary benefits using an appropriate unit cost might result in an under investment in road safety. For this reason, unit costs used and advocated for by a number of road safety models such as International Road Assessment Programme (iRAP) (iRAP, 2015), Economic Efficiency Evaluation (E^3) (Martensen et al., 2018) and SafetyAnalyst (AASHTO, 2020) should exhibit some uniformity to ensure comprehensiveness. iRAP, for example, developed a 'rule of thumb' to compute the value of a serious injury and suggested it was less robust (McMahon & Dahdah, 2008) which is explored further in this study. Therefore, this paper attempts to analyse the cost per crash/casualty and the cost components used in these appraisal models .

Method

Firstly, published casualty units costs recommended by E^3 model for 2015 (Wijnen et al., 2017) and European Union (EU) casualty units computed using iRAP methodology (McMahon & Dahdah, 2008) are analysed and presented. Secondly, comprehensive crash unit costs in SafetyAnalyst (Harmon, Bahar and Gross, 2018) and E^3 model (Wijnen et al., 2017) are analysed. The unit costs recommended by E^3 model were developed by the European SafetyCube project to support stakeholders in conducting economic efficiency evaluation of measures.

Results

Cost per casualty (iRAP and E^3)

The cost components in these two models vary significantly with most items such as medical costs, administration, property damage and other costs not considered in the iRAP model. The casualty units costs are comparable although surprisingly the unit cost for a serious injury in iRAP is slighltly higher.

Cost per crash (SafetyAnalyst and E^3)

The cost components in both models appear similar and are comparable despite the differences in terminology. These components appear to be comprehensive combining both economic costs and human costs (the intangible consequences of crashes to individuals and families). The components used in both models are similar and in agreement to those used to determine crash costs in other studies (Bahamonde-Birke, Kunert and Link, 2015; Wijnen et al., 2019). However, the unit costs are incomparable due to methodological differences in computing human costs.

Conclusions

There are no differences regarding cost components in all models except iRAP that does not include economic costs and thus appears to be unrealistic. The value for a serious injury in iRAP is slightly higher due to a higher percentage that differs significantly from literature recommended values. The crash unit costs are incomparable partly due to methodological differences in computing human costs. This paper recommends a more detailed methodological review of the iRAP approach to improve the accuracy of results.

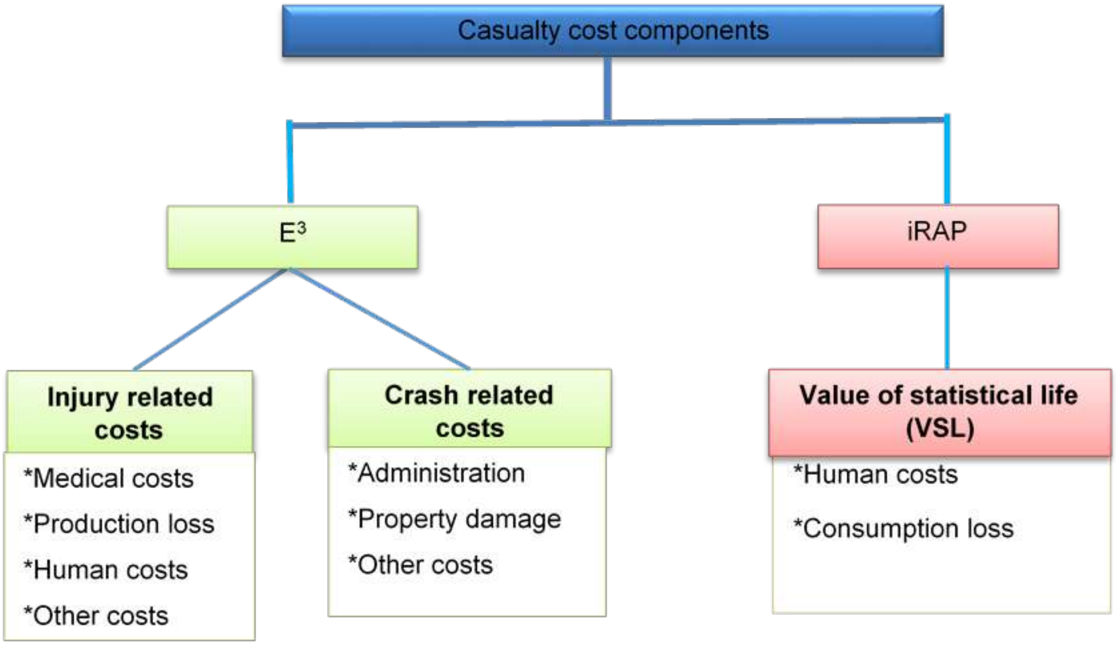

Figure 1. Casualty cost components in E^3 and iRAP models

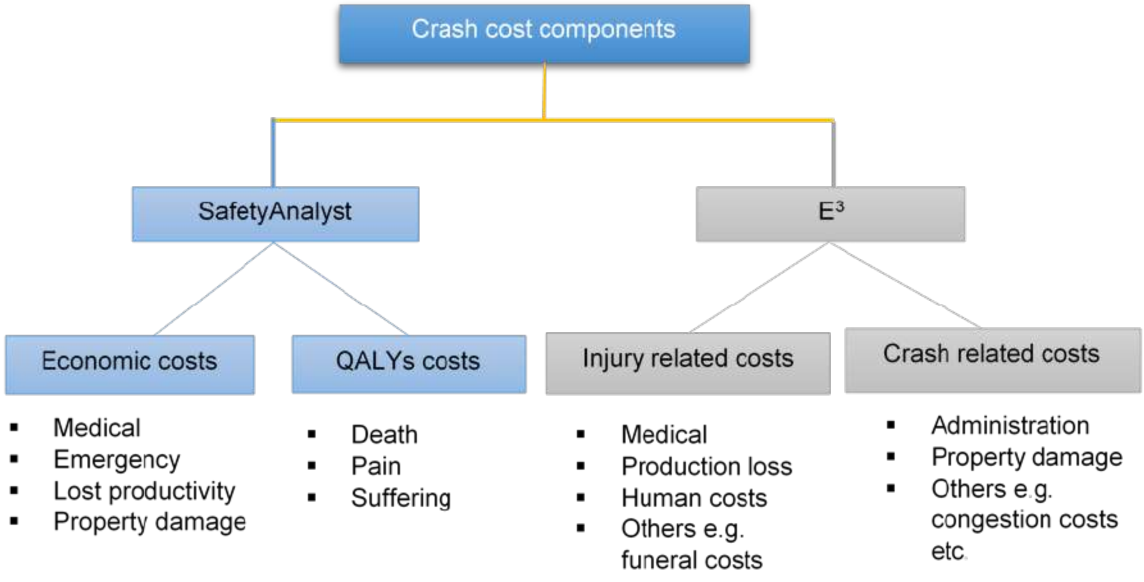

Figure 2. Crash cost components in SafetyAnalyst and E^3 models

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Compact Roundabouts for Rural High-Speed Environments

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Abstract

Compact roundabouts for rural high-speed environments are a new form of treatment that present an opportunity to achieve high levels of Safe System alignment at lower costs. As a result, definitive design standards and values have yet to be produced. To support innovation, help ensure a coherent design approach and assist in understanding emerging best practice by using the specific example of the Lance Creek compact roundabout, we discuss the development of guidelines for compact roundabouts.

Background

Roundabouts at rural high-speed intersections save lives (Isebrand, 2011) and have high Safe System alignment, but are traditionally an expensive form of treatment. Compact roundabouts for rural high-speed environments are a new form of lower-cost treatment.

The Victorian Department of Transport (2021) has constructed a compact roundabout at the intersection of a rural arterial road and local roads near Wonthaggi herein referred to as the "Lance Creek compact roundabout" (See Figure 1). This treatment has been achieving good safety results with no trauma recorded since completion in 2017 and has comparable vehicle speeds to a traditional roundabout. The decision to trial a compact roundabout with a smaller footprint and utilising road safety platforms rather than the traditional design method of reverse curves on all approaches reduced costs by nearly half.

Figure 1. Lance Creek compact roundabout. Note the raised safety platforms on approach and the elongated splitter islands.

Purpose

The Lance Creek compact roundabout project was subjected to design reviews, risk assessments, and evaluations to increase the level of confidence in the design treatment. Such careful analysis, combined with the successful results following construction, imbue confidence that compact roundabouts offer a genuinely cheaper treatment without introducing any detriment in comparison with traditional roundabouts in the right context.

The question remains, however, as to the generalized applicability of the Lance Creek compact roundabout design. How much of the detail applicable to this one location can be generalized into a design standard for the whole State of Victoria?

Conclusions, Implications and Next Steps

The findings that have been detailed in the Lance Creek compact roundabout case study (Department of Transport, 2021) are intended to provide learnings for designers and road safety practitioners to inform future projects, and additional site-specific investigations and principle-based decision making will need to be conducted for each new project. That case study document encourages practitioners to understand the principles of development and design of compact roundabouts and to make design decisions based on these principles and the site-specific characteristics. This paper also explores the process of guidelines refinment with the future rollout of compact roundabouts, and industry's position on the number of sites required for publishing definitive guidance with reference to Ritchie (2005).

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Adolescents' Perceptions Of Long-Term Effects Of Cycle Skills Training

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Abstract

Cycle skills training (CST) courses have been designed to help young people develop the skills and confidence to cycle safely in traffic, but long-term effects of such programmes remain unknown. This study examined adolescents' perceptions of the effects of CST in primary and/or intermediate school on their confidence to cycle to school. Among CST participants, 32% reported that CST increased their confidence to cycle to school whereas 63% reported no effects. In a multivariate analysis, adolescents' perceptions that CST increased their cycling confidence were positively associated with cycling frequently with friends (odds ratio (OR) (95% confidence interval (CI)): 1.77 (1.24, 2.53)) and self-efficacy for cycling to school (1.25 (1.08, 1.44)). Adolescents who perceived increased cycling confidence from CST also had more favourable attitudes towards CST compared with their counterparts ('CST could make me safer in traffic': 70% vs. 32%; $p<0.001$). Further research needs to ascertain the long-term effects of CST.

Background

Cycling to school is less common than walking among adolescents in many developed countries, including New Zealand. Traffic safety is a key concern regarding cycling for transportation, especially for young people, which could be minimised by development of cycling skills combined with speed reduction and separated cycleways. Cycle skills training (CST) courses have been designed to help young people develop the skills and confidence to cycle safely in traffic. Most previous CST studies focused on children. Recent research showed that adolescents (Mandic et al., 2016) and their parents (Mandic et al., 2017) are also interested in CST for adolescents. Although CST improves children's and adolescents' cycling-related knowledge, confidence and skills in the short term, long-term effects of CST on young people's confidence to cycle to school have not been studied. This study examined retrospectively adolescents' perceptions of the effects of CST in primary and/or intermediate school on their confidence to cycle to school.

Method

Adolescents (n=573; age: 14.7±1.2 years; 61% female) from six secondary schools in Dunedin (New Zealand) completed an online survey as part of the Built Environment and Active Transport to School (BEATS) Natural Experiment (Mandic et al., 2020). Adolescents self-reported their travel modes to school; perceptions of cycling to school; and previous participation in school-based CST. Overall, 238 (41%) participated in CST (89 in primary, 71 in intermediate, 78 in both primary and intermediate school). Factors related to increased confidence of cycling to school after CST were examined using binary logistic regression.

Results

Overall, 1% of adolescents usually cycled to school, 44% agreed that CST would make them safer to cycle to school and 26% would take such training at their school. Among CST participants, 32% reported that participating in CST in primary and/or intermediate school made them feel more confident to cycle to school during their high school years whereas 63% reported that CST did not make them feel differently about cycling to high school. In a multivariate analysis, adjusted for age and gender, adolescents' perceptions that CST increased their cycling confidence were positively associated with cycling frequently with friends (odds ratio (OR) (95% confidence interval (CI)): 1.77 (1.24, 2.53)) and self-efficacy for cycling to school (1.25 (1.08, 1.44)). Compared to CST participants who perceived no effect of CST on how they felt about cycling to high school, twice as many adolescents who reported increased confidence of cycling to school after CST agreed that CST could make them safer in traffic (70% vs. 32%; $p<0.001$), and that they would take CST if offered at their high school (40% vs. 19%; $p<0.001$).

Conclusions

Although only 1% of adolescents cycled to school, approximately one-third of adolescents reported increased confidence in cycling to school due to their participation in CST in primary and/or intermediate school. Cycling frequently with friends and higher levels of self-efficacy for cycling to school were positive correlates of adolescents' perceptions that CST increased their confidence to cycle to school. More research, using prospective designs, is needed to ascertain the long-term effects of CST.

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Introducing the new Collaboration for Ambulance Driver Development Australasia (CADDA)

Robert Jaske

CADDA group

Abstract

When driving lights and sirens, ambulances present a significant and uncommon hazard for drivers. Therefore, paramedic driving educators have a central role in minimising paramedic-related road incidents, through proactive, accurate, timely and evidence-based training and review processes. Traditionally, such training and processes have been governed and implemented by each ambulance service individually; however, it is recognised that similar challenges and solutions may be evident across each ambulance service, and an opportunity exists to approach these challenges collaboratively. In response to opportunity, educators from across Australia and New Zealand have formed the Collaboration for Ambulance Driver Development Australasia (CADDA), to share resources and explore the development of an Australasian common standard approach to education of paramedic drivers, towards increased safety of paramedics and all road users in the Australiasian region.

Background, Purpose of Policy (and/or Project), Description of Policy (and/or Project), Evaluation and Effectiveness (or Lessons Learned), Conclusions, Implications and Next Steps

Hundreds of ambulances are active at any one time on Australian and New Zealand roads. These vehicles cover millions of kilometers each year, often driving above the posted speed limits and contrary to standard road rules, as allowed through “lights and sirens” driving regulations. Across New Zealand and Australia, there are numerous different standards to which paramedics are taught to drive, with individual States, Territories and Government regions delivering these standards idiosyncratically. Each service has different strengths and weaknesses, but each shares similar challenges that may be addressed with common solutions. As a result, an opportunity existed to benefit from sharing knowledge and experience, to support driving education of all paramedics across Australasia. Recognising this need was an important first step that lead to the formation of the Collaboration for Ambulance Driver Development Australasia (CADDA) in late 2021. Through CADDA, driver trainers are sharing information, strategies and learning materials to improve driver education across Australasia, and exploring the development of an Australasia-wide ‘standard’, through which each service could benefit and contribute. Such a standard would bring with it reduced education costs, improved evidence-based education, and a recognised standard for paramedics wishing to transfer between services around Australasia without the need for retraining to each service’s own driving standard.

Since its inception in late 2021, CADDA have made significant gains by formalising a forum for sharing information. We identify that across services, primary road safety issues include low speed manoeuvring crashes and a bias towards younger and/or in-experienced paramedics involvement in incidents. It is noted that services share challenges managing the range of driving conditions from urban to 4WD, and various fleet considerations and specific training required for various ambulance trucks, motorcycles, bicycles and disaster platforms. Further, management of human factors such as cognitive overload and fatigue remain central issues for paramedics to manage in the course of their duties.

CADDA provides a monthly forum for leading paramedic driver trainers from around Australasia to share and improve driver standards training. While our initial aim is to explore the development of an Australasia-wide evidence-based standard approach to paramedic driver education, CADDA will also work to leverage technology, virtual reality, and other unique delivery methods to further improve education solutions and support increased paramedic driver safety across Australasia.

Disclaimer to abstract assessors

Whilst it was the intention of the author to have data to support this abstract, at the time of this abstract submission, due to the nature of the 10 difference services within CADDA, the collection and sharing of meaningful data is taking longer than expected. If selected for ARSC conference presentation, we would have sufficient time to gather such data.

CADDA
Collaboration For Ambulance
Driver Development- Australasia

Figure 1. CADDA logo (for reference)

Introducing CADDA

THE NEW COLLABORATION FOR AMBULANCE DRIVER DEVELOPMENT - AUSTRALASIA

Hundreds of ambulances are active at any one time on the roads of Australia, New Zealand and Papua New Guinea, driving millions of kilometers each year, often under "lights and sirens".

Ambulances present a significant and uncommon hazard for drivers, meaning paramedic driving educators have a central role in minimising ambulance related road incidents, through proactive, accurate, timely and evidence-based training, assessment and review processes.

Each ambulance service faces similar challenges in teaching their staff to drive ambulances and so an opportunity existed to approach these challenges collaboratively, leading to the formation of CADDA.

What is CADDA?

The Collaboration for Ambulance Driver Development Australasia (CADDA) provides a focal point for best practice on matters related to ambulance driver education, training, professional practice, standards and development.

What is CADDA's role?

Our role is to:

- Share driver education initiatives and solutions across Australasia
- Explore and improve the delivery of driver education
- Develop strategies to deliver re-accreditation, remedial education and ongoing professional development
- Promote consistency in education and training across Australasia
- Identify issues relevant to education and training
- Provide advice to committees and boards as needed

Who are we?

CADDA consists of at least one member of the driver education team from each jurisdiction of the CAA (Council of Ambulance Authorities). These currently include:

- Ambulance Victoria
- South Australia Ambulance Service
- Australian Capital Territory Ambulance
- New South Wales Ambulance
- Queensland Ambulance Service
- Ambulance Tasmania
- St John Ambulance, Northern Territory
- St John Ambulance, Western Australia
- Wellington Free Ambulance
- St John Ambulance, New Zealand
- St John Ambulance, Papua New Guinea

CADDA also has the opportunity to include additional members from related organisations at a future date.

Australasian Ambulance Services under the CAA represent:

23,543 Staff

and

18,670 Volunteers

responding from

1,801 Locations

driving

7,376 Vehicles

over

182M+ kms

to attend to

4.5M+ Patients

Aims & Achievements

There are numerous different standards to which paramedics and drivers are taught to drive across different regions.

CADDA aims to share knowledge and experience and to support driving education of all paramedics across Australasia.

Since late 2021, CADDA has identified that the primary road safety issues for drivers of drivers of ambulances include:

- Low speed manoeuvring crashes
- A bias towards younger and/or inexperienced paramedics involvement in incidents
- Shared challenges managing the range of driving conditions from urban to 4WD
- Various fleet considerations and specific training required for various ambulance trucks, motorcycles, bicycles and disaster platforms
- Cognitive overload and fatigue of paramedics remain as central issues

What's Next?

CADDA is exploring the development of an Australasia-wide 'standard' of driver training, through which each service could benefit and contribute.

This standard would mean reduced education costs, improved education, and a recognised standard for paramedics wishing to transfer between services around Australasia without the need for retraining.

We are also working with research partners including MUARC (the Monash University Accident Research Centre in Victoria, Australia) to leverage technology, virtual reality, and other unique delivery methods to further improve education solutions and support increased paramedic and driver safety across Australasia.

With the continual development of electric vehicles CADDA are exploring the impacts and benefits of such vehicles and what impact driverless vehicles may have upon ambulance work as well as how such technology might influence or one day be implemented into an emergency ambulance platform.

Presented by Robert Jaske
on behalf of CADDA, in conjunction with
the Council of Ambulance Authorities

CADDA
Collaboration For Ambulance
Driver Development- Australasia

CAA

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Redefining tomorrow for children with disabilities as road users

Helen Lindner, Emma Clarkson, Lisa Vale

Mobility and Accessibility for Children in Australia Ltd

Abstract

Over the last twenty years, we have seen little improvement in the way children with disabilities are transported in vehicles on our roads, with a literature review concluding they continue to be inappropriately restrained in vehicles. The vision of not-for-profit, Mobility and Accessibility for Children in Australia Ltd (MACA), is to change this. By applying a holistic, social model approach, MACA's aim is to advance the rights of children with disabilities and medical conditions to safe and accessible transport. This presentation will focus on how MACA is *redefining tomorrow* for this vulnerable and neglected road user group, by taking a cross-agency, collaborative approach to strengthening all parts of the system. The presentation will highlight advancements made to-date in research, standards, legislation/regulations, products and evidence-based information and training, and MACA's plans for a future where safe vehicle transport is accessible to all.

Australian research

MACA's recent national survey, undertaken by Curtin University, revealed stark road safety challenges for families of children with disabilities. For example, over half of caregivers reported being distracted by their child while driving. Further, more than half reported that their child had gotten out of their child restraint or seatbelt while the car was moving, and 10% reported that their child had escaped the car in the road environment.

In addition, the majority (69%) reported never receiving information on how to safely transport their child and nearly half (49%) believed that their child was missing out on participating in everyday life due to their transport arrangements.

These findings, while shocking, are not surprising. This is because, until the establishment of MACA in 2019, there was no national organisation advocating for improved road safety outcomes for these vulnerable road users, resulting in a lack of research, information, standards, and guidance for those with responsibility and accountability for their transport.

Description of approach

MACA was established to close these gaps - and has benefitted from funding support from the Australian Government Department of Social Services and road safety organisations who have funded specific projects, including the Transport Accident Commission, The Office of Road Safety and VicRoads.

MACA's approach aligns with the social model approach to road safety, recognising the influencing effect of relationships across groups, agencies, and sectors. MACA has collaborated with many organisations and partners – both within and outside the transport sector – to drive improvements and innovations in the following key areas:

Research

The presentation will outline key research activities that are building an evidence base in this area, including insights from a national survey (Curtin University), and ethnographic research (Monash University) investigating families' lived experience of transport challenges.

Standards

Exciting new developments in Australian and New Zealand Standards that aim to set a new benchmark for the safety of children with disabilities and medical conditions when travelling in motor vehicles.

Legislative and regulatory change

The presentation will showcase how inequities in our legislative and regulatory framework can be overcome through cross-agency collaboration and action that builds an inclusive system.

Global impact

The presentation will explain how the Australian Safety Assessment Program (funded by the TAC) is positioning Australia at the centre of global action, stimulating innovations in the design and safety performance of child restraint systems used by children with disabilities.

Improving capacity and capability

The presentation will share how MACA is empowering allied health professionals to play a lead role in applying evidence-based practice that improves road safety for vulnerable road users and builds a culture of road safety within allied health and disability organisations.

Conclusion

MACA will reflect on how investing in interventions for our most vulnerable road users can overcome systemic barriers and disadvantage and redefine tomorrow's transport system, improving road safety, family wellbeing and participation in the community.

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Optimal Scheduling of Random Breath and Mobile Drug Testing

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Abstract

This paper proposes a strategic day-to-day RBT and MDT scheduling method to improve drink-driving and DUI general deterrence. The RBT and MDT scheduling is formulated as a constrained optimisation program that addresses where and when the tests should start and end. The objective goal reflects the perceived omnipresence of RBT and MDT and improvement in road safety. The constraints account for location capacity and equipment workforce requirements. In addition, the method ensures the tests are unpredictable, unavoidable and ubiquitous. The method results in a cost- effective deployment of RBT and MDT tailored for different locations and times. The paper draws out the implications for operations guidelines of RBT and MDT in Australia. The paper contributes to the data-driven development of a unified and systematic framework that efficiently connects high- level road safety goals to operations of RBT and MDT with limited enforcement resources to reduce road trauma and DUI-related accidents on roads.

Background, Method, Results and Conclusions

Evidence-based research has shown random breath testing (RBT) and mobile drug testing (MDT) are effective at deterring drink-driving and driving under the influence (DUI) (Newstead et al., 2020). RBT is the primary drink-driving countermeasure implemented in all Australian jurisdictions. Evaluations of RBT and MDT have been with largely positive outcomes. Nevertheless, very little research has been done on a cost-effective method for strategic scheduling of RBT and MDT operations. This paper proposes a systematic method to determine where and when RBT and MDT should occur (daily plans) to achieve a more pronounced incident prevention impact. This impact can be measured by sustained deterrence, long-term reduction in positively identified tests, exposure to RBT and MDT (directly and indirectly) and ultimately drop in drug- and alcohol-related road trauma (fatalities and injuries).

The potential for drink driving and driving under the influence does not occur uniformly over time and place. Prevention measures in rural Australia are different than in capital cities. Christmas and Easter periods require other testing operations than weekdays and weekends. Given the considerable impact of RBT and MDT while resource-intensive, a detailed consideration of the operational constraints (equipment, location capacity, workforce requirements, etc.) is imperative. Furthermore, the daily deployment of RBT and MDT should remain unpredictable and ubiquitous. The aim is to guarantee a certain degree of randomness and ubiquity such that drivers perceive that anybody could be tested anywhere and at any time.

The proposed scheduling method is formulated as an optimisation program to maximise deterrence and detection. The number of RBTs and MDTs conducted is the first quantitative measure to aim for. However, the perception of detection (known as ‘RBT exposure’) cannot simply be determined by the volume of RBT conducted. Petroulias (2011) reported that in 2010, 80% of the surveyed population saw police running RBTs in the six months before the survey. To solve the problem, we identify hot spot areas based on historical crash data, where and when people travel and historical RBT and MDT sites and detection results. An optimisation program is developed using a time-varying hot spot identification method to identify RBT and MDT's most economical and effective operations considering technical constraints. The paper results are expected to provide evidence to contribute to law enforcement equipment and labour planning and improving road safety for vulnerable road users. The final aim is to reduce fatalities and road trauma and help achieve the 'Towards Zero' plan. This paper fits well as an innovative and evidence-based method in the safe system approach; safer people and safer roads. The paper results are expected to pave the way for developing an overarching strategy to ensure the most cost-effective and impactful operation of RBT and MDT to improve road safety.

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Safe System capability building during Covid in Aotearoa

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Abstract

Building capability and capacity in Safe System implementation is a key element of Road to Zero – New Zealand's Road Safety Strategy. Just as Waka Kotahi – New Zealand Transport Agency embarked on their biggest ever capacity and capacity building venture in road safety, Covid-19 was limiting in-person training. Safe System Solutions Pty Ltd worked with Waka Kotahi to develop interactive training courses that could be delivered via online formats, but still included fieldwork, collaboration, competency assurance and coaching/mentoring. While further evaluation is needed to determine the magnitude of capability improvement of this format compared to face-to-face, the reach and lower cost of the education rollout has meant that it will form an ongoing part of the capability and capacity-building program. This paper explores the design, application, and results from online Safe System capability and capacity building in New Zealand.

Background

Road deaths are the second largest cause of death from injury in New Zealand (NZ) and more than half of major trauma injuries treated in our hospitals relate to road crashes. NZ performs poorly compared with many OECD nations based on road deaths by population, by vehicle number and by kilometres travelled.

NZ's earlier road safety strategy 'Safer Journeys' was a sound strategy based on the reputable Safe System approach, but the leadership, sector capacity, and public buy-in necessary for successful delivery was insufficient (Martin Small Consulting. 2015). These lessons were used to develop the current national cross-sector road safety strategy – Road to Zero 2020–2030 with its initial action plan for 2020–2022. This strategy sets NZ on a course towards Vision Zero with a plan for an interim target by 2030 of 40% reduction in deaths and serious injuries achieved through interventions across five focus areas (Figure 1).

Two key performance indicators for New Zealand under Road to Zero are; 1. Percentage of people that have completed an approved Safe System training course and showed improved understanding of the Safe System. And 2. Percentage of road infrastructure projects that have been subject to a Road Safety Audit and/or Safe System Assessment.

Challenges of capability and capacity building

Capability and capacity building are being undertaken through instructional approaches, even though learning is being undertaken in an uncertain covid environment, which means that there was a need to design covid appropriate delivery methods and approaches that retained the key elements of the capability and capacity building (such as fieldwork, interaction and competency assurance). To do this, Woka Kothai worked with Safe System Solutions Pty Ltd to design a course for the New Zealand audience.

Building Safe System Assessment capability in Aotearoa

A programme of in-person training sessions was run in 2018, and the Safe System Engineering Workshop has been running for over 15 years in person. These were examined to understand the key elements that created high capability improvement in Safe System knowledge of participants. From past participant feedback, it was discovered that some critical elements were the fieldwork, interaction with the presenters and other participants and the structured competency assurance (assignments and exercises).

Method

The "learning pyramid" suggests that most students only remember about 5% of a lecture, but retain nearly 75% of what they learn if they practice by doing. The training was structured to include multiple opportunities for practice by learners. Each learner had a site selected in their local neighbourhood where they conducted a site visit in order to complete a Safe System Assessment report. In addition, learning simulation methods such as 360-degree video footage has been developed to further embed the learning.

Results

This online virtual course structure provides the ability to offer places across NZ, supporting transport professionals from many locations and organisations. This means it does not disadvantage smaller regions where a face-to-face full workshop may not be practical (due to travel, costs, time).

Feedback indicates that the flexibility of online learning and course structure is highly appreciated. There is little evidence that participants have been disadvantaged by the lack of face-to-face networking, but should this be the case then a formalized “buddy system” may need to be introduced.

Conclusions, Implications and Next Steps

The greatest benefit so far has been the ability to offer training to a more geographically dispersed group at a lower cost while maintaining key elements of the training packages. Further evaluation is needed to determine whether the overall learning outcomes are better, worse, or the same as those from face-to-face instruction.

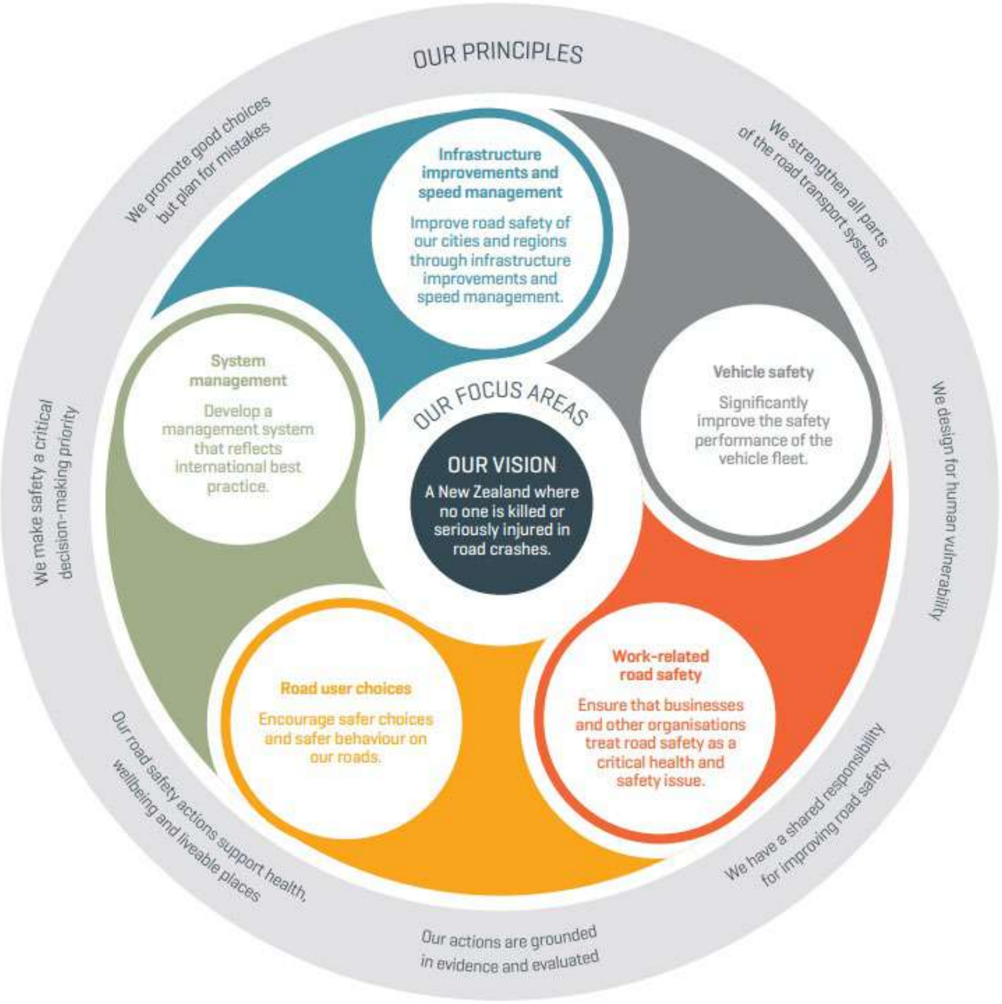

Figure 1. New Zealand's Road to Zero strategy components

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AVs & Anxiety: Resuming Control from a Simulated Automated Vehicle

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Abstract

Highly automated vehicles (AVs) offer an enormous potential benefit to the road safety environment. However, their impact is conditional on efficient human-system interactions during transitions of control when vehicle system boundaries are reached (takeover scenarios). We assessed situation awareness during takeover scenarios pre- and post-fatigue, and the relationship between the change in situation awareness and driver anxiety. Drivers required to monitor the AV during the fatiguing drive were shown to have significantly lower driving-specific post-drive anxiety, while drivers permitted to disengage from monitoring (and engage with non-driving tasks) showed no change in driving anxiety. Drivers' post-fatigue state-anxiety was found to predict change in situation awareness regardless of non-driving task engagement/supervising requirements. The results demonstrate the role of anxiety in critical takeover capacity and emphasise the importance of tailoring human-machine interactions to individuals. Finally, exposure to AV driving scenarios may reduce driving anxiety, but only in specific contexts.

Background

Highly-automated vehicles (AVs) promise to drastically alter the requirements of the driving task, and in doing so reshape the traffic environment. However, fully realising the benefits of AVs requires widespread adoption, which is in-turn reliant on a public understanding and acceptance of the technology (Pettigrew et al., 2018), including how best to interact with the automated system. Drivers will still be required to supervise the vehicle in the medium-term in order to resume control in a takeover scenario, therefore a driver's capacity to reorient to the driving task (reconstruct their situation awareness) remains crucial (McKerral & Pammer, 2021). Current research (McKerral, Pammer, & Gauld, In-preparation) has demonstrated that use or non-use of non-driving related tasks (NDRTs) is a significant factor in driver situation awareness during takeover scenarios, and it is unclear how this interaction is affected by individual personality factors.

Vulnerable populations are positioned to benefit from AVs and are often highlighted to emphasise the positive public health implications of enhanced mobility promised by increasing vehicle automation (Dean et al., 2019). Personality factors such as anxiety are argued to impair driving performance in manually driven cars (Taylor, Deane, & Podd, 2008) while also negatively impacting reported likelihood to purchase and drive an AV (Hohenberger, Spörrle, & Welpe, 2017).

Method

The present study examined the relationship between driver anxiety and situation awareness. Situation awareness was measured via verbal count scores during a takeover scenario pre- and post-exposure to a fatiguing automated drive. 68 participants were allocated to either an NDRT-permitted or no-NDRT condition. Participants were assessed on their generalised trait anxiety (STAI-Y2) and driving anxiety (DCQ) prior to the testing session. The DCQ was modified to assess state-based changes in reference to experience operating a self-driving car, and DCQ-AV and STAI-Y1 (state) scores were assessed pre- and post-drive.

Results

Our results demonstrate a complex relationship between state-anxiety, fatigue and situation awareness. Fatigue remains the strongest predictor of situation awareness. Participants in the no-NDRT condition demonstrated a significant reduction in driving-related anxiety, while those in the NDRT-permitted condition did not noticeably change from an equivalent pre-drive measure. Post-drive state-anxiety significantly predicted a driver's change in situation awareness between takeover events irrespective of NDRT use. Finally, the modified DCQ-AV also predicted change in situation awareness scores but with less certainty than the state-anxiety scores shown by the STAI-Y1.

Conclusions

These findings suggest an interaction between generalised anxiety and situation awareness during takeover scenarios in automated vehicles. Concerningly, the previously established protective affect of self-selected NDRT-use on passive-fatigue (induced by monitoring an automated system) seems to be outweighed by the impact of individual anxiety traits. Given the need for a rapid uptake of AVs in the near future, human-system interactions that either induce or fail to mitigate factors that are likely to affect takeover capacity (situation awareness) or general positive experience with the technology are of primary concern for designers and road-safety practitioners alike.

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Short-term Evaluation of Side Road Activated Speeds (SRAS).

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[a]Victorian Department of Transport, [b]SMEC

Abstract

Side Road Activated Speeds (SRAS) have been implemented across Victoria by the Department of Transport (DoT) as part of the Safe System Road Infrastructure Program (SSRIP) Investment Plan (IP) No 18 – Safe System Transformation of Intersections. An evaluation was commissioned to understand change in speed, reduction in conflicts and change in driver behaviour as a result of the treatment. The evaluation of these treatments was undertaken with a controlled before after (CBA) approach, using data collected at six treatment sites and at an additional six selected control sites. The evaluations outcomes will inform further decisions on the use or development of the treatment within Victoria. If these treatments are considered effective, then this may lead to additional rural intersections receiving the same treatment in the future.

Background

Side Road Activated Speeds (SRAS) have been implemented across Victoria by DoT as part of the Safe System Road Infrastructure Program (SSRIP) Investment Plan (IP) No 18 – Safe System Transformation of Intersections.

The SRAS treatment is based on a system introduced in New Zealand, known as RIAWS (Rural Intersection Active Warning System) which was introduced to slow vehicles through rural intersections where potential conflicts exist, thus reducing the likelihood and severity of a crash. SRAS include electronic speed limit signs that are activated by vehicles travelling on the side and/or main road of a rural intersection. Loop detectors sense approaching vehicles which then activate a sign that temporarily drops the speed limit on the main road. This sign is located approximately 300m from the intersection to warn drivers of upcoming change in speed activated by vehicles approaching the side road traffic.

The objective of the SRAS treatment is to:

- Slow vehicles on the main road as they approach the intersection, reducing the likelihood (effectively increasing available stopping distance) and severity (less energy on impact) of a crash;
- Improve driver gap judgement on minor road intersection approaches; and
- Increase driver awareness of increased risk and therefore prepare them for a possible event (effectively reducing reaction time).

A short term evaluation was commissioned by DoT to evaluate the safety benefits of the SRAS treatment in Victoria.

Methodology

In order to inform the above overall project aims, the objective of this study was to quantify changes in traffic behaviour to assess the treatment's safety benefits. The items measured in this evaluation are outlined in Table 1.

Table 2. Evaluation measures and data types collected

Measure	Data Collected
Changes in vehicle speed;	WiFi – to capture segment speeds along the main road; Radar – to capture spot speed, volume and vehicle classification at the intersection;
Changes in gap acceptance/post encroachment time (PET);	CCTV – to capture video footage at the intersection for the conflict analysis.
Changes in driver behaviour: • Impact on breaking, • Positioning at hold line, and • Through vehicle lane positioning.	CCTV – to capture video footage at the intersection for the conflict analysis.

The evaluation of these treatments was undertaken with a controlled before after (CBA) approach, using data collected before and after at six treatment sites, and at an additional six selected control sites. The control sites were selected to be as similar as possible to the treatment sites, with the sites' traffic volume, composition and priority, surrounding land use, number of approach and turning lanes, intersection layout and design, speed limit and congestion levels assessed prior to selection. Before data was collected for all sites in early 2019, between January and June. After data collection was undertaken in December 2020 and between April and May 2021.

The evaluations outcomes will inform further decisions on the use or development of the treatment within Victoria. If these treatments are considered effective, then this may lead to additional rural intersections receiving the same treatment in the future.

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Evaluation of Phillip Island Speed Limit Reductions

Matt Allan and Amir Sobhani

Victoria Department of Transport (DoT)

Abstract

The purpose of this evaluation was to determine the effectiveness of safer speed treatments on reducing speeds and lowering fatal and serious injury crashes in the Phillip Island locality. In November 2021, DoT implemented safer speed limits of 80km/h or less to replace the existing 100km/h speed limits on high speed rural sealed arterial and municipal roads across Phillip Island. The evaluation aims to collect speed data cross these treated sites and a subset of non-treated sites (to be used as controls) to assess the treatments effectiveness with the following measures: Speed reduction at each site (spot speed); Speed reduction along each route section (journey speed); Change in speed compliance along each route; Estimated reduction in FSI crashes for each route, using the above speed data collected as well as historic crash data.

Background

In November 2021, DoT implemented safer speed limits of 80km/h or less to replace the existing 100km/h speed limits on high speed rural sealed arterial and municipal road network across Phillip Island. The treatments were co-funded by the Federal Government under the Federal Road Safety Program.

To assess this treatments effectiveness, an evaluation framework (Turner, Durdin, & Wood, 2020) with supporting survey design (Debnath, 2021) have been developed. The evaluation aims to collect speed data across these treated sites and a subset of non-treated sites (to be used as controls) to assess the treatments effectiveness with the following measures:

- Speed reduction at each site (spot speed).
- Speed reduction along each route section (journey speed).
- Change in speed compliance along each route, using spot speed traffic data.
- Estimated reduction in FSI crashes for each route, using the above data collected as well as historic crash data.

Point speed data (free flow speeds), Journey speed (point to point free flow speed) along with vehicle classification data (light vehicles, heavy vehicles and motorcycles) collected from both data sources will be the main data collected in this study. Other measures, such as expected crash reductions, will also be estimated from these two types of speed data. The vehicle classification data will give an indication of the types of vehicles using each route and the proportion of trucks of various types.]

A controlled before and after trial (CBA) is proposed for this study with the above data collected at the treated and control sites across the same time period. Use of a matched control (where speed limits are unchanged) for each treated site assists in the removal of confounding factors (such as the broader road environment or a season effect). The control site of each pair has been selected to be as similar as possible to the treated site in delineation, alignment, proportion of heavy vehicles, cross-section and immediate roadside environment, providing an independent assessment of before and after mean speed.

The treated sites surveyed for inclusion in the evaluation from the wider pool of treated sites are shown in Table 1, each with their corresponding matched control site. Control sites were selected in the Bass Coast Shire but not in Phillip Island, as there were limited 100 km/h sites remaining due to the area-wide treatment. Before data for all sites was collected in late November 2021 with after data collected in early April 2022.

Table 3. Sites surveyed in this evaluation

Treatment Site	**Speed Limit Change (km/ h)**	**Control Site**	**Speed Limit (km/ h)**
Back Beach Rd	100 to 80	Cape Paterson Rd	100
Ventnor Rd	100 to 80	Dalyston-Glen Forbes Rd (1)	100
Rhyll Newhaven Rd	100 to 80	Agar Rd	100
Gap Rd	100 to 80	Loch-Wonthaggi Rd	100
Berrys Beach Rd	100 to 80	West Creek Rd	100
Ventnor Beach Rd	100 to 80	Dalyston-Glen Forbes Rd (2)	100
Smiths Beach Rd	100 to 80	Guy Rd	100

The results of this study will assess the effectiveness of these treatments in achieving safer speeds in the Phillip Island area, reducing the occurrence of fatal and serious injuries and providing a lasting impact for all Victorians into the future.

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Auckland Transport's Mass Action Pedestrian Improvement Programme 2019

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Abstract

Auckland's road safety performance deteriorated significantly with death and serious injury crashes increased by more than 70% between 2014 – 2017. A crash trend of 20% of all pedestrian related crashes in Auckland occurred at existing zebra crossings at the time. Many of these at grade zebra crossings are on arterial roads. Under the Mass Action Pedestrian Improvement programme, safe system interventions of raised safety platforms were proposed. Significant concerns were raised about the appropriateness of such devices on our arterial and freight network corridors. Auckland Transport have undertaken both literature and field studies to determine the optimal profile and proceeded to upgrade more than 50 pedestrian crossings in 2018/19. This paper presents the results on speed and crash analysis at treated sites after 24 months. The results show a significant reduction in speed and zero death and serious crashes have been recorded at all the upgraded crossings.

Background, Evaluation and Effectiveness (or Lessons Learned), Conclusions, Implications and Next Steps

Auckland Transport have been installing raised platforms as traffic calming measures across the network for the past few years. Most of them have a ramp gradient between 1:15 to 1:20 with various height ranged between 75 mm to 125 mm. These profiles were considered to be the most ideal for the network as it accommodated road users including heavy vehicles, emergency vehicles, double decker buses, bicycles and low floor vehicles. However this type of platform profile did not effectively achieve the safe system outcome of achieving a survival speed of 30 km/h for vulnerable road users at the crossing point.

There are significant concerns about the appropriateness of having raised tables for high freight routes or on busy arterial networks. There were also concerns about public and stakeholder acceptance and potential for community rejection.

Literature Review was commissioned to look at the effect of the ramp slope and height on speed to inform the design. The aim is to identify a suitable profile to achieve desired reductions in speed while minimising occupant discomfort, the risk of heavy braking, vehicle damage, or heavy vehicle rollover.

Site study including various profile tables were built with accelerometery data collected inside the bus including double decker buses with bus passengers sitting at various locations on the bus. Using a mobile phone application (Sensorlab) to record the effects of driving over different speed table profiles at different speeds. Multiple tests were conducted at varying speeds to gauge user experience as well as suspension effect on the bus passengers and measuring the effects on bus suspension at different speeds. Different types of constructions and trucks were also used to test the speed tables and no significant issues were identified.

Based on the literature, site measurements and field research, it is concluded that the vertical acceleration caused by the speed table is key to their performance. Vertical deflection devices operate on the principle that as vertical acceleration increases, so does discomfort for drivers and passengers. The overall literature review and Auckland speed table data align well, and together support the concluding recommendations for: Speed table ramps to be 100 mm in height (75 mm for buses to mitigate driver and passenger discomfort) at a 1:10 slope.

More than 50 zebra crossings were upgraded with raised tables in Auckland Transport's Mass Action Pedestrian Improvement Programme (MAPI) in 2018/19. Speed data were subsequently collected at 4 sites to determine the effectiveness of the 1:10 ramps and the speed profile can be summarised as follows:

Since the implementation of the MAPI programme, there have only been 2 years of Crash statistics of the 35 crossings included in the analysis, the total crash rates have dropped from 21 to 3.5 crashes per year, with the death and serious crashes reduced from 2.4 to zero.

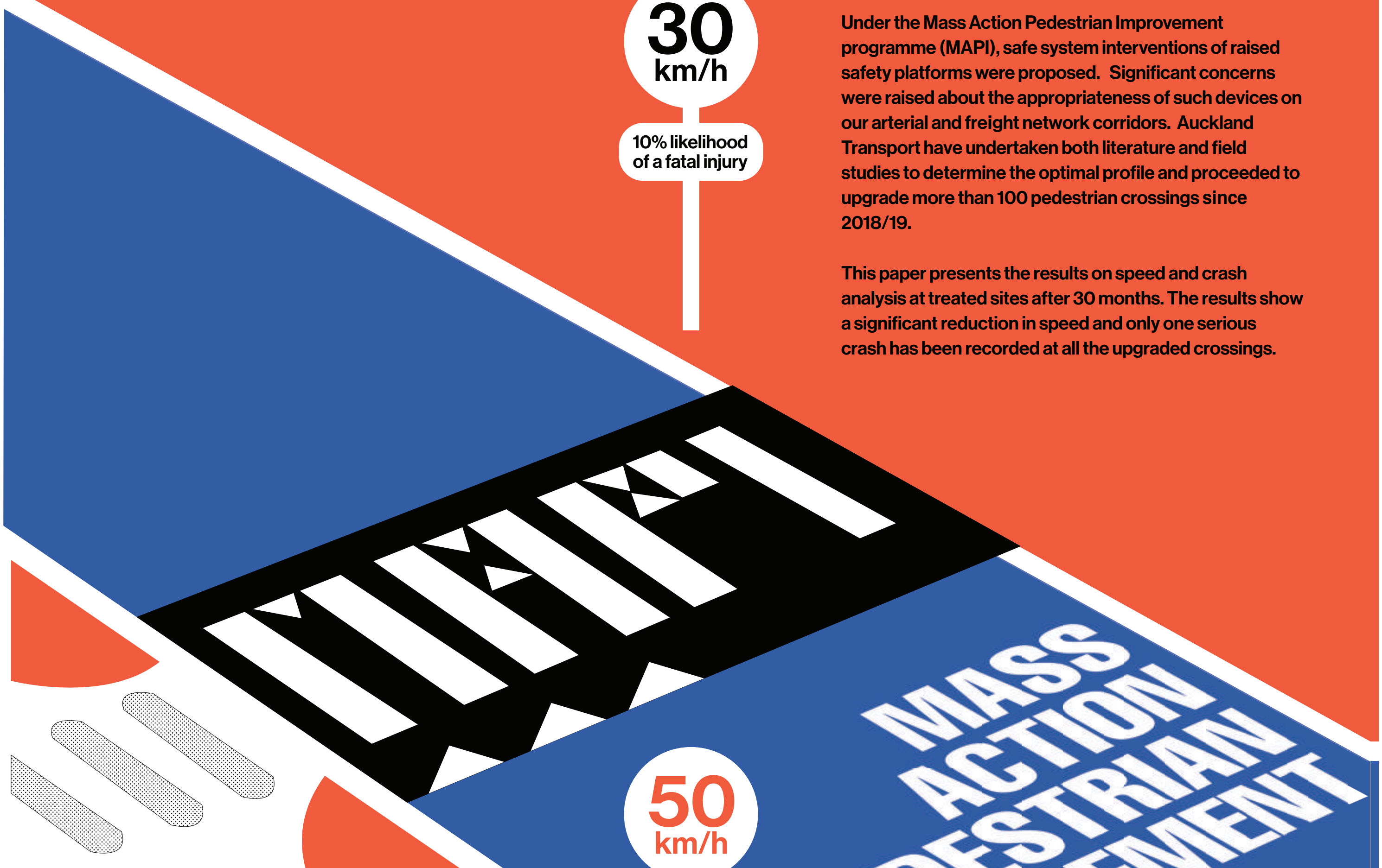
The project initiative highlighted that high volume delivery of raised tables can be achieved however there were some key lessons learnt from undertaking the programme. These include the quality of construction, drainage, noise and vibration that have been captured in the study.

IRENE TSE
AMIT PATEL
ANDREW MCDONALD
DR MICHAEL BLEWDEN

Auckland's road safety performance deteriorated significantly with death and serious injury crashes increasing by more than 70% between 2014 – 2017. A crash trend of 20% of all pedestrian related crashes in Auckland occurred at existing zebra crossings at the time.

Under the Mass Action Pedestrian Improvement programme (MAPI), safe system interventions of raised safety platforms were proposed. Significant concerns were raised about the appropriateness of such devices on our arterial and freight network corridors. Auckland Transport have undertaken both literature and field studies to determine the optimal profile and proceeded to upgrade more than 100 pedestrian crossings since 2018/19.

This paper presents the results on speed and crash analysis at treated sites after 30 months. The results show a significant reduction in speed and only one serious crash has been recorded at all the upgraded crossings.



30
km/h

10% likelihood
of a fatal injury

50
km/h

80% likelihood
of a fatal injury

MASS ACTION PEDESTRIAN IMPROVEMENT

PROGRAMME

20%
of pedestrian crashes in Auckland occurred at existing zebra crossing between 2011 and 2015.

Speed table ramps to be 100mm in height at a 1:10 slope

(75mm for buses to mitigate driver and pasenger discomfort).

Crash rates have dropped at the treated zebra crossings from 21 to 5.6 crashes per year with the death and serious crashes reduced from 2.4 to 0.4.

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Facilitating change: Road safety benefits of online medical report systems

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Abstract

A proportion of the Australasian driving community includes drivers with medical conditions and disabilities. During 2016, a major internal reform project identified that significant road safety data and process benefits could be achieved by introducing an online form into the medical review process. A multi-disciplinary working group adopted a modified co-design process supported by investigations of existing online systems to map user stories and end-to-end processes for establishing design specifications. Product development was shaped by agile , user-centred and action research methods. User group engagement (including medical practitioners/optometrists) contributed to prioritising prototype criteria, usability testing and post implementation feedback. In the last 12 months, the online medical report (OMR) has regularly exceeded 60 percent of all medical reports submitted. Data generated is supporting policy, program and service review to improve road safety: key considerations to support optimal project delivery are highlighted.

Background

People with a disability or chronic illness represent around 18% of the Australian and almost 25% of New Zealand populations (AIHW, 2019, Stats NZ, 2018). Many will be young people and adults seeking to obtain/retain driving independence (Dickerson et al., 2017). However impairments impacting on driving require management to support safety of drivers and other road users (Mitchell et al, 2020). Driver Licensing Authorities manage risks via legislation obliging drivers to report long term medical issues and disability. Health practitioners (doctors, optometrists etc.,) typically submit assessments as part of a fitness to drive process (Austroads, 2017). In 2016, a project reviewing these processes identified that data of road safety value captured in paper forms (demographics, licensing, medical conditions, test results) was not readily available as extraction required labour-intensive manual processes. Paper medical assessment forms were not always completed accurately or completely, requiring staff to contact authors for clarification, leading to protracted processing times. A "smart" online medical report (OMR) was considered a desirable alternative, enabling consistent form completion, automatic secure submission, inbuilt decision making linking to Austroads guidelines and automatic data collation available for road safety and process reporting and analysis.

Methods

Problem clarification and project design drew on several methods to address road safety, technology and service design best practice methods. User centred, modified co-design and service design methods were used to identify problems from user journeys and touchpoints across the system (See Figure 1). Action research approaches were applied to prioritise stakeholder expertise and engagement in problem identification, countermeasure development and optimising ownership of outcomes (Koshy, et.al. 2010). Both agile and sprint methods were applied at key product development stages to ensure end user (in-house staff, external health professional) feedback was obtained and incorporated into product improvements. User testing with representative stakeholders and typical case studies occurred at several points of the development cycle ensuring user needs were addressed.

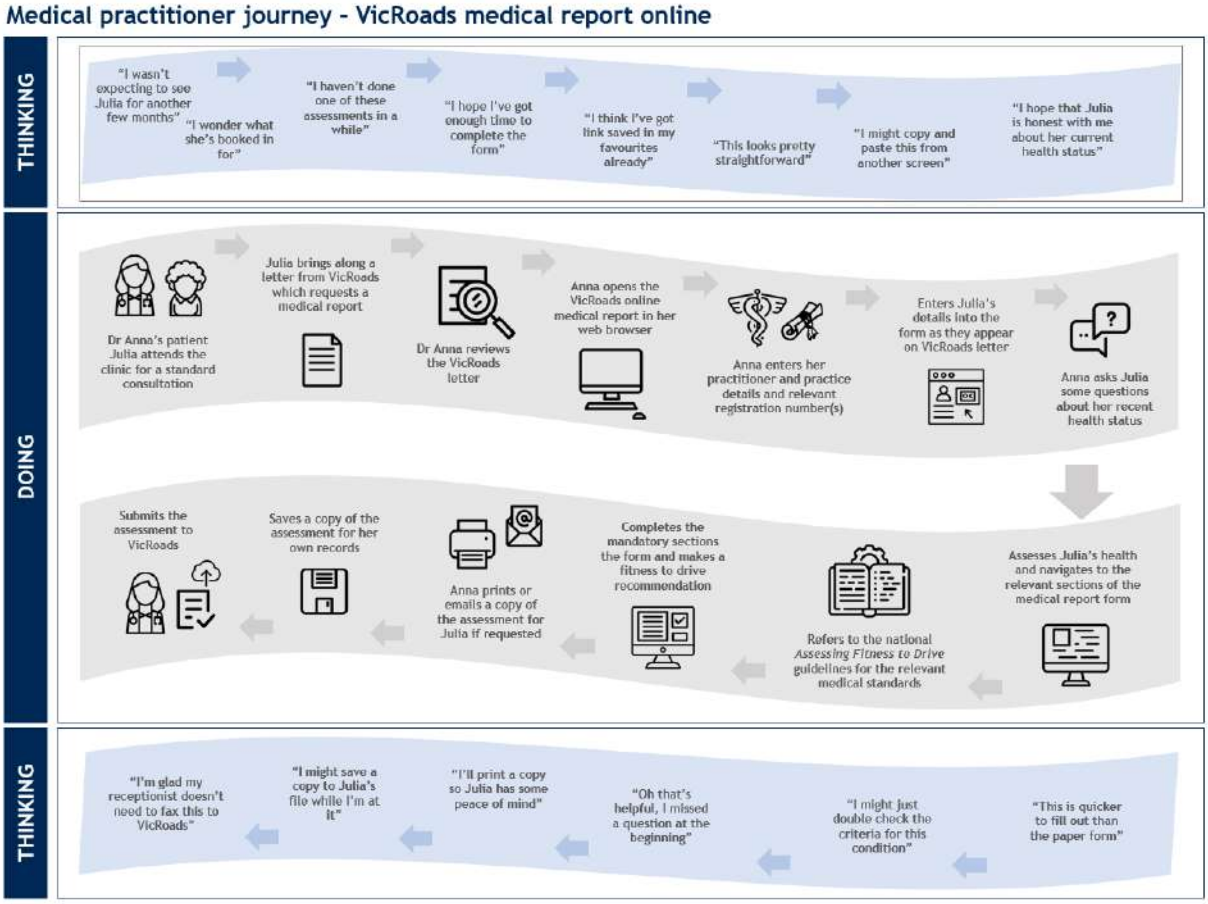


Figure 1. Example of a user journey (for medical practitioners) when using the OMR

Results and outcome implementation

We identified that addressing problems and developing solutions is enhanced by using a multi-disciplinary team, adopting various methods to support service and product development and consulting with all users at key points along the project lifecycle. Implementation and user adoption has been supported by a communications and engagement strategy (including YouTube clips and fact sheets) and quick turnaround for user feedback. OMR represented 54 percent of all medical reports submitted after the first 12 months of implementation and is now regularly 60+% each month. (See Graph 1.)

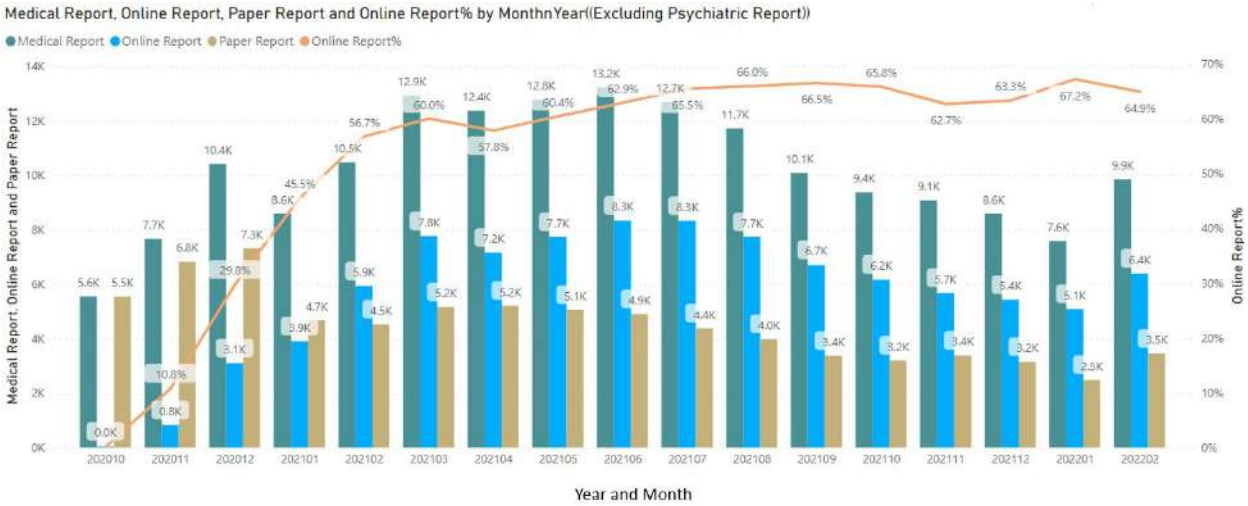
Conclusions

Investigating road safety issues thoroughly relies on accurate and complete data sets so analyses can point to suitable targeted countermeasure development. Data available from the OMR has already been used to support better understanding of drivers within our medical review system, and has informed responses to government and media enquiries. Future data uses include to review medical review policy and processes, identify if highest at risk medical conditions are accurately represented and to understand impacts of countermeasure implementation.

Acknowledgements

The Transport Accident Commission provided funding via the Road Safety Action Plan 2016//2020 and the Department of Transport provided both in-kind and funding support. Thanks to Helen Reddan, Senior Project Manager, TAC, Fiona Landgren, Project Health and the many

health practitioners and Medical Review and other Staff who supported project delivery and implementation.



Graph 1. OMR monthly summary: Oct 2020 – Feb 2022

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New Zealand Government. Results of 2018 Census as reported on https://www.stats.govt.nz/infographics/the-disability-gap-2018 (Accessed 8th of March, 2022)

VicRoads Fitness to Drive webpages:

- for Health professionals: https://www.vicroads.vic.gov.au/licences/health-and-driving/information-for-health-professionals
- for Drivers with medical review issues: https://www.vicroads.vic.gov.au/licences/health-and-driving

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Modeling Drivers' Evasive Behavior with Deep Reinforcement Learning

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Abstract

It is critical to understand drivers' evasive behavior in safety-critical situations to develop advanced driving assistance systems for crash prevention and safety-aware microscopic simulation models. This study proposes a framework to learn both the longitudinal and lateral evasive behaviors simultaneously using deep reinforcement learning. A derivative of time to collision (TTC) in a 2-dimensional space is proposed and used to extract near-crash events from real-world connected vehicle data. A deep deterministic policy gradient (DDPG) model is developed to infer the underlying strategies of evasive behaviors and imitate them. The results demonstrate high accuracy of trajectory reconstruction and a great potential for practical use.

Background

As part of an effort to improve traffic safety, it is critical to understand drivers' evasive behaviors in safety-critical situations. However, limited studies are focusing on modeling the evasive behavior, especially modeling the longitudinal and lateral movements simultaneously (Markkula, Benderius, Wolff & Wahde, 2012). In this study, we will model lane change-related evasive behaviors, considering that lane changes may either trigger or evade traffic conflicts.

Method

2-D time to collision

To capture safety risk in a 2-dimensional space, we expand the time to collision (TTC) (Hayward, 1972) to 2D-TTC. Considering both the longitudinal (and lateral) crash risks, the 2D-TTC is expressed as: where is the distance between vehicles. is the vehicle's length and is width. and are the speeds of the leading and following vehicle, respectively. The subscripts and represent the longitudinal and lateral components. Crash risks in 2 dimensions are jointly considered as they are interchangeable with disturbance.

Deep deterministic policy gradient (DDPG)

Deep deterministic policy gradient (DDPG) (Lillicrap et al., 2015) is an algorithm using deep function approximators to learn strategies in continuous action spaces. In this study, it is used to learn the underlying strategies of evasive behaviors and then imitate them. The architecture of DDPG is presented in figure 1.

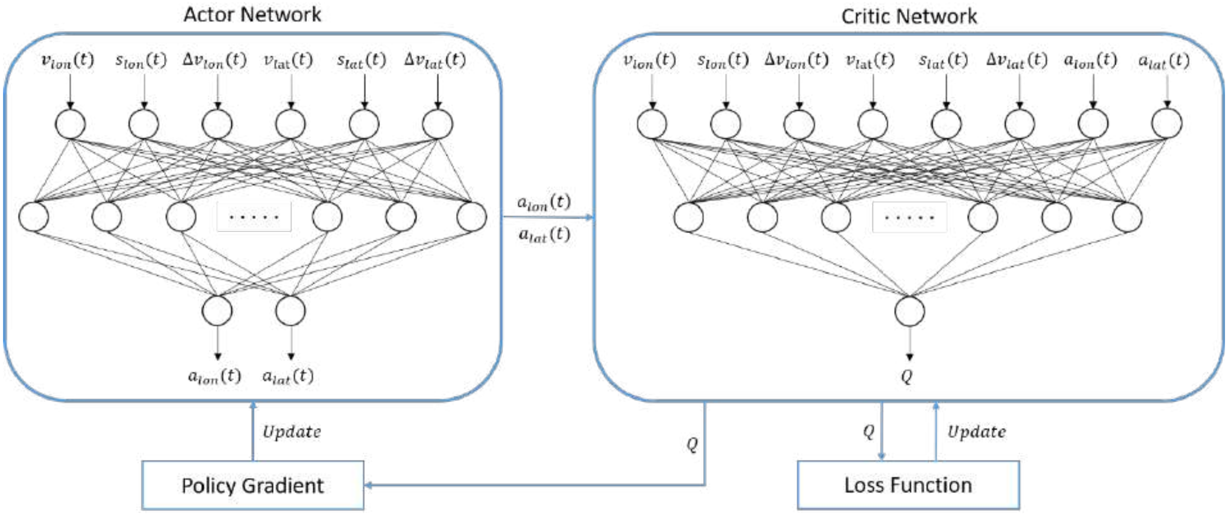

Figure 1. Architecture of DDPG

The inputs are the vehicle speed (and), relative distance (and), and relative speed (and) at time step . The outputs of actor network are the longitudinal and lateral acceleration (and). The critic network would evaluate the actions and return a value for gradient update. The spacing () and speed () reward are defined as where the variables with hat are estimated ones and those without hat are observed ones.

Results

The data comes from the safety pilot model deployment (SPMD) program, which is the world's largest connected vehicle test project (Bezzina and Sayer, 2014). The detailed data processing and lane change detection procedure can be found in our previous work (Guo, Xie & Keyvan-Ekbatani, 2021). After processing, there are 4,749 left and 4,160 right lane changes. The threshold of 2D-TTC is set to be 5s (Van Der Horst & Hogema, 1993) and 713 near-crash events are captured. The model is trained with 80% of the data using the spacing and speed rewards, and evaluated using root mean square percentage error (RMSPE) with 20% of the data.

Table 1. Model performance

	Longitudinal spacing		**Longitudinal speed**	
	MSE	**RMSPE**	**MSE**	**RMSPE**
DDPG (spacing)	0.0062	0.0023	0.0142	0.0526
DDPG (speed)	0.0062	0.0023	0.0130	0.0522
	Lateral spacing		**Lateral speed**	
	MSE	**RMSPE**	**MSE**	**RMSPE**
DDPG (spacing)	<0.0001	0.0112	0.0032	0.3807
DDPG (speed)	<0.0001	0.0002	0.0012	0.1362

The evaluation results are presented in Table 1, which shows the high accuracy. Better performance can be achieved when training with the speed reward function, especially in the modeling of lateral speed.

Conclusions

In this study, we expand TTC to a 2-dimensional space, i.e., 2D-TTC, which is later used to capture near-crash events in real-world data. We develop a DDPG model to learn the underlying strategies of evasive behavior and imitate them. The results show superior trajectory reconstruction accuracy and great potential for practical use.

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The Journey of Auckland's Proactive and Innovative Residential Speed Management

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[a]Traffic Engineering Team Leader North/West, Auckland Transport; [b]Principal Transportation Engineer, Auckland Transport; [c]Senior Transportation Engineer, Auckland Transport

Abstract

Auckland's Residential Speed Management programme proactively prioritised 2380km (31%) of Auckland's residential roads for speed-related improvements. The network was divided into 446 areas, and analysed for quantitative (crashes, speeds, risk, land use, customer feedback) and qualitative elements specific to each area. The outcome clearly identified those communities in most need of intervention and those low-ranking areas where different approaches can be taken. It includes an accompanying GIS heat-map, and a model to automate prioritisation is also underway. A key element is the innovative monitoring regime covering crashes, speeds, volume, community perception, and active mode use. To date, speeds have reduced 20-30%, people feeling roads are safer has increased 68-76%, and increases seen in local walking and cycling. The programme realises three key benefits: a) proactive prioritisation b) robust prioritisation criteria, and c) area-wide speed-calming benefits. It provides a template for developing speed management plans in other regions.

Why: The Problem

Annually, Auckland Transport (AT) receives more than 1000 requests, often emotive in nature, for speed-calming on residential roads. Before 2019, each was responded to individually. This reactive approach was granular as only individual roads were considered. Also, it did not enable identification and evidence-based prioritisation of speed-calming for those most vulnerable communities in need of intervention, and did not provide a comprehensive Safe System solution to achieve our Vision Zero goals for affected areas.

What: Proactive and Innovative Approach to Speed Management

Consequently, AT shifted from individual-street to an area-based speed-calming approach and developed prioritisation for investigating and constructing speed management schemes – the Residential Speed Management (RSM) programme.

Auckland's entire urban residential road network was divided into 446 'self-contained' areas, and proactive analysis was undertaken for five key quantitative criteria:

- Vehicular speeds

1. Crashes (DSIs and total)
2. Crash Risk (Personal and Vulnerable Road User)
3. Land Use
4. Customer feedback

In addition, a ’qualitative lens’ was added to consider area-specific issues that could limit or complement the implementation of speed-calming measures.

As a result, all 446 urban residential areas were ranked for speed-related improvements, encompassing 2,380km, or 31% of Auckland’s road network. An accompanying GIS heat-map of prioritised areas was developed, and a model to automate the prioritisation process is also currently underway.

For the top-ranking areas eventually speed-calmed, a monitoring regime was developed to measure: crashes, vehicular speed and volume, community road safety perception, active mode use, reactive community feedback, and innovatively measuring bus passenger comfort.

What: The Benefits

Benefits have been realised on three fronts: a) the proactive prioritisation of speed-calming treatments, b) robust prioritisation criteria and c) area-wide speed-calming benefits captured by well-rounded post-construction monitoring regime:

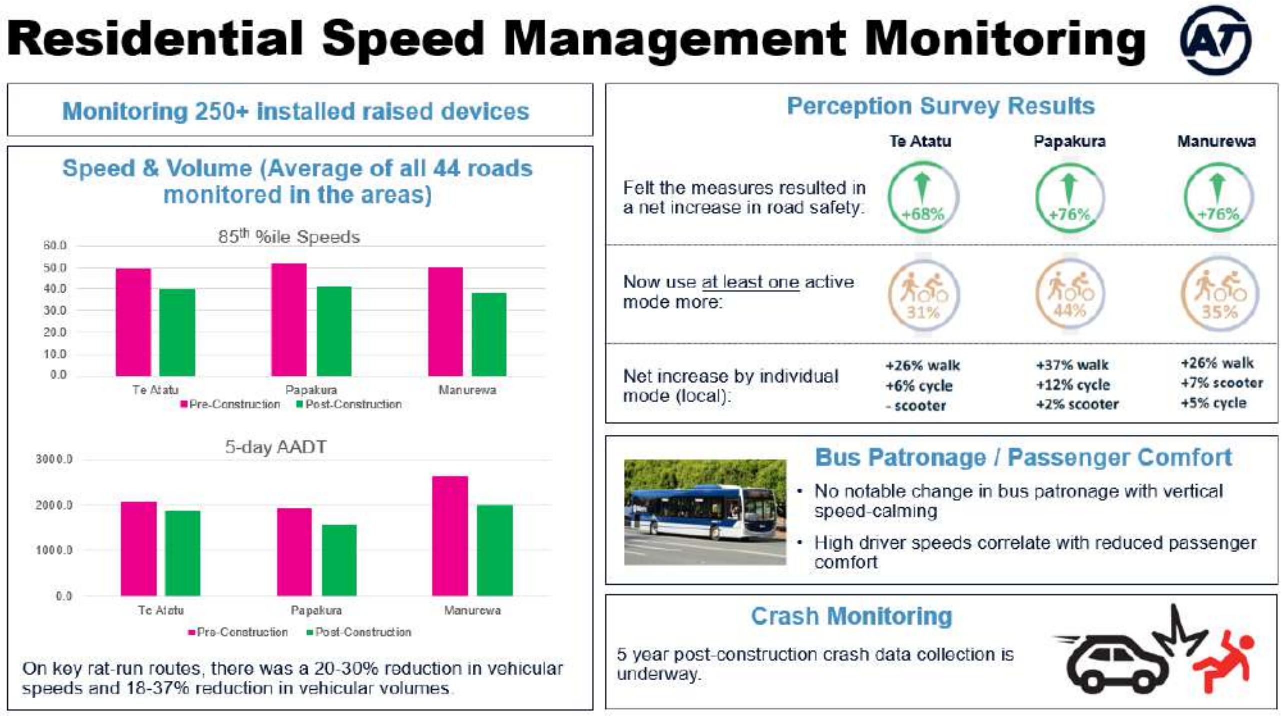
Proactive prioritisation of Auckland’s entire urban residential road network:

- Identifies high-ranking areas for infrastructure improvements, low-ranking areas for speed limit changes only, and a prioritised list for Local Boards wishing to implement speed-related improvements.
- Enables alignment with other AT programmes so infrastructure investment can be optimised to the community’s needs.

The prioritisation criteria enables consistent and evidence-based messaging to local communities regarding why their areas have been chosen (or otherwise) for speed-related improvements (see: https://at.govt.nz/projects-roadworks/vision-zero-for-the-greater-good/safe-speeds-programme/residential-speed-management-programme/). Also, including community feedback in the criteria increases community buy-in during public consultation of speed-calming projects.

Post-construction, area-wide speed-calming in top-ranking areas has resulted in the following benefits (see also Figure 1):

- 20-30% reduction of vehicular speeds and 18-37% reduction in vehicular volumes on key rat-run routes.
- 68-76% increase in people feeling roads are safer.
- Increase of 26-37% in local walking, 5-12% in local cycling, and 2-7% in local scootering.
- Bus passenger comfort ratings to inform future speed-calming designs.
- >1600% increase in length of residential roads speed-calmed (with eventual speed limit drop to 30km/h) per year.
- Estimated DSI savings of $8,000,000 for the three areas treated to date.



Residential Speed Management Monitoring

Monitoring 250+ installed raised devices

Speed & Volume (Average of all 44 roads monitored in the areas)

On key rat-run routes, there was a 20-30% reduction in vehicular speeds and 18-37% reduction in vehicular volumes.

Perception Survey Results

	Te Atatu	Papakura	Manurewa
Felt the measures resulted in a net increase in road safety:	+68%	+76%	+76%
Now use at least one active mode more:	31%	44%	35%
Net increase by individual mode (local):	+26% walk +6% cycle - scooter	+37% walk +12% cycle +2% scooter	+26% walk +7% scooter +5% cycle

Bus Patronage / Passenger Comfort

- No notable change in bus patronage with vertical speed-calming
- High driver speeds correlate with reduced passenger comfort

Crash Monitoring

5 year post-construction crash data collection is underway.

Figure 1. Residential Speed Management programme monitoring highlights

Conclusion

Auckland's proactive and innovative approach to residential speed management provides Road Controlling Authorities a comprehensive template for developing speed management plans for their region.

AUCKLAND'S RESIDENTIAL SPEED MANAGEMENT PROGRAM

Pragati Vasisht, Shane Silcock, Jun Park,
Fransiska Amos, Ramandeep Singh

Why: The Problem

Annually, Auckland Transport (AT) receives more than 1000 requests, often emotive in nature, for speed-calming on residential roads. Before 2019, each was responded to individually. This reactive approach was granular as only individual roads were considered.

Also, it did not enable identification and evidence-based prioritisation of speed-calming for those most vulnerable communities in need of intervention, and did not provide a comprehensive Safe System solution to achieve our Vision Zero goals for affected areas.

1. Vehicular Speeds

2. Crashes (DSIs and Total)

3. Crash Risk

4. Land Use

5. Customer Feedback

What: The Solution + Program

AT shifted from individual-street to an area-based speed-calming approach and developed prioritisation for investigating and constructing speed management schemes – the Residential Speed Management (RSM) programme.

As a result, all 446 urban residential areas were ranked for speed-related improvements, encompassing 2,380km, or 31% of Auckland's road network. An accompanying GIS heat-map of prioritised areas was developed, and a model to automate the prioritisation process is also currently underway.

Localised Increases

	Cycling	Walking
Te Atatu	+6%	+26%
Papakura	+12%	+37%
Manurewa	+5%	+26%

Perception Survey Results

Te Atatu	
Felt the measures resulted in a net increase in road safety	68%
Papakura	
Felt the measures resulted in a net increase in road safety	76%
Manurewa	
Felt the measures resulted in a net increase in road safety	76%

On Key Rat-Run Routes

20-30%	18-37%
Reduction in vehicular speeds	Reduction in vehicular volumes

Evaluation of Smart School Zone infrastructure in South Australia

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Abstract

This study presents an analysis into the effectiveness of a smart school zone system, installed outside a high school in Adelaide, South Australia. The system detects the presence of pedestrians within the school zone and then alerts any motorists who are approaching the zone at a speed greater than 25 km/h to 'CHECK SPEED' with a flashing message sign. The analysis compares vehicle speeds during periods when the message sign was not active to periods when the sign was active. Speeds were compared for three daily periods of interest; a morning pedestrian activity peak (prior to school), an afternoon pedestrian activity peak (after school) and an inter-peak (during school hours). The results indicated that the activation of the message sign was associated with speeds being reduced during the morning peak by up to 1.8 km/h along with more minor reductions during the inter-peak and afternoon peak periods.

Background

In South Australia, a school zone requires motorists to reduce their travel speed to 25 km/h whenever a child is present anywhere within the designated zone. Local Councils often receive feedback from members of the community indicating non-compliance with school zones. Consequently, SAGE Automation designed a Smart School Zone system as a pro-active solution to improve speed limit compliance around schools. When the system detects the presence of pedestrians (using strategically placed sensors) and a vehicle is approaching at a speed above 25 km/h (using radars mounted on the school zone signs), a message is provided to drivers to remind them to reduce their speed. This study presents an evaluation of the performance of the smart school zone system.

Method

The smart school zone site was used to collect data during two phases. While the smart school zone system measures the speed of vehicles as they approach the signposts designating the start of the school zone, there is no measurement of vehicle speeds as they are travelling through the zone. Therefore, pneumatic traffic count tubes were installed within the school zone for the two phases of data collection.

Phase 1 occurred from 7 September to 1 November 2020 and included three weeks where the message sign was inactive, followed by two weeks of school holidays, and finally three weeks where the message sign was active.

Phase 2 of data collection occurred from 26 April to 20 June 2021. During Phase 2 the message sign was initially inactive for two weeks, then active for two weeks, inactive for a further two weeks, and then active again for the final two weeks.

During both phases, data was collected on pedestrian activity, traffic volumes, traffic speeds, and message sign activations.

Results

Data across the two phases were explored to identify and exclude any periods where there were non-homogenous events, such as malfunctions with the system, or pupil free days.

The mean speeds of all vehicles during the three periods of interest (morning peak, inter-peak, afternoon peak) in both traffic directions (Northbound and Southbound) were calculated using data from both the approach speed radars and the pneumatic tubes (see Table 1).

Mean speeds during the morning peak period were found to have reduced by 0.7 - 1.8 km/h. There was a slight reduction during the inter-peak period by up to 0.9 km/h. For the approach speed radar, mean speeds during the afternoon peak were found to have reduced by 0.3 - 0.9 km/h. Conversely, during the afternoon peak the pneumatic tube data showed little change and perhaps a small increase in mean speeds up to 0.3 km/h (although the mean speed remained below 25 km/h).

Conclusions

The SAGE Smart School Zone system has resulted in an overall reduction in vehicle speeds during the periods when school children are most likely to be present and it is recommended that the system remain in use.

Table 1. Table header (note: inserting a Table is optional)

Sensor type	Travel direction	Period of interest	Phase 1 (7 Sep – 1 Nov 2020)					Phase 2 (26 Apr – 20 Jun 2021)					Combined		
			Sign inactive		Sign active		Change in mean speed	Sign inactive		Sign active		Change in mean speed	Sign inactive	Sign active	Change in mean speed
			N	Mean speed	N	Mean speed		N	Mean speed	N	Mean speed		Mean speed	Mean speed	
Approach speed radar	Northbound	Morning peak (810am – 9:00am)	9	33.1 km/h	10	31.5 km/h	-1.6 km/h	13	31.8 km/h	12	31.3 km/h	-0.2 km/h	32.3 km/h	31.4 km/h	-0.9 km/h
		Inter-peak (9:10am – 3:00pm)	9	37.7 km/h	10	37.4 km/h	-0.3 km/h	13	37.5 km/h	12	37.0 km/h	-0.2 km/h	37.6 km/h	37.2 km/h	-0.4 km/h
		Afternoon peak (3:10pm – 3:40pm)	9	30.9 km/h	10	30.8 km/h	-0.1 km/h	13	30.9 km/h	12	30.5 km/h	-0.3 km/h	30.9 km/h	30.6 km/h	-0.3 km/h
	Southbound	Morning peak (810am – 9:00am)	9	30.4 km/h	10	28.9 km/h	-1.5 km/h	13	29.2 km/h	12	28.9 km/h	-0.1 km/h	29.7 km/h	28.9 km/h	-0.8 km/h
		Inter-peak (9:10am – 3:00pm)	9	37.7 km/h	10	38.2 km/h	+0.5 km/h	13	38.3 km/h	12	38.0 km/h	-0.3 km/h	38.1 km/h	38.1 km/h	-
		Afternoon peak (3:10pm – 3:40pm)	9	30.2 km/h	10	29.7 km/h	-0.5 km/h	13	30.8 km/h	12	29.6 km/h	-0.7 km/h	30.6 km/h	29.6 km/h	-0.9 km/h
Pneumatic traffic count tubes	Northbound	Morning peak (810am – 9:00am)	9	32.4 km/h	6	30.2 km/h	-2.2 km/h	12	30.6 km/h	12	29.2 km/h	-0.7 km/h	31.4 km/h	29.5 km/h	-1.8 km/h
		Inter-peak (9:10am – 3:00pm)	9	39.2 km/h	6	38.9 km/h	-0.3 km/h	12	39.7 km/h	12	38.9 km/h	-0.3 km/h	39.5 km/h	38.9 km/h	-0.6 km/h
		Afternoon peak (3:10pm – 3:40pm)	9	28.0 km/h	6	29.6 km/h	+1.6 km/h	12	29.4 km/h	12	28.4 km/h	-0.9 km/h	28.8 km/h	28.8 km/h	-
	Southbound	Morning peak (810am – 9:00am)	9	23.5 km/h	6	22.0 km/h	-1.5 km/h	12	22.3 km/h	12	22.2 km/h	+0.1 km/h	22.8 km/h	22.1 km/h	-0.7 km/h
		Inter-peak (9:10am – 3:00pm)	9	36.3 km/h	6	35.3 km/h	-1.0 km/h	12	36.1 km/h	12	35.3 km/h	-0.7 km/h	36.2 km/h	35.3 km/h	-0.9 km/h
		Afternoon peak (3:10pm – 3:40pm)	9	23.8 km/h	6	24.9 km/h	+1.1 km/h	12	24.7 km/h	12	24.5 km/h	+0.4 km/h	24.3 km/h	24.6 km/h	+0.3 km/h

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Using geospatial data to identify and prioritise locations of interest

Jamie Mackenzie[a], Craig Kloeden[a], Martin Elsegood[a]

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Abstract

A literature review was conducted investigating how geospatial data can be used to identify and prioritise locations of interest in the context of road safety. The project then explored the practicalities of applying the identified geospatial techniques to real-world data from the Australian Capital Territory (ACT). Two common methods of applying geospatial analyses to crash data were identified, along with their advantages and disadvantages. An example of the practicalities of applying these methods to the ACT is presented, which includes details of how to adapt geospatial methods when data is not available in the necessary format. Geospatial analyses are shown to be powerful tools for road safety for identifying and prioritising locations of interest in large and complex road networks. However, to make use of the full potential of geospatial analyses, data must be made available in suitable formats.

Background

A common task in road safety is to identify or prioritise locations of interest within the road network for a variety of reasons, such as infrastructure investment, planning enforcement activities, or for a targeted deployment of advertising.

Geospatial data (such as crash locations) provides a powerful way to achieve these aims. However, large city road networks are complex and, often, several layers of data need to be geographically combined in intelligent ways to produce useful results.

Method

This project consisted of two phases. The first was a literature review on best practice for the collation, processing, and presentation of road safety relevant data sets to identify/prioritise locations of interest.

The second phase of the project was to apply the learnings from the first phase to a small Australian road network (the Australian Capital Territory) to explore the practicalities of obtaining, cleaning, combining, processing, and presenting real-world data.

Results

The literature review found there were two common methods used to identify significant points of interest based on crash data (Hovenden & Liu, 2020). The first is Kernel Density Estimation (KDE), where a 2D surface is applied across the area of interest and then influenced by each crash. At each crash point a circular ‘kernel’ of a specific bandwidth (radius) is applied to the 2D surface (Anderson, 2009). Summing the influence of each crash kernel across the entire 2D surface results in a ‘heatmap’ showing points of high crash density.

While the KDE method is useful in identifying locations of high crash density, it has no association to the road network and thus the influence of crashes can spread and interact with nearby unconnected roads. This limitation led to the development of the second common method, Network-Constrained Kernel Density Estimation (NCKDE). Lachance-Bernard et al. (2011) explains that with NCKDE the influence of each crash is spread along the road network rather than in all directions. Thus, instead of a 2D hot-spot map, a NCKDE analysis produces a road map highlighting 'hot segments'. The NCKDE method can produce impressive results (Fan et al., 2018) and should be considered current best practice for using geospatial data to identify and prioritise locations of interest. However, the NCKDE method is computationally expensive and requires road data in a specific type of 'network format' which explicitly defines the connections between individual road segments.

The lack of data in this format prevented the use of the NCKDE method for the ACT road network. Instead, a hybrid method was developed which takes the KDE approach but assigns the crash data to small road segments to identify specific locations of interest. The results of this method are shown in Figure 1 with an 'interest score' calculated over the whole road network.

Conclusions

There are powerful tools available to assist with identifying and prioritising locations of interest to road safety. Data needs to be available in specific formats to enable the full use of these tools, but it is still possible to achieve insightful results with imperfect data.

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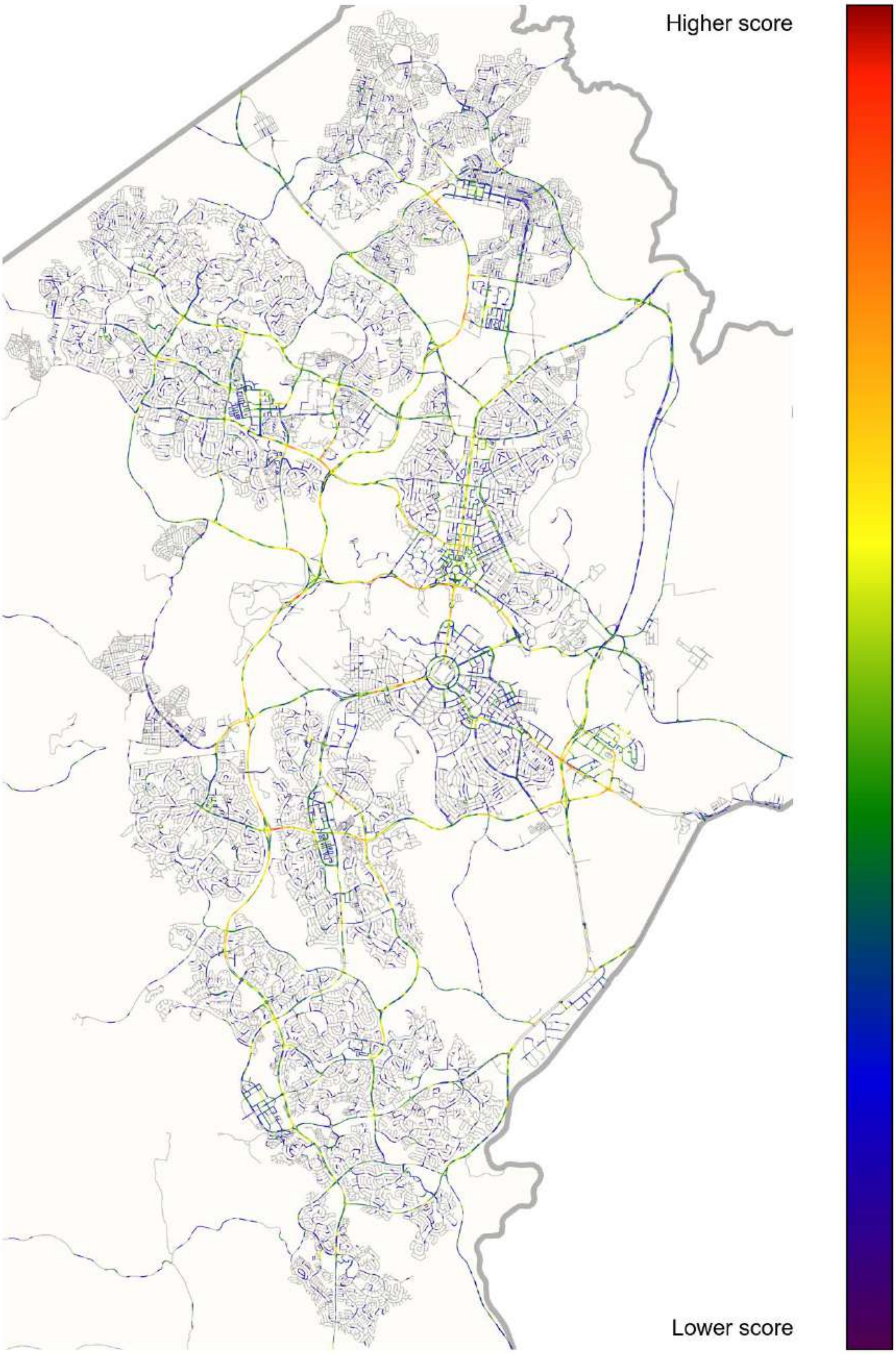

Figure 1. Scores for road segments across the ACT road network (grey roads have no score)

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Modernising Intersection Investment Decisions

Wayne Moon[a], Paul Mihailidis[b], Bruce Corben[c]

[a]Wayne Moon, Traralgon, Australia, [b]Trafficworks, Melbourne, Australia,
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Abstract

Innovative and transformational change is required to modernise intersection decision-making processes – it is critical that these processes include both efficiency and Safe System principles. Today's intersection decision-making software does not provide any guidance in accordance with Safe System principles, for example, at signalised intersections where death and serious injury are highly concentrated. Intersection efficiency software, however, is a highly valued tool used by every Australasian jurisdiction and most local government authorities. This paper argues that modernising intersection decision-making processes can be achieved by developing protocols that integrate Safe System principles, specifically using kinetic energy analysis, with intersection efficiency software used by practitioners, everyday, to significantly improve critical intersection type and design decision-making. Once established, Australia can become a global leader in safe intersection design and in the prevention of tens of thousands of avoidable deaths and serious injuries at Australia's urban and regional intersections over coming decades.

Background

Crashes at intersections account for a high proportion of Australia's road deaths and serious injuries with intersection crashes being the second biggest source of death on Australian roads. For MAIS 3+ injuries on the Victorian road network are more likely to occur at intersections (34 per cent) (Dept. of Transport). As intersection crashes are spatially highly-concentrated, they are more amenable to cost-effective treatment than spatially dispersed crashes across the network. Studies have shown that speed management and geometric design alone are unlikely to achieve Safe System outcomes for all user groups at intersections (Austroads AP-R556-17). This approach will inform infrastructure planning and investment by establishing the design protocols for a modernised intersection assessment that integrates kinetic energy management of traffic conflicts with network capacity objectives.

By considering Safe System principles, with an explicit focus on both kinetic energy management and geometric design, practitioners will be able to design intersections with substantially lower levels of systemic risk of severe injury while also optimising operational efficiency.

By adopting a 'system-view', this approach will simultaneously address all Safe System pillars, enabling intersections to be designed according to energy management and injury risk criteria for all systemic intersection crash types. Explicit account will also be taken of the strengths and limitations of humans and vehicles in traffic.

Current practice in designing intersections utilises commercial software packages to maximise operational performance. Input parameters are entered into the software to quantify estimated operational performance of a given intersection design. Commonly-used design software does not indicate changes in intersection safety performance due to changes in design parameters. MUARC and ARRB developed a tool (KEMM-X and, later, X-KEMM-X) to analyse intersection safety according to Safe System principles. While useful for assessing alternative geometric designs (Austroads 2017), its use as a stand-alone tool is currently limited as it is not accessible to the broader industry.

Problem

Safe System principles have not been integrated with intersection design software and so are often applied retrospectively rather than during the early development and design stages.

Solution

This innovative and transformational approach will address this unacceptable present-day safety gap and demonstrate how Safe System-aligned intersection design can eliminate the risk of fatal and serious injuries. Safe System-aligned design protocols for use within or alongside design software, at critical design decision gateways, are a key output of this approach. Establishing Safe System design principles early in the planning stages helps to assure their retention throughout the concept and design stages, resulting in the comprehensive integration of operational and safety criteria. Attempts for late modifications to designs are often rejected as being 'too late' in the process to change.

This proposed approach will ensure that kinetic energy in crashes is below human tolerance levels for serious injury. This, together with the safety attributes of vehicle technology and speed, will ensure clearer design guidance is available to practitioners to meet Safety Performance Indicators and support transformation to achieve 2030 and 2040 targets and, ultimately, reach near-zero serious trauma by 2050.

Acknowledgments

Fotini Toso, Amir Sobhani, Scott Elaurant

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A review and comparison of light vehicle brake testing methods

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Abstract

Brake testing machines provide a rapid method of investigating the performance of a vehicle's brakes and assessing whether they meet roadworthiness criteria. However, it is important to have confidence in the results they provide. This study presents an investigation of the ability of four brake testing methods to detect mechanical or hydraulic faults on light vehicles. A test vehicle was professionally fitted with equipment to enable the control and measurement of the brake pressure applied to individual wheels. A brake pedal robot that could supply a repeatable and consistent brake application force was also installed. Data was collected during a series of tests in which brake fault conditions in the test vehicle were simulated. For each condition the vehicle was tested three times with a plate brake tester, a roller brake tester, a portable decelerometer, and during a high-speed stopping distance test. Results were compared to minimum brake performance criteria.

Background

The objective of this study was to investigate the ability of four brake testing methods to recognise mechanical or hydraulic brake faults on light vehicles. Brakes can be considered the most important safety feature on a vehicle and must be maintained to ensure optimal performance.

Brake testing machines provide a rapid method of investigating the performance of a vehicle's brakes and measuring them against roadworthiness criteria. However, it is important for vehicle owners and roads authorities to understand the differences between brake testing methods, their advantages and their limitations.

Method

A test vehicle, representative of a common passenger vehicle, was professionally fitted with equipment enabling the control and measurement of the brake pressure applied to individual wheels. A brake pedal robot that could supply a repeatable and consistent brake application force was also installed. Four examples of commonly used brake testing equipment were acquired for the study:

- A SafeTstop plate brake tester,
- A Vehicle Inspection Systems roller brake tester,
- A Circuitlink Brake-Testa portable decelerometer, and
- A Racelogic Vbox 3iSL GPS data logger for use in high-speed stopping distance tests.

Data was collected during a series of test sets. In each test set, a brake fault condition in the test vehicle was simulated by adjusting the maximum brake pressures at individual wheels. The vehicle was then tested three times with each piece of brake testing equipment.

Results

The implemented brake fault conditions all resulted in an increase to the test vehicle's stopping distance (see Figure 1) with the largest being an increase of over 75% (equating to an extra 20 metres for a vehicle travelling at 80 km/h).

During each of the brake fault conditions, the reported deceleration values from each of the brake testing methods were investigated and compared. There were significant differences in the decelerations reported by each of the testing methods, but all were affected in similar ways with respect to the severity of the implemented brake fault conditions. In addition, some brake test methods were able to offer extra insights such as left-to-right brake force imbalance.

The minimum brake performance criteria from the NSW Authorised Inspection Scheme were used to explore how the results from each brake testing method would have been assessed. Similar brake performance criteria are also used in New Zealand and most other Australian jurisdictions. Alarmingly, there were instances where severe brake faults would have passed the brake performance criteria. These included faults leading to increases in stopping distances of 30.0%, 45.8%, and even 73.5%.

Conclusions

There were noteworthy differences in the ability of the various brake testing methods to detect brake faults. These differences need to be understood by those undertaking brake testing and those interpreting the test results. Further research into this area would be useful to provide further insight into what these differences mean for ensuring a minimum standard for brake performance. Furthermore, based on the results of this study, it is suggested that a review of brake performance criteria is warranted.

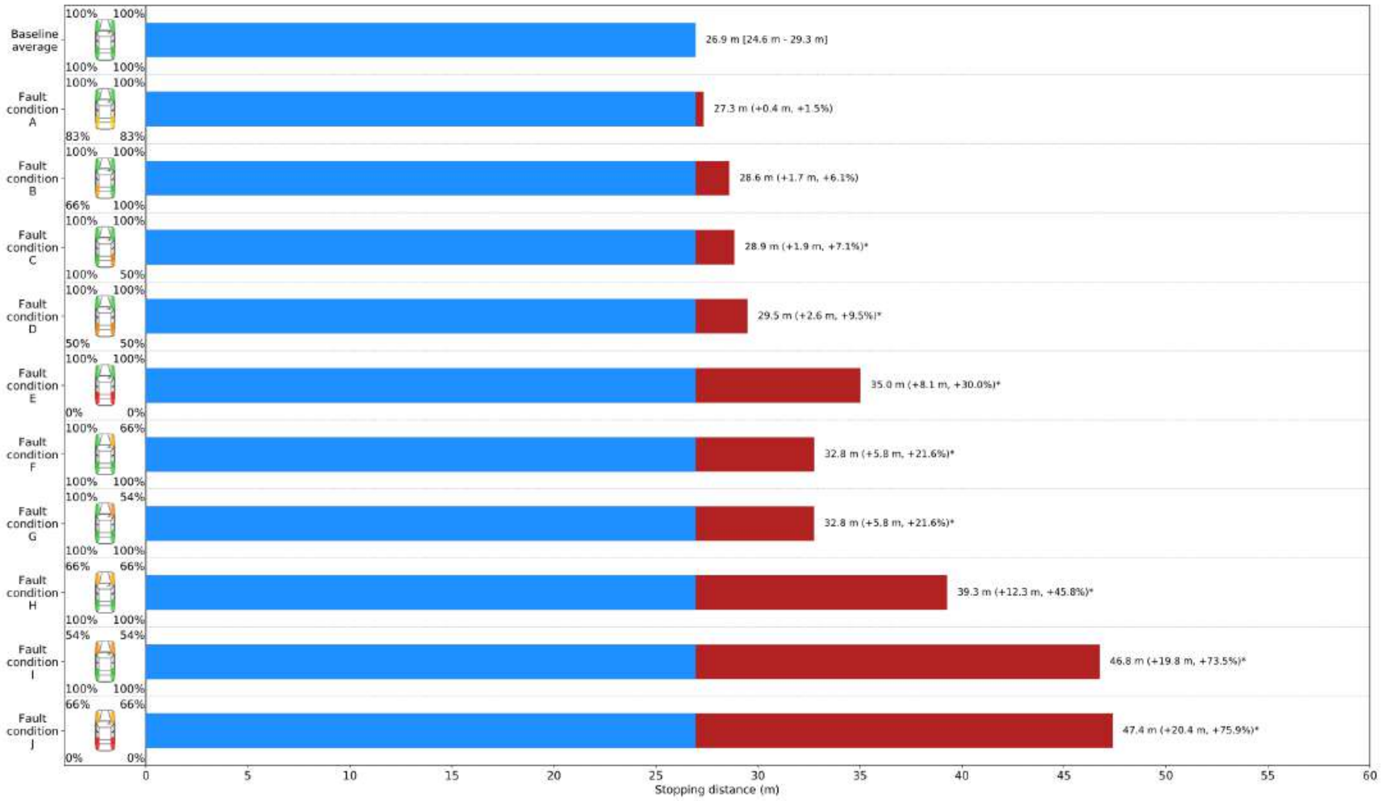

Figure 1. Average stopping distances during each brake fault condition (fault conditions shown as percentage maximum brake force enabled at each wheel)

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Bike Ed Pilots in schools – key findings

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Abstract

The Department of Transport redeveloped the Bike Ed program to modernise the curriculum and extend Bike Ed to cover a wider Victorian audience. The redeveloped program now includes Years 1 to Years 8 students and an adult program. Pilots were conducted and evaluated at 10 schools across Victoria. Parents reported improvements in their children's riding knowledge and skills, and indicated high levels of support for the program. Parents indicated learning to ride was an important life skill and appreciated that it was being delivered by schools. Students reported high levels of enjoyment of the program, especially the practical cycling components. Teachers enjoyed conducting the program and reported substantial benefits for those who participated in the program.

Background

The Department of Transport (DoT) redeveloped the Bike Ed program to modernise the curriculum and extend Bike Ed to cover a wider Victorian audience. The redeveloped program has been extended for Years 1 to Years 8 students; and for adults; with five Bike Ed units developed for Years 1-2, 3-4, 5-6, 7-8 and adults. The DoT developed a Bike Ed monitoring and evaluation plan, including program logic models for primary and secondary schools to identify aims, objectives, activities and intended impacts for the school program, which led to a monitoring and evaluation framework, including school pilots.

Bike Ed Pilots

Five primary, three secondary and two specialist schools participated in pilots across Victoria. A total of 984 students participated in the Bike Ed pilot program, with the majority of students in the primary school programs covering Years 1-6. The evaluation was a combined process-impact evaluation involving data collection with students (pre- and post-program surveys), parents/carers (pre- and post-program surveys) and teachers (individual and group interviews). Impact evaluation measures assessed changes in students' knowledge, skills, attitudes and behaviours. The process evaluation assessed how well the program was implemented and how it could be improved, with measures aimed at exploring students', parents' and teachers' experiences.

Lessons Learned

Pre-program, students reported high levels of interest in bike riding, with most students looking forward to participating in Bike Ed because they enjoy bike riding, learning new skills and how to ride safely through activities. Post-program, there was a general pattern of improvements in students' safe cycling knowledge and bike handling skills across all Bike Ed year levels. Increased confidence was most evident for Years 3-4 and 5-6 students. Improvements in dealing with hazards were most evident for Years 5-6 and 7-8 students. Students reported Bike Ed helped them become better and safer bike riders, consistent with both their enjoyment of the program and the measured impacts of the program. Students found all components of the Bike

Ed program helpful, particularly activities involving bike riding. A small number of students provided suggestions for improving the activities. Parents' responses were consistent with those provided by students, reporting high levels of children's interest in bike riding; with indications of post-program improvements in children's cycling knowledge, skills, attitudes and behaviours, and in parents' confidence in their children's ability to cycle safely in different circumstances, except for cycling on-road on busy streets. Teachers reported high levels of enjoyment of Bike Ed (for students and teachers) and substantial benefits for students who participated in the program. Teachers consider that Bike Ed provides students with a valuable life skill that they may not acquire elsewhere. One teacher highlighted the difference between students knowing how to pedal (which many students know how to do prior to Bike Ed) and knowing how to ride (ie encompassing the range of safe cycling skills included in Bike Ed). Teachers reported being well-resourced to conduct the program, including the detailed Bike Ed lessons provided a good balance of the theory and practice of safe cycling.

OUR NEW BIKE ED

Juliet Bartels, Jana Leckel, Jan Garrard

The Department of Transport redeveloped the Bike Ed program to modernise the curriculum and extend Bike Ed to cover a wider Victorian audience. The redeveloped program now includes Years 1 to Years 8 students and an adult program. Pilots were conducted and evaluated at 10 schools across Victoria.

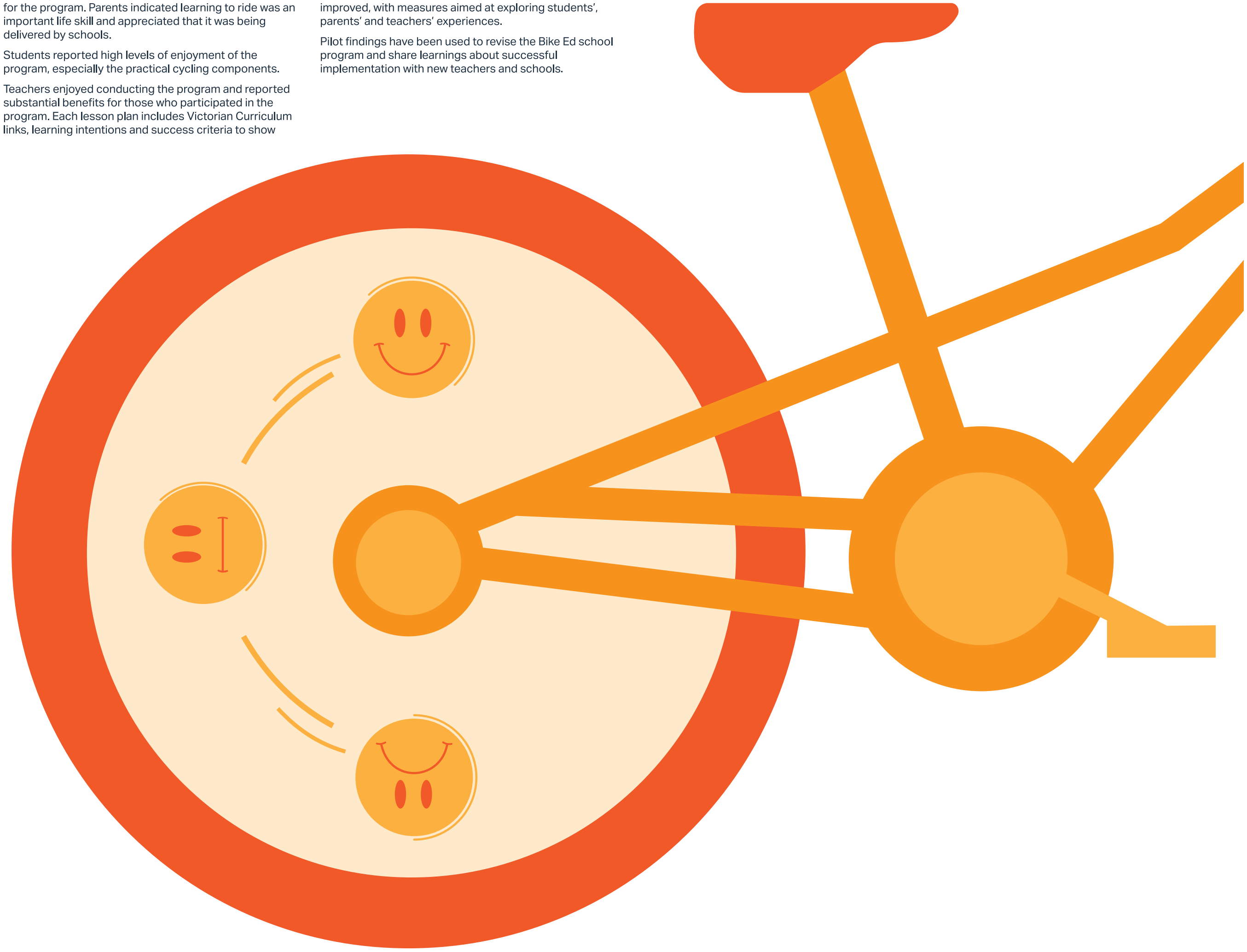
Parents reported improvements in their children's riding knowledge and skills and indicated high levels of support for the program. Parents indicated learning to ride was an important life skill and appreciated that it was being delivered by schools.

Students reported high levels of enjoyment of the program, especially the practical cycling components.

Teachers enjoyed conducting the program and reported substantial benefits for those who participated in the program. Each lesson plan includes Victorian Curriculum links, learning intentions and success criteria to show how Bike Ed is linked with the curriculum and teachers reported they really valued this.

Five primary, three secondary and two specialist schools participated in pilots across Victoria. A total of 984 students participated in the Bike Ed pilot program. The pilots assessed changes in students knowledge, skills, attitudes and behaviours. The pilots also assessed how well the program was implemented and how it could be improved, with measures aimed at exploring students', parents' and teachers' experiences.

Pilot findings have been used to revise the Bike Ed school program and share learnings about successful implementation with new teachers and schools.



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Older drivers and advanced vehicle technologies: what are their opinions?

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Abstract

Driving is the main means of transport for most adults in Australia and other high income countries. However, visual, physical and cognitive function needed for driving can decline with age. Advanced vehicle technologies (AVTs) have been developed to assist safe driving and may have particular application for older drivers. Unfortunately, there is little research on the opinions older Australian drivers have about AVTs available in the current vehicle fleet. Semi-structured interviews were completed on 13 older drivers living in NSW, Australia, with thematic analysis completed on all transcripts. Overall, an individual's driving ability was regarded as more important for safe driving than AVTs despite an understanding and appreciation of their safety benefits. This sentiment, however, was limited to features deemed simple to use, with all participants voicing their hesitations about more complicated features. Additional costs associated with purchasing a car with AVTs was a barrier for their use.

Background

Driving is an essential skill for older adults to remain independently mobile and connected with their community (Chihuri et al., 2016). Unfortunately, age-related declines in function make older drivers one of the most vulnerable road users. Aside from young and or inexperienced drivers, older drivers are involved in greater numbers of serious and or fatal crashes compared to other age groups (Owsley, Ball, Sloane, Roenker, & Bruni, 1991). Advanced vehicle technologies (AVTs), such as blind-spot monitors, have been developed to assist with safe driving and may have particular benefits for older drivers who are over-represented in intersection crashes (McGwin & Brown, 1999). Despite current literature showing AVTs to have a positive impact on improving driving safety, most of the research on the driver-vehicle interface for AVTs currently focuses on young and middle-aged drivers (Furlan et al., 2020). There is limited research investigating how older drivers view such features and whether the safety benefits expressed by younger drivers are applicable. This study therefore aimed to investigate what older drivers understand about AVTs on the current market and motivations for their use.

Method

Older drivers (≥65 years) living in NSW, Australia completed semi-structured telephone interviews with a research personnel experienced with qualitative research. Creation of the interview guide was guided by the Car Technology Acceptance Model (CTAM) (Osswald, Wurhofer, Trösterer, Beck, & Tscheligi, 2012). All interviews were audio-recorded and transcribed verbatim. Deductive-inductive thematic analysis was completed on each transcript independently by two researchers, with all themes presented to the investigative team, discussed and agreed upon.

Results

13 participants (mean age: 76.1 years; 11 males, 2 females) living in Central Coast or Port Macquarie were interviewed. Four major themes and their corresponding CTAM determinants were identified: (1) Safety and responsibility, (2) Self-directed learning vs. external help, (3) Effect of AVT design on it perceived usefulness, and (4) High out-of-pocket costs (Table 1). Most AVTs were seen as helpful technologies which could assist the driver and make driving safer. However, as an individual's skills were rated higher than the technologies' abilities, the onus of safety stayed with the driver. Knowledge on simple, easy-to-use technologies, such as reversing cameras, was strong, but participants expressed the need for additional expert help, such as from a salesperson, to complement self-directed learning to allow for more complicated technologies, such as navigation systems, to be understood. Motivation to use AVTs was linked towards the user-friendliness of the technology's design with those more autonomous in nature, disliked and perceived as unnecessary. Additional costs associated with purchasing a vehicle with AVTs disincentivised their use and made participants less likely to value such vehicles, despite perceptions on their safety and importance.

Conclusions

Despite understanding the safety benefits of simple AVTs, there are barriers that stop older drivers from using more complicated technologies. Consultation to develop appropriate resources and options for older adults aimed at helping them access AVTs on the current market is needed. Future studies investigating how AVTs influence vehicle purchase may give more insight into why some technologies are preferred over others.

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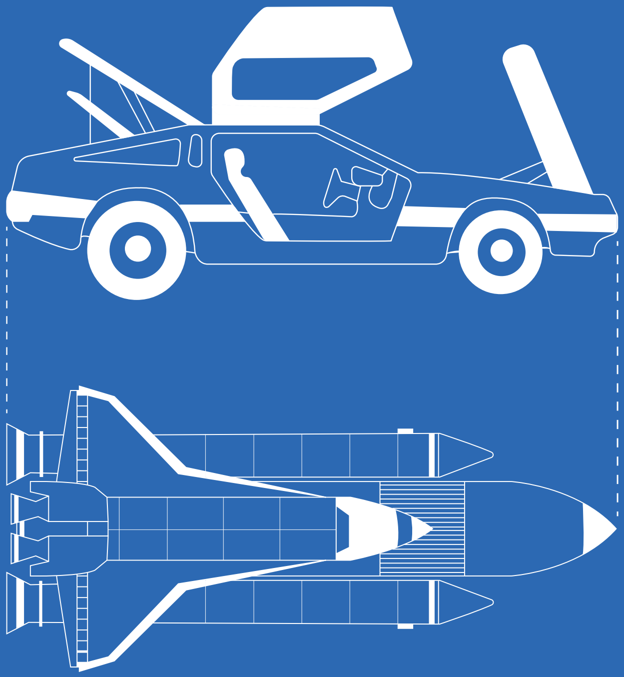
Table 1. Major themes identified from the semi-structured interviews with older drivers, and their corresponding CTAM determinants

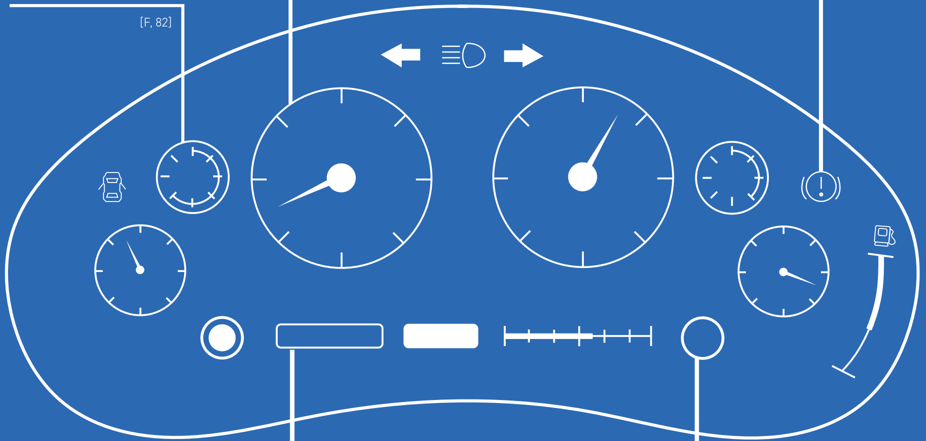
CTAM Determinants	Theme	Quotes
Performance expectancy and attitudes towards using technology	Safety and responsibility	"They are second line after the driver. The driver is responsible first but having them looking over your shoulder, it's a good thing." [M, 74] "But I think we should be very careful not to feel that we can drive unsafely because we've got safety features." [M, 87] "I don't really use them a lot, you know, because I've been driving for 50 odd years now and you just know what to do now without these features…" [F, 70]
Effort expectancy, facilitating conditions, self-efficacy, and anxiety	Self-directed learning vs. external help	"I think I have an affinity for technology. Nobody taught me, in fact some of the things I found out, I found out by sheer accident." [F, 82] "These days I'm still finding out minor things about this car after 3 years... because there's 100s of pages." [M, 87] "Probably just be shown initially when you are purchasing the car. I think that was the best way." [M, 71]
Attitude towards using technology and perceived safety	Effect of AVT design on its perceived usefulness	"Yep its autonomy, we like to be in control and we don't like hand-outs... and that's where the automatic braking is sort of an issue..." [M, 77] "And they said to me they don't use it because they can't actually see it..." [M, 71]
Facilitating conditions	High out-of-pocket costs	"If I can afford them and I think they are necessary, I would get them." [M, 74] "... but no it's mainly comfort and affordable as you say, basically." [M, 75]

ADVANCED VEHICLE TECHNOLOGY AND THE OLDER DRIVER

Helen Nguyen, Gian Luca di Tanna, Kirsty Coxon, Julie Brown, Lisa Keay



1. Safety and Responsibility
2. Self-Directed Learning vs External Help
3. Effect of AVT Design on its Perceived Usefulness
4. High Out-Of-Pocket Costs



> I've been driving for 50 years now and you just know what to do now without these features
>
> [F, 70]

> I think we should be very careful not to feel that we can drive unsafely because we've got safety features.
>
> [M, 87]

> I think I have an affinity for technology. Nobody taught me, in fact some of the things I found out, I found out by sheer accident.
>
> [F, 82]

> I'm still finding out minor things about this car after 3 years...because there's 100s of pages.
>
> [M, 87]

> It's autonomy, we like to be in control and we don't like hand-outs... and that's where the automatic braking is sort of an issue
>
> [M, 77]

Driving is the main means of transport for most adults in Australia and other high income countries. However, visual, physical and cognitive function needed for driving can decline with age. Advanced vehicle technologies (AVTs) have been developed to assist safe driving and may have particular application for older drivers. Unfortunately, there is little research on the opinions older Australian drivers have about AVTs available in the current vehicle fleet. Semi-structured interviews were completed on 24 older drivers living in NSW, Australia, with thematic analysis completed on all transcripts. Overall, an individual's driving ability was regarded as more important for safe driving than AVTs despite an understanding and appreciation of their safety benefits. This sentiment, however, was limited to features deemed simple to use, with all participants voicing their hesitations about more complicated features. Additional costs associated with purchasing a car with AVTs was a barrier for their use.

METHOD

Older drivers (≥65 years) living in NSW, Australia completed semi-structured telephone interviews with a research personnel experienced with qualitative research. Creation of the interview guide was guided by the Car Technology Acceptance Model (CTAM) (Osswald, Wurhofer, Trösterer, Beck, & Tscheligi, 2012). All interviews were audio-recorded and transcribed verbatim. Deductive-inductive thematic analysis was completed on each transcript independently by two researchers, with all themes presented to the investigative team, discussed and agreed upon.

RESULTS

24 participants (mean age: 74.5 years; 13 males, 11 females) living on the Central Coast, Port Macquarie or metropolitan Sydney were interviewed. Four major themes and their corresponding CTAM determinants were identified: (1) The responsibility of safety, (2) Self-directed learning due to the lack of expert advice, (3) Effect of AVT design on it perceived usefulness, and (4) High out-of-pocket costs (Table 1). Most AVTs were seen as helpful technologies which could assist the driver make driving safer. However, an individual's skills were rated higher than the technologies' abilities, thus keeping the onus of safety with the driver. Knowledge on simple, easy-to-use technologies was strong, but participants expressed the need for additional expert help, such as from a salesperson, to complement self-directed learning as the vast information on AVTs in the vehicles' manuals can be overwhelming. Motivation to use AVTs was linked towards the user-friendliness of the technology's design with those more autonomous in nature, disliked and perceived as unnecessary. Additional costs associated with purchasing a vehicle with AVTs disincentivised their use and made participants less likely to value such vehicles, despite the participants' awareness of the technologies' safety and importance.

CONCLUSIONS

Despite understanding the safety benefits of simple AVTs, there are barriers that stop older drivers from using more complicated technologies. Consultation to develop appropriate resources and options for older adults aimed at helping them access AVTs on the current market is needed. Future studies investigating how AVTs influence vehicle purchase may give more insight into why some technologies are preferred over others.

ACKNOWLEDGEMENTS

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Thanks to two 5th year UNSW optometry students (SQ and JL) for their help on the project. Importantly, thanks to the individuals who kindly participated and shared their time and experience with the research team.

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Hydroplaning: preparing today for tomorrow's downpours

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Abstract

Hydroplaning is a phenomenon that can occur on wet roads where a motorised vehicle's speed is such that tyres begin to rise up over the water film similar to water skis, resulting in the loss of frictional forces between the tyres and road and hence loss of vehicle control. Given Australia's east coast recent large rain downpours and flooding and New Zealand's expected future extreme rainfalls, it may now be timely to review Australia's and New Zealand's vehicle roadworthy laws concerning minimum tyre tread depth of 1.5 mm and the need for in-vehicle tyre pressure monitoring systems. This article discusses the relationship between tread depth and critical speed identifying when hydroplaning occurs. Two fatal injury vehicle crash case examples are discussed to illustrate the concern. Increasing minimum tread depth for roadworthiness compliance and automatic tyre pressure monitoring are recommended based on this study.

Background

The frictional force between a car's tyre and the road pavement is critical for safe steering and braking. Hydroplaning is a phenomenon in which this frictional force between the tyre and the road surface reduces to a very low value. It can occur when a vehicle drives on a road covered by a layer of water. The water penetrates between the tyre and the pavement such that a dynamic pressure builds up between the tyre and the pavement. As the dynamic pressure rises, a portion of the tyre raises off the pavement. With increasing speed of the vehicle, this pressure increases, supporting more of the tyre, until at a critical speed, termed the hydroplaning speed, the tyre is supported only by the water, and loses all contact with the pavement.

Tread on a tyre is used to allow the water to displace via the grooves usually to the sides to reduce the dynamic pressure build up that causes hydroplaning. Similarly, good drainage on roads to prevent the water layer from increasing in depth also ensures an increase in the critical hydroplaning speed.

Navin (1995) also looked at all the hydroplaning models and presented an overview of them in a key summary paper where he showed that the critical hydroplane speed is dependant on not only the tyre pressure but also on the water depth and tyre tread depth. He detailed an equation developed by Gallaway et al. (1979) that provides the critical speed at which hydroplaning occurs taking into account tread depth and water depth. Further discussion of the Gallaway et al. (1979) equations are provided in the US Texas Department of Transportation Hydraulic Design Manual (2004).

Method

Using Gallaway's (1979) equation, Navin (1995) provided the formula for critical velocity :

where: dynamic hydroplaning speed (km/h)
spin down (%) (commonly set at 10%)
rotational velocity on dry pavement
rotational velocity on wet pavement
tyre pressure (kPa)
tread depth (mm)

texture depth (silicone putty method where 0.96 mm commonly adopted)
water depth above asperities (mm) where the following equation can be used to evaluate the depth of storm water on pavement

WD =

where: pavement width (m)
rainfall intensity (mm/hr)
pavement cross slope (m/m)

Typical tyre pressure can range from as low as 207 kPa (30 psi) up to 241 kPa (35 psi). However, the first author has investigated two separate fatality cases resulting from hydroplaning where the lower limit of tyre pressure recommended by the vehicle manufacturer was even lower.

For example, in one case a dual cab 4WD vehicle had spun out of control leaving the verge and hit a tree sideways killing the occupant. It was alleged that water pooled up to a depth of 2 to 3 mm on the road. The speed limit was 100 km/h. The tyre pressure measured by Police at the crash scene of one of the still inflated front wheels was 193 kPa (28 psi). Interestingly, the vehicle manufacturer's inflation range for the recommended tyre designated 235/70 R16, was between 179 kPa (26 psi) to 248 kPa (36 psi) depending on the load the vehicle is carrying (Tire Pressure Chart).

In a second case, a work utility single cab vehicle allegedly hydroplaned during a downpour such that it crossed a median and was then struck on its left side by an oncoming tipper truck, killing the driver of the utility (Figure 1a). Again, it was claimed that water pooled up to a depth of between 2 to 3mm on the road. The speed limit in this case was 100 km/h. The minimum tyre pressure recommended by the vehicle manusfacturer was again as low as 179 kPa (26 psi) for the front tyres of the utility depending on the load carried.

Results and Discussion

Figure 1b shows a chart of speed versus water depth for a tyre pressure of 179 kPa (26 psi) and 36 psi (248 kPa) for a tread depth of 1.5 mm and for a new tyre of 12 mm.

Figure 1b shows that a tyre with the minimum tread depth of 1.5 mm that is inflated to only 179 kPa (26 psi) for a water depth ranging between 2 to 3 mm, the hydroplaning critical speed ranges from 81 km/h to 83 km/h. Importantly, at 1 mm water depth hydroplaning can occur for as low as

Figure 1a: Water pooling on lanes left of median.

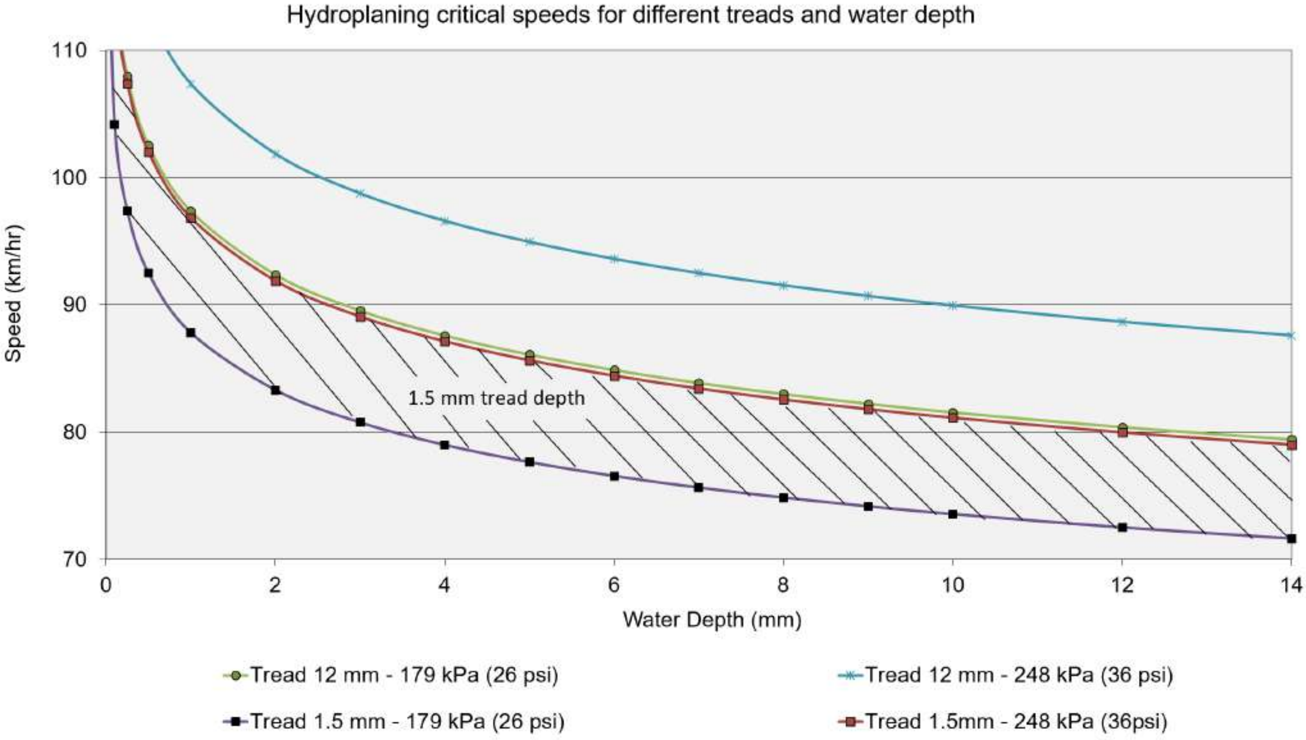

Figure 1b: Hydroplaning critical speeds (water depth in mm)

87 km/h for such a tyre presenting a serious hazard to drivers on freeways. By simply increasing the pressure in a tyre to 248 kPa (36 psi) with such low tread depth increases the critical speed from 87 km/h to 96 km/h at 1 mm water depth.

Interestingly, even for new tyres with a tread depth of 12 mm and 1 mm water depth, Figure 1b indicates that hydroplaning can occur below 100 km/h (e.g. on a freeway) if the tyres are under-inflated (e.g. 179 kPa (26 psi) being the lower end of the pressure range suggested by some vehicle manufacturers) below the tyre manufacturers suggested lowest inflation of 207 kPa (30 psi).

Conclusions

It is critical that tyre inflation should be monitored at all times using automatic sensors to ensure they are at least at or above 207 kPa (30 psi) and that an Australian Design Rule be introduced requiring all new motorised vehicles have such sensors and instrument displays capable of providing the driver information regarding their vehicles tyre pressure.

When downpours occur it is recommended that all vehicles are slowed to maximum speed of 70 km/h. This would help prevent any vehicles which have tyres that have a tread depth just above the legal limit of 1.5 mm hydroplaning.

With speed limits commonly set for arterial and rural roads at 80 km/h to 100km/h [and some freeways at 110km/h], hence, it is recommended that the roadworthy tread depth be reviewed and increased from the current minimum of 1.5 mm to 2 mm. This would assist with raising the hydroplaning speed above 80 km/h for a 3 to 4 mm water depth which may start to be a more common event over the next decades.

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Tire Pressure Chart 235/70R16 https://tirepressure.com/235-70r16-tire-pressure (Accessed 11/03/2022)

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Associations of vision impairment on crash involvement and driving cessation

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Abstract

Driving is a visually demanding task. Declines in vision can result in motor vehicle crashes (MVCs) and driving cessation. However, the global impact of vision on MVCs and driving cessation has not been comprehensively reviewed. This review aimed to investigate the associations between vision impairment and risk of MVC involvement and driving cessation and evaluate vision-related interventions to reduce MVCs and prolong safe driving. Searching Medline (Ovid), EMBASE and Global Health (inception to March 2020) identified 90 studies for inclusion after screening, data extraction and appraisals by two investigators independently. Visual field impairments increase the risk of crashing by 66% but cataract surgery can halve these risks. AMD, glaucoma or contrast sensitivity impairment increase the risk of driving cessation with anti-VEGF injections at high doses able to prolong driving in persons with AMD. Current literature, however, is heterogeneous and more high-quality studies from low- and middle-income settings is needed.

Background, Method, Results and Conclusions (*please use these proposed section headers*).

Background

With the rise of global motorisation increasing the number of drivers on the roads, the number of motor vehicle crashes (MVCs) is also increasing. Approximately 1.35 million MVC-related fatalities and 20-50 million road-related injuries occur each year (WHO, 2020). The United Nations therefore developed Sustainable Development Goals Targets 3.6 and 11.2 which aimed to halve road-related deaths by 2020 and improve the transport system for vulnerable road users (UN, 2015). Despite being a common and valued activity for many adults, driving is a visually demanding task and declines in vision can result in MVCs. Individuals may therefore decide to stop driving, however driving cessation has been linked to depressive symptoms and poorer health, particulary amongst older adults (Chihuri et al., 2016). As part of the *Lancet Global Health Commission* on Global Eye Health (Burton et al., 2021), this review therefore aimed to systematically evaluate the evidence to (1) investigate the associations between vision impairment and risk of MVC involvement and driving cessation across the lifespan, and (2) evaluate vision-related interventions to reduce MVCs and prolong safe driving.

Methods

Medline (Ovid), EMBASE and Global Health electronic databases were searched from inception to March 2020 for observational and interventional English-language studies on drivers of four-wheeled vehicles of all ages with no cognitive declines (PROSPERO registration: CRD42020172153). The outcomes were

MVC involvement and driving cessation. Exposures were eye diseases and declines in measures of vision function. Screening, data extraction and appraisals were completed by two investigators independently, with conflicts resolved by a third investigator. Where appropriate, measures of association were converted into risk ratios (RRs) for meta-analysis. All narrative summaries were reported using appropriate SWiM guidelines.

Results

90 studies (n=753860) were included after full-text review. 53 studies (58%) involved older drivers (≥65 years) only and 76 studies (84%) were in high-income settings. Visual field loss (two studies; RR 1.66 (95% Cl 1.05-2.62); p=0.03; I^2=28.79%) but not glaucoma (five studies, RR 1.27 (95% Cl 0.67-2.42); p=0.47; I^2=93.48%) or cataract (two studies RR 1.15 (95% Cl 0.97-1.36); p=0.11; I^2=3.96%) increased crash risk. Cessation was associated with glaucoma (two studies; RR 1.62 (95% Cl 1.20-2.19); p<0.001, I^2=22.45%), age-related macular degeneration (AMD) (three studies; RR 2.21 (95% Cl 1.47-3.31); p<0.001, I^2=75.11%) and reduced contrast sensitivity (three studies; RR 1.30 (95% Cl 1.05-1.61); p= 0.02; I^2=63.19%). Cataract surgery halved MVC risk (three studies; RR 0.55 (95% Cl 0.34-0.92); p= 0.02; I^2=97.10). From four RCTs (two on AMD, two on diabetic macular oedema), high doses of ranibizumab injections (0.5mg) only prolonged driving in persons with AMD.

Conclusion

Impaired visual fields were associated with increased MVC involvement, while cessation was associated with other forms of vision loss. Cataract surgery can reduce MVC risk. Detection of vision problems and appropriate treatment is critical to road safety. Current literature is however heterogeneous making it difficult for stronger conclusions to be reported using meta-analysis. More high-quality studies from low- and middle-income settings and studies focused on younger adults need to be addressed to meet global targets on road traffic injury and crash rate reductions.

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RJAWS Lite: A Low-cost, Technology-based Intersection Safety Treatment

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Abstract

Crashes at intersections contribute a substantial number of fatal and serious injuries in Australia. Regional and remote intersections are particularly dangerous for road users, due to high speeds and a widespread lack of safety measures beyond the minimum control and sight distance requirements. The high cost of additional safety treatments means they are often not employed, leaving a gap in road safety at many intersections. The rural junction active warning system (RJAWS) Lite has been developed as a low-cost, technology-driven treatment that will fill a need for evidence-based treatments at lower-volume regional intersections. RJAWS Lite is currently being trialled at six intersections across regional South Australia. Through this trial, we will demonstrate RJAWS Lite as a viable road safety tool that state and local government can employ from their toolbox of road safety treatments.

Background

Crashes at intersections contribute a substantial number of fatal and serious injuries in Australia. Regional and remote intersections are particularly dangerous for road users, due to high speeds and a widespread lack of safety measures beyond the minimum control and sight distance requirements. Often, additional safety treatments are not employed due to their high cost. Recently, technology-driven treatments have been introduced to help reduce the cost of improving safety at regional intersections. In South Australia, the rural junction active warning system (RJAWS) uses traffic detection to temporarily reduce the speed through an intersection when the potential for a collision with traffic entering from the side road arises (Mongiardini, Stokes, and Woolley, 2021). Despite the promising benefits of this treatment, installation costs exceed, and in some instances substantially, $150,000. This largely limits its implementation to higher-volume intersections.

RJAWS Lite, a low-cost system derived from RJAWS, is being developed and tested by the Centre for Automotive Safety Research (CASR) and Sage Automation through a Federal Road Safety Innovation Fund (RSIF) grant (ORS n.d.). Support is also being provided by the South Australian Department for Infrastructure and Transport (DIT).

Method

RJAWS Lite uses radar detection, mobile-based communication, and off-grid solar power systems to substantially reduce costs when compared to RJAWS. RJAWS Lite requires no undergrounding of infrastructure and minimal excavation for the installation of frangible roadside poles. It is estimated that in its basic three-approach intersection format, RJAWS Lite will cost around $70,000 per intersection. Due to the off-grid solar and mobile-communications systems that are utilised, which

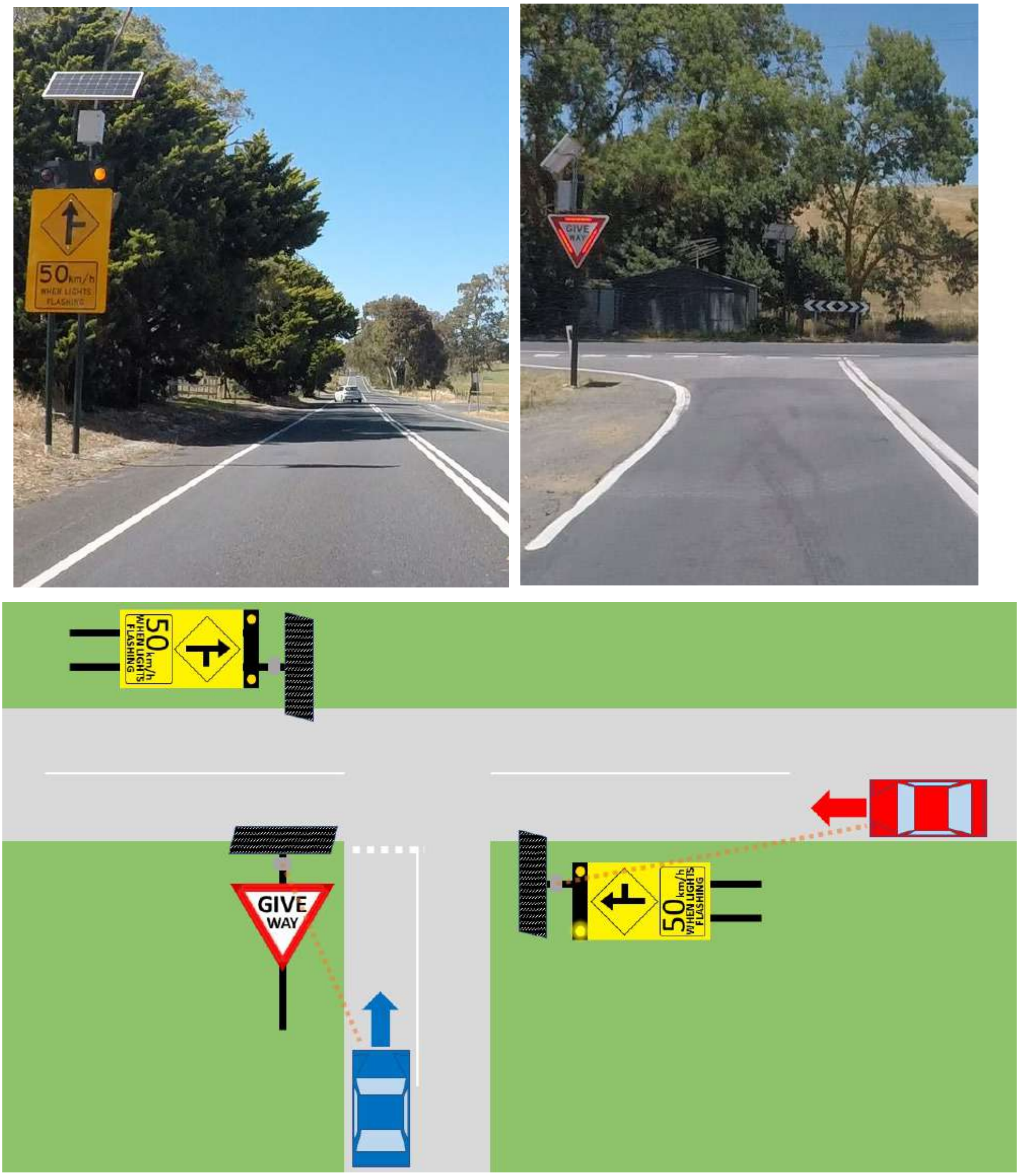

Figure 1. The major road warning sign (left) and minor road flashing control sign (right) during activation of the system. Diagram of RJAWS Lite (bottom): major road speed warning signs are activated when minor road traffic approaches the intersection (blue car) and major road traffic is present (red car); minor road flashing control sign is activated when minor road traffic approaches the intersection above a set speed threshold (blue car).

may result in occasional disruptions to the operation of the system, a non-regulatory speed warning is employed to slow traffic on the major road when the system is activated (Figure 1 left). Currently, RJAWS Lite is being trialled through activation by minor road traffic only (Figure 1 bottom); activation by traffic turning out of the major road should be possible for future iterations of the system at minimal additional cost. In addition to RJAWS and other similar existing systems, RJAWS Lite also utilises a flashing control sign to warn minor road traffic that is approaching the intersection too quickly (Figure 1, right).

Results

RJAWS Lite is being trialled at six treatment and six control intersections across regional South Australia. This trial is being staged with the trial being undertaken at two treatment and two control intersections at a time. Speed data is being collected and will be used to evaluate the risk reduction induced by the warning provided by the system. The evaluation surveys for the first stage are currently being conducted and as such, no results are available to disseminate at this time.

Conclusions

RJAWS, and the similar systems used across Australia and New Zealand, have been shown as effective road safety treatments for regional intersections. However, the higher cost of RJAWS may limit its application to higher-volume intersections. RJAWS Lite is a low-cost alternative to RJAWS that may allow this technology to be implemented on lower-volume state and local government roads. Through this trial, we aim to demonstrate RJAWS Lite as a viable road safety treatment that state and local government can employ.

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Applying road safety assessments in local government – proactive risk approach

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Abstract

Between 2015-2019 QPRC had 545 casualty crashes resulting in 699 road casualties, including 13 fatalities and 47 serious injuries.[1] QPRC identified safety of the road network as a key community priority in Council's Community Strategic Plan[2] where a community outcome for the transport network was to take safe system approach that allowed for safe ease of movement through QPRC. While reactive Federal and State programs[3] continue to provide QPRC with funding for addressing crash locations with countermeasure treatments, Council has three case studies to demonstrate efforts of applying proactive road safety assessments to identify crash risks, confirm treatment alignment with safe systems and utilizing results to inform proactive options analysis for funding applications. To achieve ambitious trauma reduction targets Local Governments are being encouraged to proactively manage their road networks[4]. Efforts to adopt a proactive approach of managing QPRC's road network, and the results, will be examined in this presentation.

Background:

Australia's National Road Safety Strategy[4] has set road trauma reduction targets of 50% fatalities and 30% serious injuries by 2030. New Zealand's Road Safety Strategy[5] has established a target of 40% reduction in death and serious injuries by 2030. Both strategies identify local governments' commitment to road safety will be vital to achieving the national road trauma reduction rates with local government managing 75% of road network in Australia[6] and 88% of New Zealands road network.[5] At the time of the conference, there are 3017 days left to reach the trauma reduction targets for 2030. If QPRC was to continue to use reactive programs to managing their road network, countermeasure treatments can take 1213 days to 3038 days to implement – too late for 2030 deadline. Embedding road safety into core business of local government and adopting proactive approaches will be the transformational change required to reach the trauma reduction targets.

Project Decription:

QPRC has three case studies of proactive assessments conducted on their road network. Assessment results were used to inform proactive options analysis, apply for funding and integrate road safety treatments into road asset upgrade projects. Each of the three case studies had a different outcome but they demonstrate how road safety assessment can by applied by road authorities, used as training exercises for internal staff, enhances design integrity of treatments and enables proactive management of Council's road network.

For each case study the presentation will examine which assessments were conducted, how the assessments were conducted, involvement of internal and external stakeholders to improve the assessment, the crash risks addressed by the assessment and the outcomes.

The three case studies include examining:

- Informal bus stops on high-speed rural road
- Pedestrian crossing on high-volume arterial mixed-use road
- T-junction intersection on a high-speed rural road

Evaluation:

The three assessments have resulted in proactive funding applications, of which only one has been successful to date in obtaining funding and resulted in best identified treatments incorporated into a Council road asset upgrade. One assessment, while unsuccessful in proactive funding application, resulted in short-term treatment options that evaluations have shown improvement in driver behaviour at the location. But the treatment that aligned best with safe systems remains Council's preference for long-term safety upgrade. One assessment, the proactive funding application is pending, with short-term safety upgrades implemented.

Table 1. Safe System Assessment Results for Pedestrian Crossing Treatment Options

	ROR	HO	INT	OTHER	PED	CYCL	M/C	TOTAL
Baseline with existing pedestrian crossing	24/64	36/64	9/64	32/64	48/64	8/64	24/64	181/448
Treatment 1: Remove pedestrian crossing and upgrade with pedestrian refuge	12/64	24/64	12/64	8/64	48/64	8/64	16/64	128/448
Treatment 2: Remove pedestrian crossing and intersection upgrade with traffic lights	12/64	24/64	3/64	16/64	16/64	4/64	8/64	83/448
Treatment 3: Upgrading the pedestrian crossing to a wombat crossing	16/64	24/64	6/64	24/64	24/64	6/64	18/64	118/448

Figure 1. Identified crash risks eliminated for informal bus stops on a high-speed rural road

Conclusions, Implications and Next Steps:

Best practice and National Road Safety Strategies^4 advocate for Councils to proactively managing the risks on their road networks with approaches such as network safety plans. However, road safety funding programs traditionally favour reactive approaches, which have shown to be time-consuming to implement, in some cases countermeasure treatments aren't implemented until after the 2030 trauma-reduction deadline. QPRC has used proactive road safety assessments to improve timely management of risks on their network, increase staff's knowledge of safe systems and use results to inform proactive options and funding applications. The case-studies can demonstrate to other local governments the key factors to successfully conducting road safety assessments, the benefits of proactive approach, and showcase innovation and transformative approach to road safety.

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Do women have heads of steel? A road safety paradox

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Abstract

A mixed methods study was conducted among women drivers in Chandigarh on wearing helmets while riding a two-wheeler vehicle. Theory of planned behaviour was referred for the theoretical framework. For data collection, triangulation of data was achieved through on road observations, semi-structured questionnaire and in-depth interviews (IDI). The questionnaire assessed behavioural intention, attitude, subjective norm, and perceived behavioural control. Observational study showed huge proportion of female riders as not wearing helmets while riding on a two-wheeled vehicle. Questionnaire revealed behavioural intention as a key factor for helmet usage while IDI's documented their reasons behind voluntary endorsing safety gear while riding a two-wheeler. The research draws to attention the much needed realization by female drivers on the significance of wearing helmets.

Background

As per the World Health Organization (WHO), road traffic accidents (RTAs) claim around 600,000 lives with over 15 million people being injured every year which makes up to more than one life being lost every minute and an injury every two seconds. Developing countries contribute an enormous proportion to mortality and morbidity with each year more than 135,000 traffic collision-related deaths occurring in India (Pal et al., 2019). Two-wheeled vehicles contribute a significant proportion of the vehicle composition on Indian roads and head injuries are the main reasons behind road crash injury and death. Helmets act as a potent barrier saving lives and the rider from head injuries when met with a road crash. Although wearing helmets are mandatory as per the Indian Motor Vehicle Act (MVA), implementation of it comes under the jurisdiction of the State where some modifications can be done. As per certain modifications in the Act, some relaxation has been given to women drivers with them not being booked for violation as per some reservations shown by certain religious organizations on not wearing helmets. Therefore, to gauge compliance among women riders and to unravel the reasons behind it, this mixed methodology study was framed.

Method

In this study, triangulation of data was done and analysed to gain information on the perceptions on the perceived benefits, risks, barriers, threats involved of wearing and not wearing helmets among female riders belonging to the tricity area (Chandigarh, Panchkula, Mohali, India). Purposive sampling was done, in which women who rode a two-wheeled vehicle were selected for the study. Data was collected through an on-road observational study, a semi-structured questionnaire and in-depth interviews (IDI's). For the on-road observational study, three observations were done of two hours each (3-5pm) to observe the number of female riders and pillion riders who are wearing and not wearing helmets (Table1). To gain an insight into the reasons behind voluntary adherence and non-adherence to the helmets while riding, a semi-structured questionnaire was prepared and administered to 133 female riders. The questionnaire was framed as per the theoretical framework from Theory of Planned behavior (Ajzen, 1991) and the items assessed behavioural intention, attitude, subjective norm, and perceived behavioural control together with general exposure and socio-demographic characteristics. To further the objective, a semi-structured topic guide was prepared for In-depth interviews (IDI's).

Results

The results obtained from the observation sites are given in Table 1. As per the results, there are hardly any pillion women riders who wear helmets. Since they are not booked for traffic violation on not wearing helmets, it remains a choice for them. Results revealed frequency of helmet use while riding, perceptions on the efficacy of helmets in reducing the risk of serious or fatal injuries and that behavioral intention and perceived behavioral control were strongest influencers. Participants reporting helmet non-use were characterized by low threat perception, possibly attributed to non-mandatory rule of helmets, accompanying feelings of invulnerability, lack of knowledge or experience in risk identification.

Conclusion

Future implications holds for advocacy change in policy measures and strict enforcement for compliance among women drivers.

	Wearing helmets			**Not wearing helmets**	
	No. of vehicles observed	Riders	Pillion	Riders	Pillion
Ist observation*	406	149	4	113	190
IInd observation**	183	43	7	44	106
IIIrd observation***	190	72	8	21	113

*Dated 24.9.21 at Intersection of Sectors 44/45/50/51 Chandigarh, India.
** Dated 5.12.21 at Intersection of Sector 42/43 Chandigarh, India.
***Dated 19.12.21 at Kalibari chowk, Chandigarh, India.

Table 1: Data from the observation sites

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The Ipswich Connected Vehicle Pilot: a longitudinal study of cooperative intelligent transport systems in Australia

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Abstract

Connected (or cooperative) intelligent transport systems (C-ITS) have the potential to increase safety by boosting awareness of the driving environment. In short, C-ITS delivers messages to the driver to alert them to potentially unsafe road conditions or unsafe vehicles within the immediate, or forthcoming driving context, via an in-vehicle display, the human-machine interface (HMI). The Ipswich Connected Vehicle Pilot (ICVP) was a field operational test (FOT) that tested the effects of C-ITS retrofitted into 350 participants' vehicles over a 9 month period. The ICVP explored safety impacts in terms of participants' driving behaviour as well as their subjective experiences via four questionnaires, short interviews, and post-pilot focus groups. The C-ITS in the ICVP had several functions (use cases) that provided information related to intersections, congestion, road-hazards, road-works zones, and speed monitoring. The data indicated that there were positive and negative aspects associated with the C-ITS deployed.

Background

C-ITS systems leverage the connection between in-vehicle technology (typically, small displays) and advanced infrastructure (e.g., networked traffic lights) to increase the driver's contextual awareness (e.g., displaying a warning for an upcoming red-light). C-ITS FOTs explore the benefits of these advanced driver assistance systems and have been conducted internationally for more than a decade (Alessandretti et al., 2009; Böhm et al., 2009; Emami et al., 2020; Kölbl & Fuchs, 2011; Regan et al., 2002; Stahlmann et al., 2011; Wall, 2013).

Method

The Ipswich Connected Vehicle Pilot (ICVP) was a FOT of C-ITS conducted in Ipswich, Australia in September 2020-September, 2021, with more than 300 public participants (M_{age} = 46.61). The C-ITS comprised a 5-inch HMI mounted centrally on the windscreen (Figure 1), a small computer secured below the driver's seat (connected to the vehicle's CAN[3] bus), and a roof-mounted antennae. The C-ITS had several functions (use cases, see Table 1) that increased awareness by presenting alerts in the form of purpose-designed icons and, in time-critical instances, audio. Alerts were presented when the vehicle's trajectory was determined to be potentially unsafe.

Participants were assigned to either a Control condition (HMI inactive), a BaselineFirst condition (HMI inactive for three months and active for six months), or a TreatmentFirst condition (HMI active for six months and inactive for three months). Participants' driving data were collected when they operated their vehicle within Ipswich and the connecting motorways, a 300kms^2 area.

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[3] CAN - Controller Area Network

Additionally, participants completed four questionnaires (required) and optional interviews or focus groups.

Figure 1. Dash-mounted HMI that presented alerts to participants as they drove. The example shows the display with a mockup of the in-vehicle speed and road hazard warning.

Results

Driving data

Speed and celeration (cumulative acceleration behavior, Af Wåhlberg, 2008), indicated a positive impact on safety for most use cases. Speed tended to be statistically lower when participants received RWW, ARLW, and TWVR alerts, but did not change for BoQ and RHW alerts. Celeration was statistcally lower following alerts for TWVR, RWW, and BOQ; and statistically higher after receiving alerts for RWW and ARLW-High. In the former, lower celeration describes smoother behaviour, for example, gentler approaches to active pedestrian crossings while the latter describes more abrupt changes in speed, for example, sudden braking behaviour before an unnoticed red-light.

Subjective Data

Overall ratings of the C-ITS were high indicating that particpants appreciated the awareness-benefits provided by the technology, however small decreases in responding were detected for some measures (acceptance, intent-to-buy/use, general usefulness) following exposure to the active HMI. Responses indicated issues related to the timing and appropriateness of alerts. Qualitative feedback from the interview and focus group findings indicated that the technology was perceived as beneficial to safety and that participants would be interested in adopting the technology in the future when it is more mature.

Conclusions

The ICVP was a successful operationalization of C-ITS in the southeast Queensland context. The effects of the C-ITS were generally positive. Namely, some potential safety benefits were detected in the form of reduced speed and changes in celeration in some driving contexts. Additionally, participants' reported positive attitudes towards C-ITS as well as expectations to use such systems as they increase in usability and pervasiveness.

Table 1. The use cases included in the ICVP.

e case	Abbreviation	Description	Image on HMI
Advanced red-light warning	ARLW (Medium and High)	Alerted drivers that they were approaching a red-light at a signalized intersection at a potentially unsafe speed. ARLW had two levels. The yellow-on-black image (ARLW-Medium) was used if the driver was between two and 10 seconds away from the intersection. The black-on-red image (ARLW-High) was used if the driver was less than two seconds from the intersection. ARLW-High could also be presented if the participant came to a stop, and then inched forward and crossed the stop bar at the intersection (ARLW-Event/Conflict).	
Back of queue	BOQ	Alerted drivers that they may be travelling at an unsafe speed towards an upcoming traffic queue. BOQs could only be triggered at two specified areas of the motorway that were known for congestion.	
In-vehicle speed	IVS	Persistent display, that provided drivers with information about the current speed limit. In total there were more than 35,000 speed zones coded in the pilot area, an effort to include all public access roadways.	
Road hazard warning	RHW	Alerted drivers that they may be travelling at an unsafe speed for a hazard up ahead, such as water on the road, road closures or a crash.	
Road works approach warning	RWW	Alerted drivers that they may be travelling at an unsafe speed for upcoming road works, giving them time to slow down or change lanes.	
Road works speed warning	RWW-S	Alerted drivers when they exceeded the speed limit within the road works zone.	
Turning warning vulnerable road-user	TWVR	Alerted drivers to pedestrians or bicycle riders potentially crossing at an upcoming signalized intersection.	

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Wide Centrelines, the Road to a Safer System

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Abstract

The Road to Zero, NZ's Road Safety Strategy, targets a 40% reduction in Deaths and Serious Injuries by 2030. Within the context of a high-speed rural highway, head-on crashes account for a disproportionate number of deaths. median barrier is often the go to treatment and rightly so, with an expected reduction of 65% of high severity crashes (even as much as 90% reduction in head-on crashes) it is easy to see how this is the case. But how do we get to Median Barrier? Topography, narrow sealed pavements and frequent accesses often mean that it's difficult and expensive to implement median barrier. Wide centrelines are an alternative to median barrier but are less effective and can result in projects having lower priority although they could be a considerable step towards a safe system environment.. So how does wide centreline fit into a Towards Zero environment?

Background

This review of wide centrelines intends to summarise the roles and opportunities that the safety treatment has to offer in a Towards Zero environment, where it is often seen as a costly substitute for median barrier. New Zealand's highway network presents a challenging scenario for median barrier:

- Few Limited Access highways that restrict direct property access
- Long no-exit roads that intersect with highways, with limited alternate routes
- Historically constrained highway corridors, presenting difficulties for road widening, and turnaround construction
- Challenging road alignments and terrain
- Moderate levels of traffic volumes that sit on the fringes of being suitable for Median Barrier (<6000 AADT)
- High speed limits that still require supporting infrastructure at 80km/h
- Highways that often intersect with rural communities, resulting in severance issues
- Narrow bridges that restrict coverage and reduce overall benefits

All of these challenges add complexities and cost to a project, often resulting in significant difficulties or obstacles that must be overcome to result in a successful project. However often these projects become unsuccessful due to cost or risk, resulting in deferment of the project.

Why Wide Centrelines?

With an assumed DSI reduction of just over half of what Median Barrier would (at 35%), Wide Centreline presents an opportunity to provide road widening that is considered "towards safe system" while avoiding a significant amount of the challenges noted above. A highway that can be widened to accommodate a 10.5m cross section (currently the ideal minimum for Median Barrier) is effectively ready to go for a future barrier to be installed.

While the majority of the costs associated with providing median barrier are within the widening itself, many of the challenges for median barrier result in:

- Longer design periods to resolve concerns such as community opposition or property impacts
- Greater upfront funding required to construct supporting infrastructure (such as roundabouts)

This abstract presents the use of wide centrelines as a step towards median barrier, some of the limitations and changes in thinking by implementing median barrier as we approach the horizon of the Road to Zero strategy and saving many Deaths and Serious Injuries along the way.

Current Examples

Recent projects installed around New Zealand present a successful implementation of Wide-Centreline that are likely to present a simpler pathway to Median Barrier in future as required while enabling early intervention, and delivering fewer DSI savings, sooner.

Figure 1. 1.5m Wide Centreline Example (SH2)

While underlying concerns of wide centreline exist, such as informal overtaking lanes, increasing driver speeds or general confusion leading to crashes. We now have an established history, along with reported experiences to determine if these concerns are realised.

Conclusions

Delivering Wide Centrelines (supported by other treatments, such as lower Speed Limits) as a step towards Median Barrier provides far greater opportunities to start work sooner, allowing projects to progress without being caught up in the various issues that are making median Barriers difficult to implement, whether its due to costs, communities, or other constraints.

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Simplifying and Improving Road Safety Benefit Calculations

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Abstract

Waka Kotahi, NZ Transport Agency has developed a tool for practitioners to consistently and accurately estimate death and serious injury reductions from road safety projects as projects progress from concept to construction. The tool is intended to reflect the true nature of road safety projects, which are rarely stereotypical in nature, and typically comprise multiple infrastructure components. The tool takes account of multiple infrastructure component, including those that overlap, those that are continuous or intermittent along a project length, such as roadside barrier at high-risk location, and those only at discrete locations only e.g. intersection treatments. Waka Kotahi promulgated guidance on the tool in September 2021 and instructed that it be used on all projects in the Road to Zero Speed and Improvement programme (SIP). The tool is helping practitioners, project sponsors and funders better understand the contribution of different infrastructure components and gain more confidence in safety benefit calculations.

Background

The Waka Kotahi Standard Safety Intervention (SSI) toolkit helps guide investment decisions and contributes to embedding Vision Zero in the wider road safety sector. It introduces a streamlined investment pathway for SSI projects, which assist project teams in demonstrating value for money to support investment decisions on interventions that form part of an approved Programme Business Case for the SIP.

The SSI included within the toolkit are proven road safety interventions that deliver beneficial safety outcomes by improving the existing road network. For each SSI the toolkit specifies a range of costs and a single assumed death and serious injury (DSI) reduction value. The assumed DSI reduction value for each SSI is an industry agreed value that is based on industry experience and research. However, industry experience and research shows the DSI reduction effectiveness of the same intervention type will often vary significantly from project to project.

Whilst it is a long-established practice to refine project cost estimates at every stage of the design process, the same has not typically occurred for the estimated DSI reduction. The DSI Calculator Tool helps practitioners calculate safety benefits that reflect the idiosyncrasies of each project, including projects that have multiple overlapping infrastructure components as well as continuous and intermittent features.

DSI Calculator Tool Features

The DSI Calculator Tool requires users to input as series of physical, operational and crash data information associated with the project location. This information is transformed to derive a Baseline DSI for the project site upon which safety benefits are then estimated. The Baseline DSI comprises reactive and proactive components. This approach helps address two perennial issues that plague our industry, which are a) a selection bias of sites with poor recent crash history and b) use of unadjusted crash history when calculating the baseline situation.

Reactive and proactive approaches are also used to estimated DSI reductions. Crash reduction factors set out in the SSI toolkit are combined with changes in the variables that inform the proactive risk calculation to determine the future DSI for the project. DSI reduction factors are applied in a hierarchical manner starting with primary safe system component first. The DSI reduction of other infrastructure components are then applied to the residual DSI remaining following introduction of the first component and so on until all components have been assessed. This process ensures that double counting of safety benefits is avoided. The DSI Calculator also enables for the benefits of changes in speed limits to be incorporated using a modified form of Nilsson's Power Model.

Practitioner Feedback

The DSI Calculator Tool has received positive feedback from practitioners, project sponsors and funders. It is achieving its purpose of providing a repeatable and accurate means of estimating DSI reductions of safety projects. It is also helping tool those using the tool to better understand the contribution of different infrastructure components, which is leading to safer project designs being developed. The second version of the DSI Calculator Tool is currently under development.

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A Higher-Order Instruction Framework for Learner Driver Training

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Abstract

Developing higher-order skills during the learner phase of driving is critical to safer outcomes for novice drivers. Higher-order skills are safety-critical driving skills that compensate for young age and driving inexperience known to contribute to young drivers' overrepresentation in road trauma. There are no guidelines for professional instructors and parents to teach higher-order skills during the learner phase that are theoretically informed and empirically grounded. Based on naturalistic observation of learner driver lessons (*n*=110) and a survey of adolescent drivers (*n*=1,627), a framework was developed integrating Self-Determination theory and the Goals for Driver Education whilst considering systems thinking, i.e., the young learner driver does not learn to drive in isolation of the young novice driver road safety system. In a three-part framework, the relationship between trainer and learner, the content and strategies of higher-order instruction, and the context that influences learning are considered as interactive elements important to driver training.

Background

One young driver is lost on the road every second day in Australia (AAA, 2017). Young drivers aged 17-25 years are overrepresented in road crash fatalities and serious injuries with a lack of higher-order skills identified as a critical contributing factor (Cassarino & Murphy, 2018). Graduating driver licensing (GDL) has had a positive impact on the overrepresentation of young drivers in crashes, however, this success has stagnated requiring immediate attention to leverage this success and integrate training with GDL. Research has shown that both professional instructors and parents who are supervisors of learner drivers are not using the extended number of GDL supervised driving hours optimally to improve the safety of young drivers. Indeed, training is delivered ad-hoc and often focuses on passing the on-road practical driving test disregarding training and strategies to teach safety-critical skills (Watson-Brown et al., 2020, 2021). Innovative and practical solutions are required *now* to create a positive impact on the long-term safety of our young drivers.

Method

A naturalistic observation study (*n* = 110) and an online survey (*n* =1,627) were conducted to understand current practices of professional driving instruction in Queensland with a focus on higher-order instruction (taken and missed opportunities) and the important strategies in teaching higher-order instruction. Both studies were informed by the Goals for Driver Education (GDE; Hatakka et al., 2002; a framework outlining the goals of training and education that are necessary to develop safe drivers) and Self-Determination theory (Deci & Ryan, 2012; a theory of motivation often applied to health behaviour that includes practical strategies for coaching that result in the sustainability of positive behaviours in the long term with a focus on state self-regulation).

Results

A transtheoretical model represented in Figure 1 was developed integrating the GDE and Self-Determination theory. The model was developed to be incorporated into current on-road training practices. Upskilling trainers and supervisors in this way enhances safe driving practices via in-depth safety knowledge and practice. The *core* of the model explains what higher-order instruction is and how to deliver this training in learner driver lessons recognising current practices and requirements of the more basic skills training. The *foundation* of the model highlights the key to successful training relying on the relationship between the instructor and the learner driver with personal insight for both parties one important aspect of this foundation. Finally, the important recognition of the system within which learning occurs (Scott-Parker et al., 2016), the *context*, defines a small number of key considerations when training a young learner driver such as the GDL and influence and role of parents and peers.

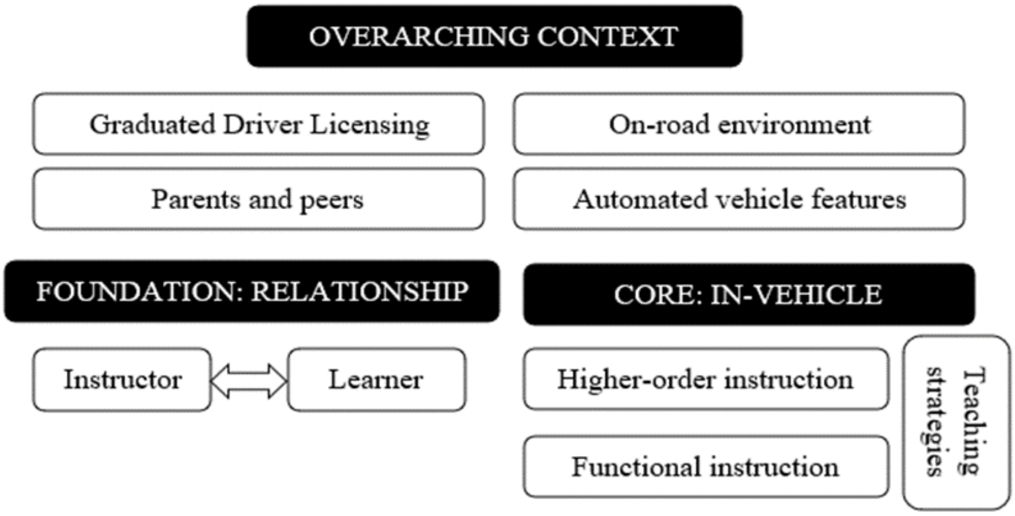

Figure 1. Transtheoretical Model of Critical Driving Skill Development **(adapted from Watson-Brown, 2020).**

Conclusions

This model is an innovative solution to a long standing problem of young driver high crash risk once they start driving independently. Evidence-based and theoretically informed this practical solution has potential to improve the safey of young novice drivers. Application of this model *now* has important long-term implications for the safety of all road users.

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Influencing self-regulation of speeding and phone use while driving

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Abstract

Self-regulation is critical to reduced engagement in deliberate and unintentional risky driving behaviours. This study examined what constructs influence self-regulation to better understand how to improve self-regulation of speeding and phone use while driving. Theoretically informed by self-determination theory, internal/self-regulation is important to sustain safe driving behaviours in the long term while external regulation impacts short term behaviour change. An online survey of Queensland drivers (*n* = 1,146) examined regulatory processes informed by self-determination theory in addition to variables theoretically suggested to be associated with regulatory processes such as risk perception, certainty of apprehension, and perceived legitimacy. Internal regulation was found to be influenced by a higher risk perception and lesser engagement in speeding and phone use while driving, while external regulation was influenced by a higher perceived certainty of apprehension. Nuances and similarities between speeding and phone use while driving inform generalised and specialised countermeasures.

Background

Speeding and phone use while driving contribute to up to 50% of road crash fatalities globally (International Transport Forum, 2020). In Queensland, where the current study was conducted, 22% of fatalites have been attributed to speeding (DTMR, 2021). Crashes due to phone use while driving are more difficult to assess, however, up to a quarter of crashes have been attributed to this behaviour and research in Australia shows up to 50% of drivers engage in phone use while driving (Oviedo-Trespalacios et al., 2017; Pless & Pless, 2014). Enforcement measures are often the focus of countermeasures yet are limited in effectiveness in reducing these risky behaviours. Recent research has identified the development of self-regulation for low-risk driving can reduce engagement in deliberate and unintentional risky driving behaviours (Watson-Brown et al., 2019). This study examined elements associated with developing self-regulation that can be targeted in future countermeasures.

Method

A cross-sectional online survey was disseminated via paid social media advertising throughout Queensland with 1,146 respondents (53% female; mean age = 37 years). Demographic (age, gender, licence type) and driving related (average number of driving hours per week, self-reported crashes) items were included in addition to key variables: identified and external regulation informed by self-determination theory, trait self-regulation, certainty of apprehension, risk perception, legitimacy, and frequency of engagement in speeding and phone use while driving.

Results

Over half of the participants reported engaging in speeding and around one fifth phone use while driving on a regular basis. Participants believed they more likely use internal regulatory processes over external regulatory processes for both regulation of speeding and phone use while driving. However, regulation of speeding was lower than that of phone use while driving. Belief in the legitimacy of enforcement, a high risk perception and greater frequency of engaging in non-compliant driving behaviours were important factors that influenced self-regulation. Distinguishing phone use while driving form speeding was the importance of trait self-regulation. That is, the findings suggested that the developmental processes associated with self-regulation are only important to the regulation of phone use while driving. Furthermore, a greater sense of certainty of being apprehended for engaging in both speeding and mobile phone use while driving influenced a higher level of external regulation.

Conclusions

Understanding the regulatory processes used in refraining from engaging in speeding and phone use while driving allows us to better understand individual driving behaviours to inform improved countermeasures. Examining regulatory processes via self-determination theory identifies appropriate critical prevention techniques that can be integrated with current interventions. Most importantly, while this study showed identified and external regulation to be important to deter risky behaviours, developing identified regulation has greater potential to sustain low-risk behaviours in the long term.

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Real-world evidence supporting road safety guidance for insulin-treated drivers

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Abstract

Drivers with type 1 diabetes are advised to start journeys with glucose >5 mmol/L and to recheck after two hours. There is limited evidence supporting these recommendations. Glucose levels of drivers with type 1 diabetes were monitored for three weeks using masked continuous glucose monitoring. Eighteen drivers (median [IQR] age 40 [35, 51] years; 11 men) undertook 475 trips (duration 15 [13, 21] minutes). Hypoglycaemia (low blood glucose) did not occur in any trip starting with glucose >5mmol/L (92%; n=436). Thirteen drivers recorded at least one trip (total n=39) starting with glucose <5 mmol/L. Among these, driving glucose was <3.9 mmol/L in 5 drivers (38%) during 10 trips (28%). A ≥2 mmol/L drop was observed in 5 drivers (28%) within 20 minutes of trip start. These findings support current guidelines to start driving with glucose >5 mmol/L, and highlight that glucose levels may change significantly within 20 minutes.

Background

Driving is a metabolically demanding activity for people with type 1 diabetes, who must regulate their glucose levels via insulin therapy (American Diabetes Association, 2014; Cox, Gonder-Frederick, Kovatchev, Julian, & Clarke, 2000). Too little or too much insulin can result in hyper- or hypoglycaemic states, both of which are deleterious to health. It is the latter, hypoglycaemia, with its impact on cognitive functioning, which is linked to the over-representation of drivers with type 1 diabetes in road trauma statistics (Cox et al., 2009; Redelmeier, Kenshole, & Ray, 2009). Australian guidelines advise insulin-treated drivers to perform a glucose check *prior* to driving, with appropriate action to ensure their blood glucose is >5mmol/L and to re-check their glucose levels at least every 2 hours when driving (Austroads, 2017). However, there is a lack of observational data to inform these guidelines.

Method

Data reported in this paper is taken from a multicentre trial of a closed-loop insulin pump (ACTRN12617000520336), where all participants wore masked continuous glucose monitoring (CGM) devices (Enlite, Medtronic, Northridge, CA) at baseline prior to randomisation for a period of three weeks. Melbourne-based participants with valid full driving licences were asked to install a vehicle logging device (Drive 51 sat-nav; Garmin, Schaffhausen, Switzerland) in their car. Vehicle use periods were recorded and synchronised with masked CGM data. All participants were instructed to note any use of their vehicle by drivers other than themselves, to enable removal of non-participant driver data.

Glucose analysis was informed by Australian guidelines, indicating that driving should commence only when blood glucose is >5 mmol/L and finger-prick blood glucose monitoring performed every two hours (Austroads, 2017). The primary aim was addressed by examining the percentage of time driving when hypoglycaemic (<3.9 mmol/L) for trips that started >5 mmol/L and those that did not. The suitability of advice to check blood glucose every two hours was assessed by examining glucose change in relation to trip start. A decrease of 2 or increase of 5 mmol/L was considered clinically significant (Cox et al., 2000; Cox et al., 2005).

Results

Eighteen drivers (median [IQR] age 40 [35, 51] years; 11 men) undertook 474 trips (duration 15 [13, 21] minutes). In total, 436 trips started above 5mmol/L and none of these recorded any hypoglycaemic events. Thirteen drivers recorded 39 trips that started below the recommended minimum glucose (5 mmol/l). Five of these drivers (38%) drove their vehicles in a hypoglycaemic state (<3.9 mmol/L) over the assessment period, recording a total of 10 trips (26%) (see Figure 1A). A trend was noticeable after 20 minutes in Figure 1B, with a ≥2 mmol/L drop observed among five drivers. An increase of 5 mmol/L or more was observed after 50 minutes.

Conclusions

This study provides the first objective data in support of the widely used “above 5 to drive” and highlights that glucose levels may change significantly within 20 minutes. A CGM-based, in-vehicle display could provide glucose information and alerts that are compatible with safe driving.

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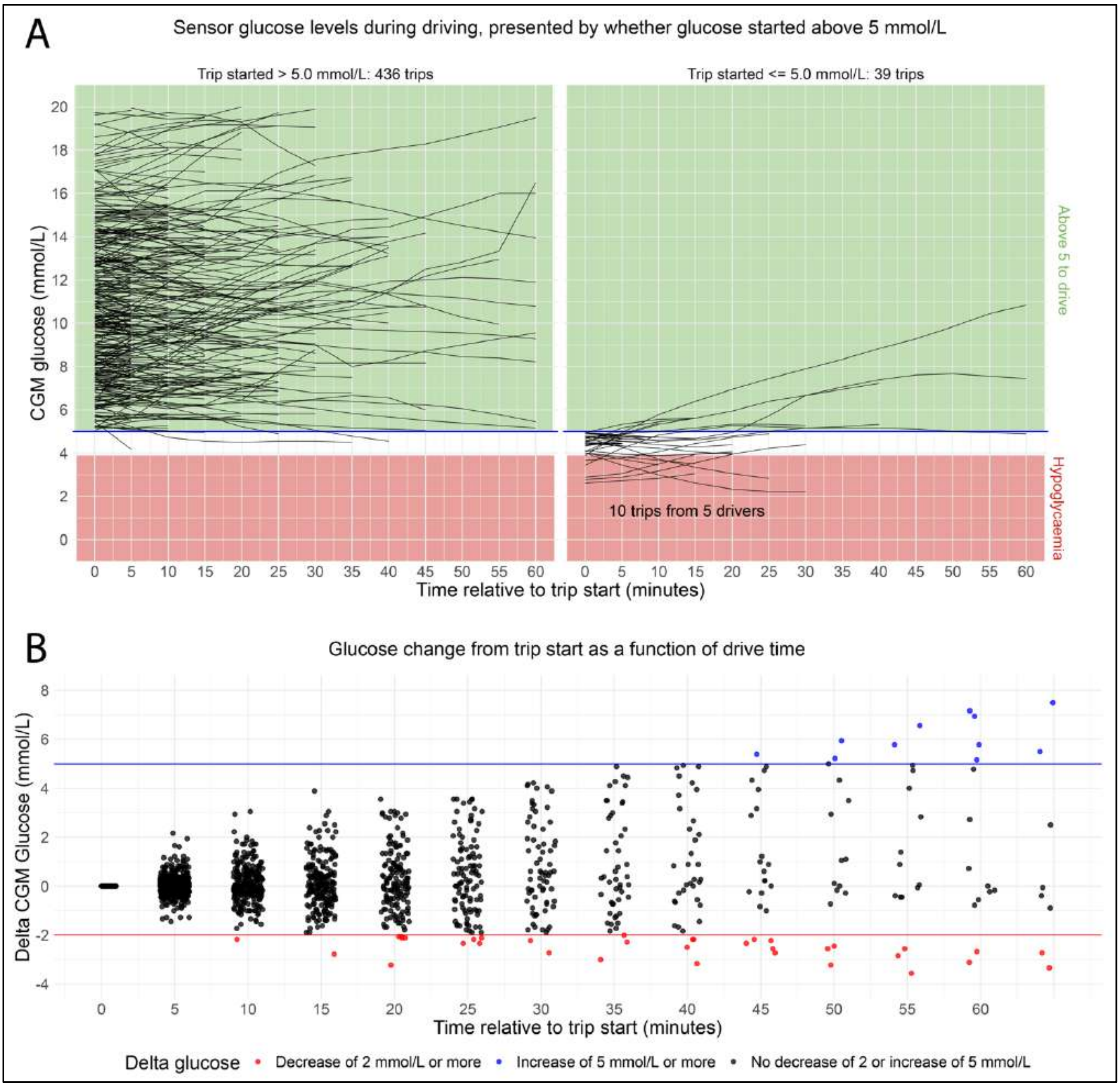

Figure 1. Sensor glucose recordings when driving. Top panel A seperates drivers into those that started their trip above the minimum glucose level (5 mmol/L) and those that did not. Bottom panel B presents glucose change since trip start over time. Clinically significant decreases or increases are highlighted in red and blue respectively.

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Applying the Safe System Assessment Framework to Movement and Place

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Abstract

The Safe System Assessment Framework for Movement and Place Practitioners Guide has been prepared to provide guidance on physical design and management of treatments to improve movement, place and safety outcomes concurrently. It recognises that places designed through the single lens of capacity, or indeed road safety, may have unintended impacts for the liveability and enjoyment of a road or street. Integrating the NSW Movement and Place Framework with the Safe Systems Assessment Framework, the Guide provides planning practitioners with direction on improving place outcomes, to achieve a safe road and street environment for all customers.

Background

Studies demonstrate that there is a distinct mismatch in terms of mass and speed capacity across the spectrum of road users in urban environments. Urban roads represented 33.8% of NSW road fatalities between 2015 and 2019, yet accounted for 61.4% of NSW serious injury crashes. Urban areas in NSW experience greater traffic volumes and growth as well as higher density population and land use. These characteristics result in generation of a greater mix of road users and higher Vulnerable Road Users (i.e. pedestrian, cyclist and motorcyclist) (Australian Transport Council, 2011). Moderate to heavy traffic, combined with a need to negotiate intersections, requires continuous decision-making from all road users within a high density and high traffic volume environment, resulting in a higher incidence of multi-vehicle crashes involving vulnerable road users.

Vulnerable road users are almost if not completely unprotected from physical forces in the event of a crash, and are therefore more susceptible to serious road trauma outcomes. Even relatively low speeds have potential to result in a fatal or serious injury unless the vehicle, road and roadside environment take account of the physical vulnerability of all road users (Transport Acccident Commission Victoria, 2019). Investment into treatments and policy such as the Movement and Place framework to inform infrastructure planning and manage the risk of conflict to vulnerable road users is required to reduce existing road trauma trends.

Safe System Alignment and Place Value of Treatments

The Safe System Assessment Framework for Movement and Place Practitioners Guide provides guidance on best-practice for design and treatment application through an interactive treatment dashboard and case studies. The treatments are categorised by their alignment with Safe System from Primary treatments through to Supporting and Other treatments as well as the three risk influences: Exposure, Likelihood and Severity. Each treatment has also been identified as having a Supporting, Neutral or Detracting influence on Place value in alignment with the Practitioner's Guide to Movement and Place. The intent is that practitioners should maximise inclusion of primary Safe System treatments that support Place in their project scope.

Safe System Assessments and Movement and Place Assessments

The Guide applies an abridged Safe System Assessment that focusses on Pedestrian, Cyclist and Intersection as these crash types in urban areas are overrepresented in NSW serious injury data. This is combined with an existing vs potential assessment of the five Built Environment Indicators from Movement and Place (character and form, green and blue, comfort and safety, access and connection, amenity and use).

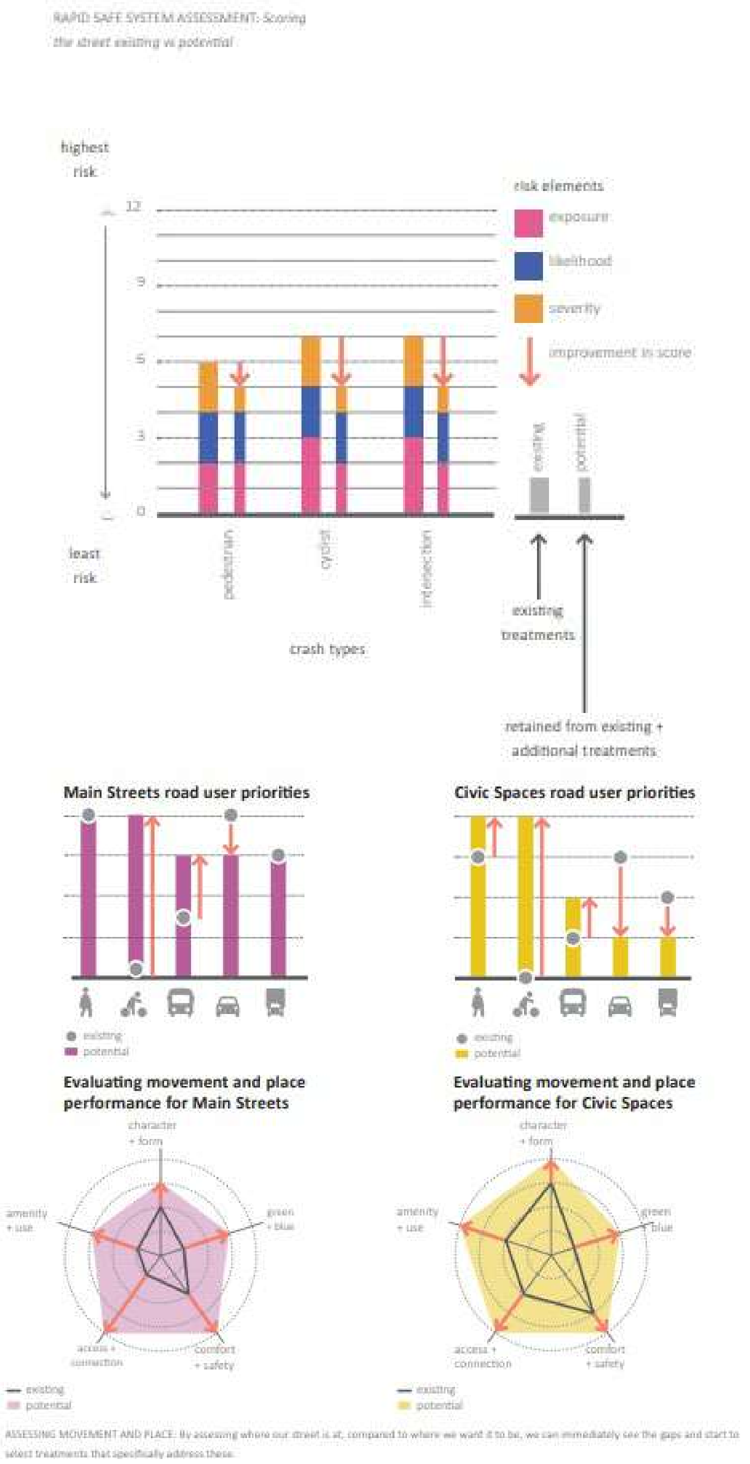

Figure 1. Safe System Assessment (left) and Movement and Place Assessment (right)

A number of case studies were carried out to demonstrate to practitioners how these metrics can be applied to inform decision making in the concept and strategic phases of project development. The locations selected included Main Streets and Civic Spaces (both existing and desired) across metropolitan and regional NSW and each gives a typical mid-block cross section and intersection layout with retained and additional treatments shown that contribute to the assessment scoring.

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Sustainable Surrogate Safety Measures Collection in practice

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Abstract

The aspirational target of zero fatalities and serious injuries on our roads (Towards Zero strategy) cannot be achieved if we continue our reliance on historical accident rates to drive transport safety investment. Proactive surrogate safety measures that describe driver behaviour indicating safety risks play an increasing role in road trauma prevention. By applying computer vision (CV) and artificial intelligence (AI) techniques over high-resolution video, we could extract these metrics. We have successfully applied this method, at a commercial level, to evaluate the safety of cost-effective compact roundabouts, the safety of school crossings and the Perceptive Countermeasure (PCM) for motorcycles in rural roads. Road agencies have a role to play in enabling such data to be shared and the learnings to inform a coherent national strategy. A public data set and coherent industry-wide policy will support practitioners working in road trauma prevention.

Surrogate Safety Measures

The aspirational target of zero fatalities and serious injuries on our roads (Towards Zero strategy) cannot be achieved if we continue our reliance on historical accident rates to drive transport safety investment. This has motivated the development of proactive surrogate measures of safety around the world (Laureshyn,A.,2018) to identify high risk areas. Conventional performance evaluation techniques done using automated tube counters (ATC) and accident data falls short in their ability to capture surrogate safety measures. This paper presents a practical method to capture surrogate safety measures using video technology.

Computer vision and artificial intelligence

By combining techniques in CV and AI over a high-resolution video, we can extract safety measures: Speed, Post Encroachment Time, Gap Time, and lane positioning.

The solution involves sophisticated 3D modelling techniques overlayed on the 2D video to extract metrics to the centimetre accuracy (Figure 1). This approach enables us to precisely measure object movements and interactions in areas of interest.

To validate our approach, we use data captured by ATC for comparison. This solution has been developed to be accessible and highly scalable so it can be applied in a sustainable manner. We have applied this solution to collect data over 36 sites, totalling 6,048 hours of videos analysed.

Case Studies

The compact roundabout evaluation

This project, in collaboration with the Australian Road Research Board and Victorian Department of Transport, aims to evaluate the effectiveness of a new low-cost compact roundabout design. 15 cameras were deployed analysing over 2,500 video hours. This method not only allowed the project to evaluate the continuous speed profile of different vehicle types (masses) but also to

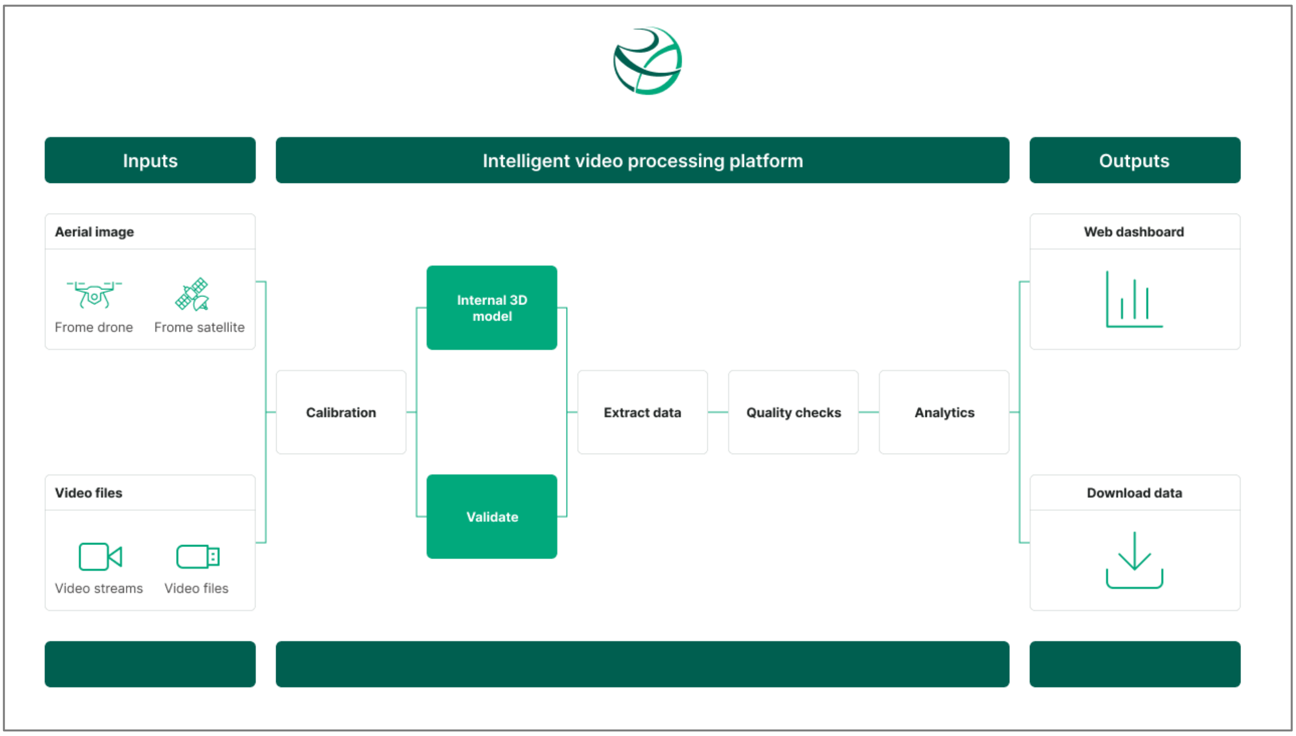

Figure 1 - Solution Components

record the number of near misses. Analysis of the energy exchange in potential collisions was used to evaluate whether such roundabout design would deliver injury-reducing benefits.

The school crossing safety evaluation

This project, in collaboration with the Transport Accident Commission and the Maribyrnong City Council, captured the risk profiles at two school crossings to inform the need for permanent safety treatments. Our method captured surrogate safety measures such as near misses, PET, speed, classification and focused on the interaction between vehicles and pedestrians (specifically children) over 2 months to support the business case.

Motorcycle PCM evaluation

This project, led by the Regional Roads Victoria, aims to trial PCM targeting motorcycle safety in rural roads. Innovative linemarking aims to reduce riders' speed on approach to a curve and encourage selection of a safer ride-path. This approach allowed us to capture longitudinal speed profiles and lane positioning as motorcycles moved through the curve.

Next Steps

Capturing surrogate safety measures using video technology is becoming more accessible. Transport authorities have an important role to enable the sharing of the data collected between authorities and practitioners, and to inform a coherent industry-wide policy for the use of surrogate safety measures in driving investment. We recommend a public register of collected data and the development of data standards to enable practitioners to contribute to this learning database.

Resources

Laureshyn, A. "*The Swedish traffic conflict technique: observer's manual*" Lund University Publications – Transport and Roads. Sweden. 2018, pp. 1-3.

Creating a positive road safety culture through community partnerships

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Abstract

GMC is committed to implementing road safety into the Local Government Areas (LGA) through multi-sectorial partnerships. GMC Road Safety and Traffic Officer (RSTO) produced GMC Road Safety Action Plan 2021-2025[1], which was endorsed by Council, after researching local crash statistics[2], engaging with community on local issues and inspecting local road network. The Action Plan was designed to create a positive road safety culture in the community and to foster successful, multi-sectorial partnerships functioning across community. GMC is working towards this achievement by collaborating with Police, local community groups, local businesses and the community. Working together in cross sector partnerships has proven an innovative approach to road safety challenges, aiming to impregnate road safety into everyday life and ensuring the community take ownership. Programs were developed out of these relationships addressing numerous behavioral issues as well as network infrastructure problems and the presentation will cover examples of these programs.

Background:

Managing safety for 1250km road network, GMC participates in the NSW Local Government Road Safety Program (LGRSP). The program enables Council to develop and access funding[3] for localised road safety programs to address local issues and engage with their community on road safety.

With GMC Road Safety Plan 2021-2025 endorced by Council[1], RSTO engaged with local community and community groups to identify road safety problems and solutions. The engagement included, motorcyclist, schools, older drivers, learner drivers, heavy vechile industry, cyclists and the general community. The main stakeholders identified were The Hume District Police, Goulburn Rotary Club, a local trucking company (Divals), schools, GMC and Police Driver training (PDT). By incorporating feedback and participation capacity from the stakeholder and community engagement, local intervention programs were developed to address road safety issues.

Project Decription:

GMC Road Safety and Traffic Officer (RSTO) is a key resource for Council and the community for driving and implementing the GMC Road Safety Action Plan 2021-2025[1]. RSTO coordinates with key stakeholders their involvement in core intervention programs that engage with the community on road safety. The programs include:

- Log Book Runs for Learner Drivers and U-Turn the Wheel Education Days
- Grey Driving Skill Enhancement Run for older drivers
- Motorcyclist Safety Programs including Look out for Joe Rider
- National Road Safety Week including community pledge towards zero road trauma
- Safety Around Schools

- Plan B Win a Swag endorsed by local Liquor Accord
- Free Child Restraint Vehicle Installations
- Safe Cycling Promotion including Community Bike Rides

The presentation will cover these programs and elaborate about key stakeholder involvement in the implementation of the programs and further demonstrate how the stakeholder involvement is fostering their ownership of road safety.

Figure 1. Collaboration of NSW Police and the local community at National Road Saftey Week

Evaluation:

Road Safety is everyone's responsibility and at a local community level, local governments must role model and advocate road safety. GMC is leading the way by implementing their Road Safety Action Plan 2021-2025[1] through coordinating stakeholder involvement in identified local road safety programs. It has resulted in local groups such as Goulburn Rotary involvement in three road safetyprograms on an annual basis providing their resources and participation free of charge. This has seen key programs such as Log Book Run, Grey Driving Enhancement Skill Run and U-Turn Wheel offered to the community annually free of charge and booked to capacity without promotion required. Similarly, The Hume District Police are involved in most road safety programs supporting implementation with resources and staff. Divalls, a local trucking company, participate in road safety programs for learner drivers and seniors and have transferred their road safety responsibility into their corporate practices.

Conclusions, Implications and Next Steps:

GMC is two years into their Road Safety Action Plan 2021-2025[1]. The strategy of implementing road safety programs in partnership with important local stakeholders is proving successful in embedding road safety into community approaches. It has seen stakeholders take ownership for road safety and prioritising it in their businesses and championing road safety for the wider community.

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Visualising In-Vehicle Data from the CITI Light Vehicle Study

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[a]Transport for NSW

Abstract

Connected vehicle technologies have the potential to deliver road safety benefits by providing vehicles with mutual 'awareness' of other vehicles' position and movement as well as exchange information with transport infrastructure. Transport for NSW's Cooperative Intelligent Transport Initiative (CITI) conducted a ten-month trial, where 45 community-based light vehicles were fitted with Cooperative Intelligent Transport Systems (C-ITS) and telematics devices to better understand the benefits and challenges of this technology. Each device collected millions of datapoints, including basic safety messages transmitted and received. Given the large dataset, researchers aimed to visualise and explore the relationship between driver 'alerts' and 'events' with driver behaviour and geospatial location data, focusing on the three different audio-visual alert types explored during the trial: Intersection Collision Warnings, Red Light Warnings, and Harsh Braking Ahead Warnings. Some limitations, such as data inconsistencies from the trial were able to be identified and visualised.

Background

The Cooperative Intelligent Transport Initiative (CITI) was established in 2012 by Transport for New South Wales (TfNSW) as a long-term project to develop an integrated testbed facility for Cooperative Intelligent Transport System (C-ITS) technologies in the Illawarra region, NSW. The aims of the project were to establish a testbed of C-ITS technology using Dedicated Short-Range Communication (DSRC), assessing issues related to the road safety and traffic efficiency benefits of C-ITS technology. The initial focus of CITI was on heavy vehicles, including trucks and public buses.

The Connected Light Vehicle Study

In 2018, 45 privately owned light vehicles were involved in CITI for a ten-month period. The aim of this component, known as the Connected Light Vehicle Study, was to investigate the potential for C-ITS technology to improve road safety and to explore potential issues that might impact wider deployment of the technology. Vehicles were fitted with both a C-ITS device and a telematics device. The study used surveys, focus groups and in-depth interviews to collect user feedback of the technology. The in-vehicle data offered an opportunity to better understand the situations in which drivers received alerts. Drivers involved in the study were provided with the following alerts:

- Intersection collision warnings (ICWs involved two or more C-ITS equipped vehicles warned of possible intersection or junction collision).

- Red light ahead warning (RLWs were available at three junctions with C-ITS equipped traffic signals. C-ITS equipped vehicles were warned when upcoming traffic signals were turning amber or red).

- Harsh braking ahead warning (HBAWs involved two or more C-ITS equipped vehicles where the rear vehicle/s was warned of harsh braking ahead based on braking of lead vehicle. This alert is also known as the emergency electronic brake light warning).

Creating visualisations from in-vehicle data

Each of the in-vehicle devices collected millions of datapoints, including basic safety messages transmitted and received. Given the complexity of handling and analysing large datasets, researchers aimed to visualise and explore the relationship between driver 'alerts' and 'events' with driver behaviour and geospatial location data, focusing on the three different audio-visual alert types. 'Alerts' were considered to be an individual occurrence of a warning whereas an 'event' may have contained multiple alerts – as in the case of an ICW where each driver would have received an alert.

Data from the C-ITS and telematics devices were aggregated to 'alert' and 'event' level data to be visualised. The visualisations created interactive descriptive and geo-spatial results which enabled the research team to draw unique insights from the trial, particularly around the ICWs. One of the visualisations, for example, tracks vehicles as they travel towards one another on a potential collision course and illustrates at which point drivers received the ICWs. Some limitations, such as data inconsistencies from the trial were also able to be identified and visualised. Future research will explore how these insights can support and benefit the roll out of C-ITS technologies in Australia.

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Advocating for an equitable road safety fines and penalties framework

Stacey van der Putten

Auckland Transport

Abstract

Safety on the transport network is a high priority for Auckland Transport (AT) as expressed through its Vision Zero for Tāmaki MakaurauTransport Safety Strategy and Action Plan to 2030. Since 2018, AT has achieved positive results for its communities in reducing deaths and serious injuries. However, more remains to be done especially in the safety policy regulatory environment. For example, it has been more than 20 years since road safety fines and penalties framework was reviewed. Advocating for changes to the road safety fines and penalties framework (at central government level) is one of the recommendations made in the 2021 Report on Auckland 2018 Road Safety Business Improvement Review Implementation, written by international road safety expert, Eric Howard. With this in mind, AT has made advocating for changes to the road safety fines and penalties framework as one of its priorities for 2022.

Background

AT's research, *On the road to achieving Vision Zero: Reclaiming lost opportunities* shows that the people of Aotearoa New Zealand are concerned about the crisis on our roads and want the Government to do more to prevent deaths and serious injuries. However, AT wanted to make sure that what it was advocating for did not further exacerbate inequity in the system. Towards this, AT commissioned an independent report on *Equity of Fines and Penalties,* written by Bridget Doran of MR Cagney, to gain an understanding of the current system, in the context of the upcoming Te Manatū Waka, Ministry of Transport review of the road safety penalties framework. The research found that Aotearoa has an inequitable system of road safety fines and penalties. New Zealanders who face the most disadvantage in everyday life, also incur the most hardship from fines and penalties. The timing of this research has taken on greater significance noting geo-political impacts on supply chains and the cost of living.

In Aotearoa, road trauma rates are not the same for every ethnic and socio-economic group. Children, young men, especially Māori, and Pacific Island children are over-represented. In Tāmaki Makaurau, Māori face higher injury rates in each age group, both as people walking and as car occupants, except for pedestrians over 65 years. Pacific Islanders also had high injury rates but only between the ages of 0 – 24. This finding was especially prominent for people walking, i.e., Pacific children were particularly at risk for being hit as pedestrians.

A lack of access to alternative transport in many parts of New Zealand means a higher reliance on motor vehicles. Additionally, Māori, older people, those with low incomes and low levels of education were less likely to live in areas with high-quality public transport. Most people who do not pay fines, cannot afford to, and those who do not pay usually incur further penalties. This relationship means that those who are already disadvantaged eventually receive much harsher penalties, which affect their livelihoods to a greater extent than those who can pay straight away.

There are several ways the on-going review of the road safety penalties framework can achieve equitable outcomes; some of them include: reviewing the fines structure that is more closely related to people's ability to pay, providing flexible payment plans, increase access to legal aid and community legal services, increase automated enforcement (to remove bias) and to provide more flexible, community-centric alternative to fines and penalties. AT is advocating at Central Government level and supports Te Manatū Waka Ministry of Transport's review of the road safety penalties framework. AT has also written to each of Aotearoa's Road Controlling Authorities to encourage participation in any forthcoming review.

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Developing Cross-sectoral Partnerships between Local and State Governments – Motorcycle CRASH Card

Lesley Tipping[a] and Susan Lewis[b],

[a]Hornsby Shire Council, Road Safety Officer, [b]Road Safety Victoria, Department of Transport, Senior Policy Officer

Abstract

Multi-sectoral partnerships provide the opportunity to collaborate and share information, concepts, and resources. Developing and maintaining multi-sectoral partnerships across jurisdictions are especially important in road safety, particularly when developing new and untested initiatives, where there are complex road safety challenges, or when targeting a specific cohort of road users. The success of the Motorcycle CRASH Card is evidence of a collaborative and effective partnership between two jurisdictions attempting to resolve a complex road safety challenge for a cohort of road user which has traditionally been resistant to traditional safety messaging. This presentation will explain the development and implementation of the Crash Card by Hornsby Shire Council using extensive stakeholder engagement and outline the opportunities for collaboration between the Council and Victoria's Department of Transport as it adopts the concept for a local audience.

Background

Hornsby Shire Council is one of the largest LGAs in the greater Sydney metropolitan area and has a population of approximately 152,419 (2021) – it is an attractive area for motorcycling due to many scenic roads. The Motorcycle CRASH Card was first introduced to Australia by the Council in response to a high percentage of moderate, serious injury and fatal motorcycle crashes throughout the LGA. The Council identified an opportunity to promote road safety messaging using non-traditional methods targeting a challenging audience and it spent significant effort in developing relationships with key stakeholders across the NSW emergency services landscape to ensure that the initiative was fit for purpose. Council has now distributed more than 80K CRASH Cards across NSW and throughout all states of Australia

Benefits of Partnerships

The development of the CRASH Card has provided a connection for riders moving through the Hornsby local government area, as well as providing a resource for riders in other parts of NSW. In addition, the development of partnerships with relevant emergency services has provided expertise and knowledge regarding motorcycle crashes and types of injuries sustained as well as access to crash locations, a broadened awareness of motorcycle road safety issues, sustainable development of other programs, as well as lasting relationships that have benefited every aspect of Council.

The crash card is an initiative to engage with motorcyclists to create road safety awareness for the rider. It not only encourages discussion about a rider's vulnerability, but also connects all sectors with aspects of post-crash care. The ongoing development of these partnerships benefits more than just the initial intended project developed with them.

Learnings and Outcomes

The crash card initiative has resulted in two jurisdictions which had never worked together cooperating on a significant road safety challenge. There have been several learnings throughout this process:

- To be successful, partnerships don't necessarily have to have equal standing. It's likely that each organisation will have different access to resources, funds, and information but that doesn't need to impact the equity of the relationship.

- The most effective partnerships are based on trust, mutual respect, and open communication, as well as an understanding of each partner's strengths and weaknesses. A willingness to share information is critical and an acknowledgement of mistakes and learnings builds trust and confidence.

- Road safety agencies cannot address complex road safety challenges alone. There are limitations what agencies can provide solely through infrastructure, legislation, and policy without seeking input and advice from other road safety partners across the wider Australian and New Zealand landscape. It is important to develop and nurture partnerships with other key road safety organisations which are not in your immediate jurisdiction to improve road safety outcomes.

Conclusion

The collaboration of the two transport jurisdictions is evidence that partnerships can be formed by organisations who may have varying levels of access to funds, resources, and information. Road Safety Victoria has applied the learnings of Hornsby Shire Council to its own project scope and development. Ongoing support has been offered by Hornsby which has allowed RSV to create a product which will be well received amongst the riding community.

Learnings from a trial of an automated shuttle in Queensland

Gemma J. M. Read[a], Rachael A. Wynne[ab], Lauren Coventon[a], Pia Sauer[a], Tim Mitchell[c], Grace Willems[c] & Paul M. Salmon[a]

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c Royal Automotive Club of Queensland

Abstract

Automated vehicles are currently being introduced onto Australian roads. Automated shuttles are designed to provide short distance passenger services, including 'last mile' links between mass public transport hubs and user destinations. This study involved the evaluation of an automated shuttle being trialed on a public road in Queensland. Online surveys were used to collect shuttle user perceptions and shuttle dashcam footage was used to analyse traffic interactions. Overall, the findings suggest that while perceptions towards automated shuttles are generally positive, their presence, under trial conditions, may lead to undesirable behaviours from other road users and that behavioural adaptation may occur which may require changes to the road environments in which vehicles are implemented.

Background

Automated shuttle trials continue to be implemented around the world to demonstrate driverless technologies for short or 'last mile' trips (Nordhoff et al., 2018). An evaluation was undertaken of the *RACQ Smart Shuttle* trial in Raby Bay, Queensland. The aims of the evaluation were to evaluate user perceptions of the shuttle and interactions between the RACQ Smart Shuttle (shuttle) and other road users (drivers, cyclists, motorcyclists, pedestrians).

The shuttle is an Easymile EZ10 Gen 2 model. The trial was approved by Transport and Main Roads Queensland prior to commencement. The permits placed conditions on operation of the shuttle, such as reporting requirements, operational times and maximum speeds (20km/h when operated in automated mode and 5km/h in manual mode). The EZ10 uses several types of sensors (localisation lasers, GPS, odometry and cameras) to navigate along a programmed route. The shuttle's safety chains, detect objects around the shuttle at a distance up to 80m. The shuttle either slows or performs an emergency stop (e-stop) in response to detected obstacles. The shuttle has indicators, brake lights and mode indicator lights (informing whether operating in automated or manual mode), to communicate externally with other road users.

The trial operated along a 1.9km loop in Raby Bay, Queensland between November 2020 and June 2021. The route incorporated six stops and an accredited chaperone accompanied the shuttle during operation. Some services were disrupted/suspended within that period due to COVID-19 lockdowns, weather conditions and shuttle maintenance. Nearly 1,600 passengers used the shuttle during the trial.

Method

An online survey distributed to shuttle passengers following their journey (*n*=116 participants) asked about perceptions regarding attributes of the shuttle and incorporated dimensions from the Unified Theory of Acceptance and Use of Technology (UTAUT) model (adapted from Louw et al., 2017). Additionally, a sample of forward-facing dashcam footage was reviewed (*n*=2,179 interactions).

Results

Survey results are presented in Figures 1 and 2. Overall, users rated their experience with the shuttle as very positive. In relation to the UTAUT, shuttle users were very positive regarding effort expectancy, facilitating conditions, hedonic motivation (enjoyment), safety/trust, and intentions to use the shuttle in the future.

The analysis of interactions with other road users found that the vast majority of interactions involved no risk of collision. Some undesirable road user behaviours were noted including drivers overtaking the shuttle on the right-hand side (in some cases causing an e-stop), and via the left-hand side (i.e. "undertaking"). Cases were also noted where vehicles pulled out in front of the shuttle without giving way, and pedestrians crossed in front of the shuttle while it was moving (generally these did not result in e-stops).

Conclusions

Shuttle users provided positive feedback regarding their shuttle experience. However, the speed of the shuttle, as required under trial conditions, may have influenced undesirable behaviours by other road users. These behaviours could increase the risk of an e-stop (potentially leading to passenger injury) or collisions with other road users. Integration into traffic flow is a consideration for supporting the integration of automated shuttles.

Acknowledgement

This research was conducted in partnership with the Royal Automobile Club of Queensland (RACQ) and Redland City Council. The views expressed are those of the authors and do not necessarily reflect the views of the partner organisations. This research was funded by the Australian Research Council (DE180101449).

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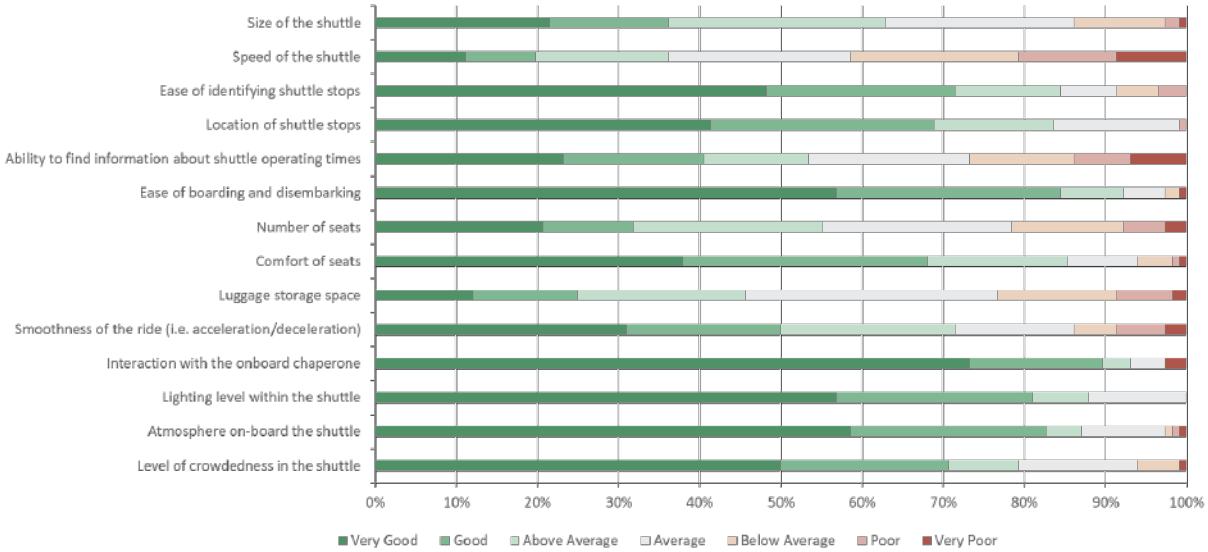

Figure 1. Shuttle user perceptions of shuttle attributes.

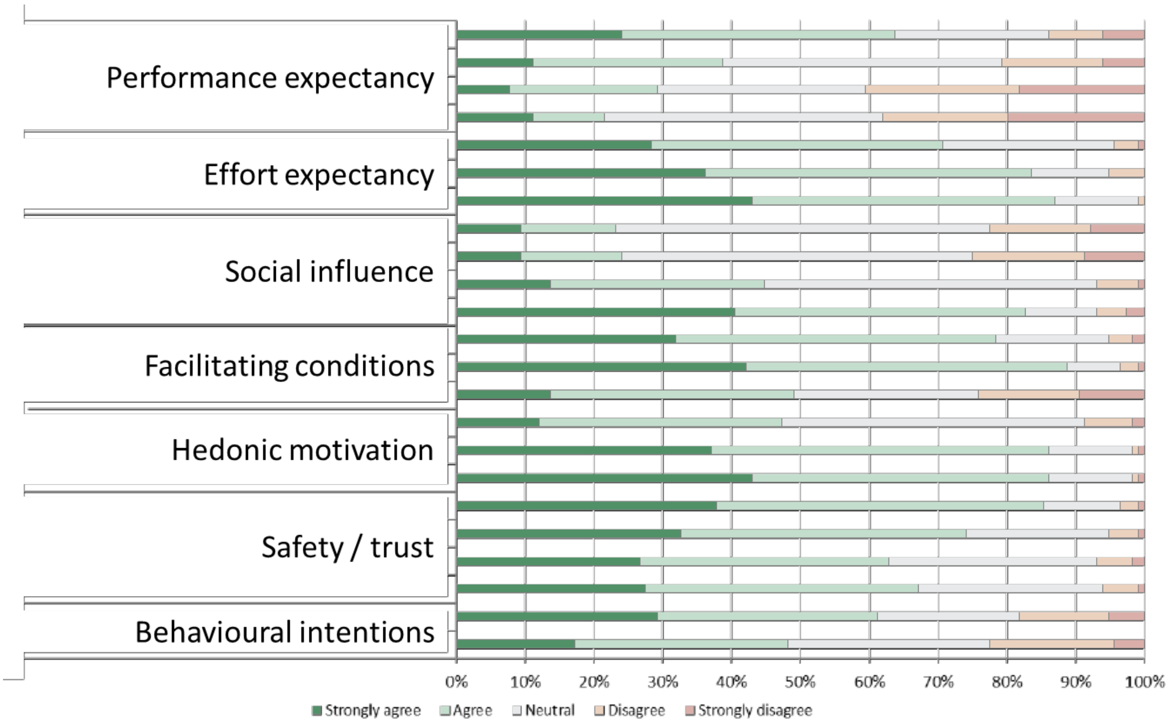

Figure 2. Shuttle user responses in relation to the UTAUT dimensions.

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SH22-Safety impact of LED Lighting on previously unlit Section

Bill Frith

WSP, Research and Innovation

Abstract

In September 2011 a rural, 100km/h, 7 km section of SH22 was lit to V3 standard using LEDs. The lights dimmed after midnight to V4/V5 level. Previously, only some intersection flag lights existed. The study's purpose was to detect any indications of a safety impact of the change. Injury crashes and rates were analysed five years before and after installation. All crashes and crashes not involving single vehicles losing control and crashes involving single vehicles losing control were analysed separately. The latter crashes tend not to reduce under lighting so may obscure positive changes in other crash categories. The study suggests a beneficial impact on road safety. being the sum of a positive impact on multi-vehicle crashes and a negative impact on loss of control single vehicle crashes. Multi-vehicle crashes, the main target group for lighting, were absent post-midnight before and after lighting. Lighting may not be required under such conditions.

Background

In September 2011 a rural, 100km/h, 7 km section of SH22 was lit to V3 standard using LEDs, The lights dimmed after midnight to V4/V5 level. Previously, only some intersection flag lights were in place. The study's purpose was to detect any indications of a safety impact of the change. Figure 1 depicts the stretch of road studied.

Method

Injury crashes and crash rates per 10^6 vehicles were analysed five years before and after installation. These analyses related to all crashes, all crashes excluding single vehicle loss of control crashes and single vehicle loss of control crashes by themselves, The latter crashes tend not to be influenced downwards by lighting (Jackett and Frith, 2015) so may obscure positive changes in other crash categories. This may occur by some drivers perceiving the lit road environment in such a way that they choose imprudently high speeds. No comparison sites were used as suitable ones did not exist..

Results

Before and after analyses of injury crashes and crash rates per 10^6 vehicles

Table 1 contains details of main analyses carried out. The results are indicative rather than definitive owing to the low numbers of crashes available to work with. The night to day crash ratio (Jackett and Frith, 2015) is an indicator of the impact of lighting on crashes.

- The five-year comparisons indicated crash and crash rate improvements before and after the change.
- The multivehicle crash savings were greater than all crash savings, on a percentage basis.

Figure 1. Map of the relevant section of SH22

- The higher savings in multivehicle crashes could relate to previous findings that such crashes are most susceptible to improvement from lighting.
- There were increases in night single vehicle lost control crashes. This may be due to the lighting increasing the tendency of drivers to increase their speeds.

Impact of post-midnight dimming on injury crashes and injury crash rates

Post-midnight multi-vehicle crashes were absent both before and after installation, leaving only single vehicle crashes. This questions whether there should have been lights on at all in that period as the main target group crashes for lighting was absent. This may relate to low traffic volumes, with vehicles in close proximity relatively rare.

Conclusions

- This study suggests an overall beneficial impact on road safety associated with the 2011 SH22 LED lighting installation.
- The net impact appears to be the sum of a positive impact on crashes involving more than one vehicle and a negative impact on single vehicle lost control crashes.
- Multivehicle crashes, the main target group for lighting, were absent post-midnight in the lit area both before and after the lighting was installed. This suggests that lighting may not be required under such low volume conditions where interactions between vehicles are sparse.
- This study has been hampered by small numbers of crashes to work with. Similar work involving more stretches of road would add to the precision of the study.

Table 1. details of main analyses carried out

<table>
<tr><th colspan="7">Night crashes five years before and after lighting installed</th></tr>
<tr><td></td><td>Before</td><td>After</td><td>Change</td><td colspan="3">% change</td></tr>
<tr><td>Injury crashes</td><td>9</td><td>8</td><td>-1</td><td colspan="3">-11%</td></tr>
<tr><td>High severity crashes</td><td>3</td><td>1</td><td>-2</td><td colspan="3">-67%</td></tr>
<tr><td colspan="7">Night to day crash ratio five years before and after lighting installed</td></tr>
<tr><td></td><td>Before</td><td>After</td><td>Change</td><td colspan="3">% change</td></tr>
<tr><td>Injury crashes</td><td>0.45</td><td>0.36</td><td>-0.09</td><td colspan="3">-19%</td></tr>
<tr><td>High severity crashes</td><td>0.60</td><td>0.14</td><td>-0.46</td><td colspan="3">-76%</td></tr>
<tr><td colspan="7">Multi-vehicle night crashes five years before and after lighting installed</td></tr>
<tr><td></td><td>Before</td><td>After</td><td>Change</td><td colspan="3">% change</td></tr>
<tr><td>Injury crashes</td><td>7</td><td>3</td><td>-4</td><td colspan="3">-57%</td></tr>
<tr><td>High severity crashes</td><td>3</td><td>1</td><td>-2</td><td colspan="3">-67%</td></tr>
<tr><td colspan="7">Multi-vehicle night to day crash ratio before and after lighting installed</td></tr>
<tr><td></td><td>Before</td><td>After</td><td>Change</td><td colspan="3">% change</td></tr>
<tr><td>Injury crashes</td><td>0.54</td><td>0.17</td><td>-0.37</td><td colspan="3">-69%</td></tr>
<tr><td colspan="7">Before and after injury crashes per 10^6 vehicles for all crashes and multi-vehicle crashes</td></tr>
<tr><td>Before</td><td>After</td><td>% change</td><td>Multi-veh, crashes</td><td>Before</td><td>After</td><td>% change</td></tr>
<tr><td>All crashes</td><td>1.4</td><td>-15.9</td><td>Night</td><td>1.3</td><td>0.5</td><td>-59.4</td></tr>
<tr><td>Night</td><td>0.7</td><td>4.1</td><td>Day</td><td>0.4</td><td>0.5</td><td>30.8</td></tr>
<tr><td>Night/Day Ratio</td><td>2.1</td><td>-19.2</td><td>Night/Day Ratio</td><td>.3.3</td><td>0.9</td><td>-69.0</td></tr>
<tr><td colspan="7">Before and after single vehicle loss of control injury crashes</td></tr>
<tr><td></td><td colspan="4">Before</td><td colspan="2">After</td></tr>
<tr><td>Night</td><td colspan="4">2</td><td colspan="2">5</td></tr>
<tr><td>Day</td><td colspan="4">6</td><td colspan="2">3</td></tr>
<tr><td>Night/Day Ratio</td><td colspan="4">0.33</td><td colspan="2">1.67</td></tr>
</table>

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Changing the narrative around 30km/h speed limits

Lena Huda

[1]30please.org, Bulli, Australia, [2]Safe-Streets-to-school.org, Figtree, Australia

Abstract

Lena Huda is founder of 30Please.org and safe-streets-to-school.org – these are grass-roots organisations that are campaigning for 30km/h speed limits in neighbourhoods. One key aim is to enable children to walk or ride to school without them having to worry to be hit by fast-moving cars. Lena will discuss a school pilot that took place in Wollongong in 2021/2022. It combined elements of a behaviour change programme to increase walking and riding to school with a social marketing campaign encouraging drivers to slow down to 30km/h voluntarily. Lena will give an overview of what strategies are used to engage with community and stakeholders to create a broader understanding of the importance of lower speed limits in urban areas. She will explore examples for partnerships, media and social media strategy.

Community engagement strategy

Lower urban speed limits are the most effective day to date increase pedestrian safety, however in Australia speed limits in neighbourhoods are higher than in most other more walkable countries.

Children’s independent mobility has tremendous benefits both to children and adults and if put at the core of a vision for Australian neighbourhood streets can help to get community support for necessary improvements, behaviour change and acceptance of lower urban speed limits.

Slow Down day Pilot

Healthy Cities Illawarra supported by Safe Streets to School Wollongong and 30please was awarded a grant by the NSW government for a pilot with three schools. Helping the schools to advocate for infrastructure improvements and a 30km/h Slow Down Day formed part of the pilot. Lena will discuss strategies used to engage with the community on the subject of lower speed limits. https://healthycities.org.au/programs/safe-and-active-routes-to-school-saarts/

We want to enable more children to walk or ride to school safely.
Within a 2km radius of every school in Canberra, we are asking for—

Pedestrian priority crossings on streets with speed limits 40km/h and higher

Footpaths on streets with speed limits 40 km/h and higher

30km/h speed limit on streets where there are no pedestrian priority crossings or footpaths

Find out more and sign our petition at
safe-streets-to-school.org

NEIGHBOURHOOD

SLOW DOWN DAY

FRIDAY 25TH MARCH 2022

Neighbourhood Slow Down Day

Friday 25th March

This Friday 25th of March is National Ride to School Day, and as part of the Safe and Active Routes to School Project (SAARTS), Healthy Cities Illawarra is encouraging all motorists to voluntarily slow down to 30km per hour in the Figtree and Mount St Thomas areas to make our streets safer for children to walk and cycle!

We have been working with Wollongong Council and Transport for NSW to raise awareness of the benefits of lower speed limits. On our Neighbourhood Slow Down Day, we will be encouraging all of our local school children to walk or ride to school – please slow down if you are driving a vehicle and look out for them, give them a friendly smile and wave as they cross the road.

Please note: This is an awareness day only and 30km/hr is not mandated.

Did you know? Internationally, best practice is driving no more than 30km/h in areas where children walk to school and are not separated from traffic. Many parents prefer to drive their children to school because of safety concerns, but on Neighbourhood Slow Down Day, we'd like to see that change!

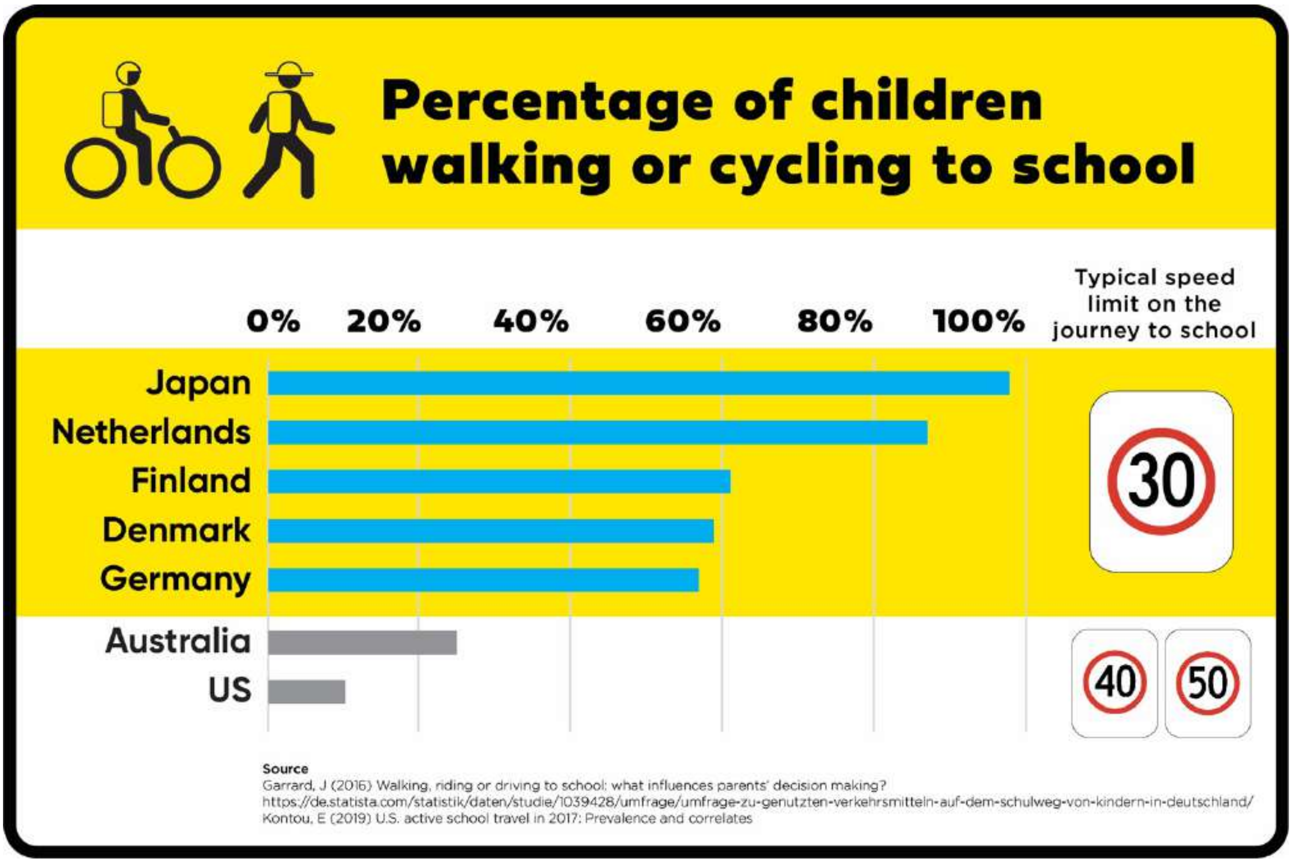
– To find out more about the Safe and Active Routes to School Project

– To find out more about the benefits of 30km/hr

– To find out more about other local advocacy projects for safer streets to school

Queries or concerns?
Email events@healthycities.org.au

Healthy Cities Illawarra
NSW GOVERNMENT
WOLLONGONG 2022 OFFICIAL LEGACY PROGRAM



Source
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Should Apple Design our Streets for People?

Gemma Dioni
Christchurch City Council

Abstract

Apple take an existing concept (computers, phones, music players) and make it user friendly. Their accessibility design guidelines promote the belief that everyone, regardless of their capabilities or situation, should have a great user experience. If this formula, which has worked pretty well for Apple, was applied to our public spaces and in particular our streets, would they not be more successful for people regardless of their capabilities, and be available to the widest audience? If everyone is so interested in the latest apple device, why are we as transport planners and designers not using best practice street design devices for our customers? If devices like raised priority crossings democratise our street space, help us to create walkable neighbourhoods, enable us to live locally, improve accessibility to opportunities, and allow people to engage in their communities for their social well-being, why are we not seeing more of them?

Introduction

Empathy was the first of three key ideas in the original one page "Apple Marketing Philosophy" back in 1977, with the subtext of truly understanding and serving the customer unlike anyone else. Simplicity and accessibility were design focal points that ensured products were intuitive enough for anyone to be able to use it, with a focus on simplicity, ease of use and consumer experience.

Apple recommend that for an application to be inclusive and accessible to everyone, the four main categories of disabilities (vision, hearing, physical and motor, and literacy and learning) need to be addressed, so the features that can make it individual are built in are for the customer to make something wonderful as per the Accessibility Guidelines (Figure 1).

Make yours.

Built-in features designed for you
to make something wonderful.

Figure 1. Basic principle of Apple's Accessibility Guidance (Apple, 2021)

But do we take the same approach as designers of streets? Do we empathise with our customers, and really take the time to understand them? If we were to take this approach of simplicity, accessibility, and inclusivity, would our streets be more successful for the customer that walks? Our customers, being humans, are diverse in both physical and mental states. This requires people planning and designing streets and spaces to understand that every human is unique and has different characteristics which can change over time or with situational disabilities.

Industry Survey

An industry survey undertaken to explore the use of raised zebra crossings identified that there appears to be two schools of thoughts on the implementation of these devices. Those that are in support of this device associate this crossing type with accessibility, people priority, placemaking and safe systems. On the other hand, those that they may not support the device as much, identify issues unrelated to the walking customer, but rather focused on the negative effects on vehicles and driver delay, perceived impact on emissions, and the perceived and actual safety benefits.

Discussion

To recommend application of a big picture philosophy like Apple's, promoting inclusive, accessible and consistent design to encourage walking, a focus on addressing the challenges and barriers to implementation is paramount. Understanding that our designs today affect the bigger picture and could enable change, could the challenges identified by respondents be minimised to enable more people to walk more often?

If we approached street design using design thinking or the double diamond approach, could help planners and designers to understand, rather than assume, what the problem is and develop a deep understanding of people they are designing for is paramount to defining users needs. In the transport design space, this part of the process is often missing. Only by bringing diversity to the table can we really understand the needs and wants of customers.

It is recommended that we continue to question the why, dig deeper to understand our customers by asking and watching, and continue to build understanding in human-centered design. These efforts could be a game changer in the ongoing effort to improve our access and enjoyment of neighbourhoods and communities.

Should Apple design our streets for people?

Customers are at the heart of the Apple brand. The company promotes the belief that everyone, regardless of their capabilities or situation, should have a great user experience. They produce devices that are inclusive and can be used by the widest audience because of the simple, intuitive, consistent and user-friendly design.

If we adopted the same philosophy and put our customers at the heart of design, could we make our streets something wonderful?

Gemma Dioni
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Christchurch City Council

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Collaborating for success - the Load Restraint Education Project

Melanie Suitor

Parkes, Forbes and Lachlan Shire Councils

Abstract

The safe carriage of loads affects us all. Loose or incorrectly restrained loads become a growing area of concern in 2020, with a 49% increase in the number of load restraint breaches detected by NSW Police on local roads. The Load Restraint Education Project was developed to curb these figures. It focused on the safe transportation of hay bales, machinery and general freight. A multi-agency Project Steering Committee, comprised of members from the Councils along with NSW Police, NSW Farmers and Transport for NSW, oversaw the project's implementation. Strategies included; a pre and post online awareness quiz, how to videos and accompanying fact sheets, local case studies and a Load Restraint Village Tour. The project developed high quality collateral and saw grass roots community engagement. As a result, load restraint knowledge has increased, breaches have decreased by 69% and there were no load restraint incidents during 2021.

Background

The safe carriage of loads affects us all. Loose or incorrectly restrained loads became a growing area of concern within the Parkes, Forbes and Lachlan Shire Council areas in 2020, with a 49% increase in the number of load restraint breaches detected by NSW Police. In early 2020 there were three serious heavy vehicle load restraint incidents, one of which resulted in a fatality, the other two were near misses. Hence the need for a local project to reduce these numbers.

Project Objectives

The project aimed to increase awareness about load restraint fundamentals and reduce the number of load restraint breaches and incidents on local roads.

Project Strategies

The project involved a number of strategies;

- Target commodities (hay bales, machinery and general freight) were chosen as they account for the majority of load types in the area.
- Pre and post online awareness quizzes were held to measure the current level of load restraint knowledge at the beginning of the project and whether there were any shifts in awareness at the end of the project.
- How to videos and accompanying fact sheets were developed containing simple tips to ensure load restraint was done correctly and safely.
- Local case studies were promoted to show what happens when load restraint fails.
- A three week, 12 location, Village Tour was held to take load restraint information directly to the farming community. A number of additional stakeholders joined the Project Steering Committee on the tour including NSW RFS, Safework NSW and NSW Health's Rural Adversity Mental Health Program.

Results

The results show that;

- The pre quiz had 452 entries and the post quiz had 363 entries. The two questions that saw improvement in knowledge were 'what is the most appropriate lashing for tying down a tractor' and 'what should you do if you notice that your load of hay bales had shifted during the trip'. Over 25% of respondents were unsure where you could get a copy of the Load Restraint Guide 2018.
- More than 100 farmers attended the Village Tour and all provided positive feedback.
- The how-to videos have had more than 1,000 views.
- More than 1,000 load restraint packs, containg the guide, have been distributed to the local community.
- 311,740 people were reached through social media posts and there were 5,070 engagements, which is an engagement rate of 61%.
- Police enforcement figures show that load restraint breaches have decreased 69% with no load restraint incidents recorded during 2021.

Next steps

A number of opportunities have emerged following the success of the project, some of these include;

- A webinar with TAFE NSW's School of Transportation and Logistics. They are thinking about using the resources in their load restraint module.
- Training sessions were conducted by NSW Police for each of the the Councils' operational staff. This has lead to improved load restraint understanding, especially in relation to the staff's regular fleet vehicle.
- Transport for NSW will be following this project model when they roll out a light vehicle load restraint education project.

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The Last Line of Defence

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Abstract

Providing proper pavement markings, signs and delineation is the answer to lifting motorist's 'blindfolds'. Governments have taken large steps forward in the quest for the goals of a Vision Zero road safety strategy. The objectives identify targets for casualty reduction across a number of strategies, including infrastructure improvements, speed management, vehicle safety and road user choices. Recent trends in flat line budgets have resulted in a worrying development that is reducing the safety of the road user. The reduction in funds is impacting all elements of the road maintenance framework with serious consequences. Taking away the safety belts and braces (guide posts, signs and markings) needed by the motorist is like driving down the road with a blindfold on. Removing such essential information results in more crashes and trauma to our society. This paper explores how using the "belts and braces" approach can address road safety in the short term.

Background, Implications and Next Steps

Road Controlling Authorities (RCAs) are under pressure from society to reduce expenditure. This directly affects the road maintenance budget which can lead to a blanket across the board reduction in all areas being employed. This reduction of funds in turn has been observed to cause a reduction in the quality and performance of road furniture by reducing inspections of the network (both day and night time), diminishing the opportunity for the RCA to identify and act on deficiencies. Likewise, financial pressures can lead to poor performance from the incumbent contractor who may be relying on the RCA not undertaking regular checks of the contract (due to time / budget / staff constraints). It is accepted that money has to be saved. Yet, we are still having fatal and serious injury crashes on our roads. Work is being deferred (i.e Pavement rehabilitations), but can we afford to defer such non-negotiable items such as delineation and guidance?

The experience of two senior Road Safety practitioners reveals that RCAs are saving money by taking away the very elements that form the backbone of road user's safety. In essence: the last line of defence for the driver.

There are certain items and areas that simply can't be cut: they must be there. We have a moral obligation to the population of New Zealand to ensure that we maximise motorist's safety. Research by Waka Kotahi NZ Transport Agency shows that effective delineation help to reduce the number of night-time loss of control crashes by up to 67 percent and overall have a 30 percent crash effectiveness rate. Road signs have a 30 to 60 percent effectiveness in reducing the total number of crashes where the signs are located in accordance with national standards and guidelines

This paper explores the observations of the Road Safety Practitioners, the extent of deviation from acceptable standards and the crash consequences of the poor performance of roadside furniture. An analysis of crash occurrence for various sections of road is explored to highlight the strong need for an improved maintenance intervention. The paper will explore the inter-relationship between stated network contract Key Performance Indicators (KPI) relating to Road Safety, and crash occurrence.

Join us in exploring examples of poor performance in the maintenance of the "belts and braces", and the impact that it has on crash occurrence. A case will be presented that maintenance of the 'belts and braces' elements should be increased, not decreased.

Sharing the Road Safely with Bicycles Campaign

Robynann Dixon

Northern Beaches Council Road Safety Officer

Abstract

Northern Beaches Council (Council) is experiencing high levels of traffic and parking congestion, with many complaints and requests from residents for Council to “fix it”. With many residents living an active lifestyle, promoting bicycle riding as a feasible transport alternative to cars should be a reasonable option. However, the challenge is that there is not an adequate off-road connecting system of paths on the Northern Beaches, and many bike riders are reluctant to ride on roads for safety reasons. Council has introduced the ‘Sharing the Road Safely with Bicycles’ campaign to foster a respectful and safe sharing of the road, through raising awareness of road rules related to bicycles, and also to promote short local bicycle trips. This paper identifies the challenges for bicycle riders wanting to ride on the road, the basis of the campaign and the evaluation.

Background:

Much of Northern Beaches Council is on a peninsula with limited major roads. Being an attractive area to live, as the population increases, there is increasing congestion of traffic and parking. However, the majority of residents enjoy an active lifestyle. In a survey in 2018 40% of Northern Beaches residents rode a bicycle in the last year, compared to 25% in Sydney, 83% of these rode for recreation and 26% road for transport (National Cycling Survey 2018). It’s therefore reasonable to encourage more residents to use their bike as a feasible form of transport. The challenge is that there is not an adequate off-road connecting system of paths on the Northern Beaches, and many bike riders are reluctant to ride on roads for safety reasons.

In 2019 Council conducted research to better understand attitudes and knowledge of road rules of road users. The results showed that 43% of motorists have a negative attitude when driving, including in their attitude to bicycle riders, that they ‘take risks and hog the road’.

The Sharing the Road Safely with Bicycles campaign aims to encourage both motorists and bicycle riders to be more mindful in how they share the road, by knowing the road rules and behaviours relating to bikes on the road. The goal is to create a safer road environment for bikes, so that people will replace some car trips with a bike ride, especially for short trips.

The benefits in shifting travel options from cars to bikes are not only for traffic and parking congestion, but also for the environment, health and finances.

Overview:

Using the results and recommendations from the 2019, Council chose a campaign approach to fit our budget; to provide education on road rules related to bicycles.

The campaign is 2-pronged, primarily to raise awareness for both motorists and bicycle riders on the relevant rules in sharing the road with bicycle riders, to improve safety for bicycle riders on the road; secondly to encourage the use of bikes in short local trips, such as to the beach or to the local café.

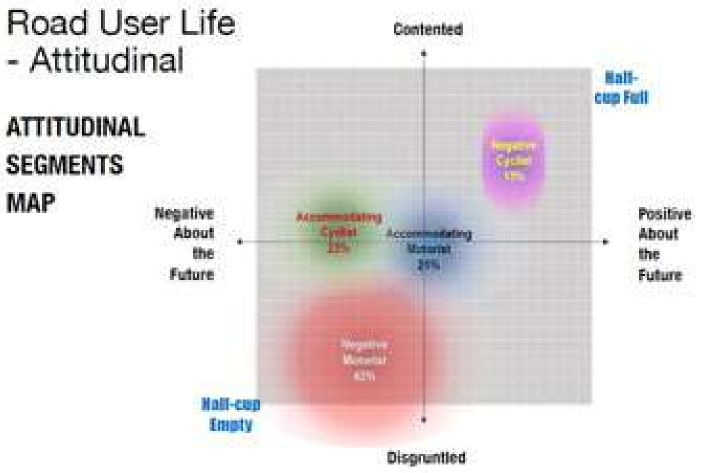

Figure 1. Road User Attitudes

Road User	Attitudes of/ to road users
Negative motorist **43% of survey replies**	- Negative attitude to bicycle riders – they take risks and hog the road - Agree that they don't know the road rules with bicycle riders and that many motorists are aggressive to bicycle riders
Accommodating bike rider **23% of survey replies**	- More people should ride bicycles for environment reasons - Many motorists don't know road rules with bicycle riders
Accommodating motorist **21% of survey replies**	- No negative attitudes to bicycle riders - State few motorists know rules with bicycles - State many motorists don't pay attention to bicycle safety and are aggressive to bicycle riders
Negative bicycle rider **13% of survey replies**	- Agree bicycle riders take risks - Very negative to motorists, dangerous, selfish, not aware of road rules with bicycle riders

Table 1: Road User Segment Profiles

Purpose of project:

Based on crash data, resident complaints, liaising with bicycle organisations and groups, and personal experience we identified 10 rules and behaviours as the basis for the campaign. A series of videos was produced to explain these rules and behaviours; https://www.northernbeaches.nsw.gov.au/services/roads-and-paths/sharing-the-road

From these we chose four rules to focus on, with an extensive campaign of stills media. To promote the short road trips we produced five suggested bike routes on local roads identifying potential interesting destinations.

Evaluation:

A comprehensive online pre-survey was conducted to establish the baseline data relating to the knowledge of road rules, bicycle riding behavior and the attitudes of motorists towards bicycle riders, for comparison in further research after the campaign. Results from the post-survey at the end of the campaign in May 2020 will be presented at a later date.

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Analysing media representation of bikelanes in Aotearoa New Zealand

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Abstract

Background and Method: Bikelanes are an important intervention for improving cyclist safety and community health. However, community opposition can be a barrier to implementing these projects. Media framing influences public perception of cycling projects, in turn influencing government policy. Our research aimed to examine the dominant themes in New Zealand newspaper coverage of bikelanes between January 1, 2018 and November 1, 2020. Results: There was a relatively even number of articles for and against bikelanes but, the anti-bikelane articles were more emotive and more strongly negative; while pro-bikelane articles tended to be more weakly positive. Bikelane opposition was primarily represented as being aimed at the government. Recommendations: Media reporting guidelines established, through legislation or industry self-regulation. Government and cycling advocates need to engage with the media about bikelanes in a way that reduces potential bikelash, shifting to advocating for bikelanes as a safety solution rather than as urban regeneration projects.

Background

Safe, separated bikelanes are a key intervention for increasing cycling (Macmillan et al., 2014), however, bikelane projects that require 'reallocation' of road space away from motorists are often controversial. Organised campaigns against cycling infrastructure, or 'bikelash', are common, and can result in scaled back or abandoned projects, and city leaders adopting a 'cautious inaction' stance on cycling safety initiatives (Wild et al., 2017). This paper examines media representations of new cycling infrastructure projects in Aotearoa, New Zealand, to explore the role that these representations may be playing in establishing or weakening social license for bikelane projects.

Method

Data Source: Newspaper articles from 1/1/2018 – 1/11/2020, sourced from Newztext media database, NZHerald and RadioNZ websites using keywords: "bikelanes" "bike lanes", "cycle lane", "cycleway", "cycle path", and "cycle paths". Articles excluded: duplicates, sponsored articles, solely about recreational bikelanes or infrastructure that did not share pedestrian or motorist space, or international stories.

Data Analysis: Articles were coded (using NVivo12.6) for bikelane *event slant* (event reported as positive, negative or neutral) and bikelane *opinion slant* (dominant opinion of author was positive, negative or neutral) (Durrant et al, 2003). Stakeholders directly quoted within articles were coded by type and opinion position. Thematic analysis, using a mix of inductive and deductive methods (Braun, 2013), was used to identify themes specifically related to bikelash.

Results and Conclusion

From 539 identified articles, 374 articles were coded (165 articles excluded).

Slant and Stakeholder: Articles were an almost even split between positive and negative *event* slant, and 69% of articles were neutral *opinion* slant. Negative opinion slant articles used very emotive language. In contrast, positive opinion slant articles tended to contain fact-based statements in favour of bikelanes. Positive slant articles would still sometimes criticise bikelanes, often their cost, design or the time and disruptions caused, while negative slant articles were rarely so balanced. The effect of this is that while the split between positive and negative slant articles was quite even, the strength of positivity and negativity being expressed in them was not. Two-thirds of stakeholder quotes were pro-bikelane, 18% anti and 15% neutral, with Government officials most often quoted, emphasising their importance in the coverage of bikelanes (Table 1).

Table 1: Article slant and stakeholder type by position

Article Slant	**Positive**		**Negative**		**Neutral**	
	n	**row%**	**n**	**row%**	**n**	**row%**
Event	157	42.0	154	41.2	63	16.8
Opinion	51	13.6	66	17.6	257	68.7
Stakeholder Type	**Pro-bikelane stakeholder**		**Anti-bikelane stakeholder**		**Neutral stakeholder**	
Activists	0	0.0	5	100.0	0	0.0
Businesses	14	28.0	24	48.0	12	24.0
Mana whenua	0	0.0	5	71.4	2	28.6
Private citizen	29	45.3	18	28.1	17	26.6
Residents Association	1	7.1	11	78.6	2	14.3
Schools	5	55.6	2	22.2	2	22.2
Student	2	100.0	0	0.0	0	0.0
Cyclist quoted	35	94.6	1	2.7	1	2.7
Cycling Advocates	53	98.1	0	0.0	1	1.9
Cycling Businesses	2	66.7	0	0.0	1	33.3
Cycling Trusts	12	100.0	0	0.0	0	0.0
Law Enforcement	3	42.9	0	0.0	4	57.1
Local govt	148	79.6	20	10.8	18	9.7
National govt	72	71.3	10	9.9	19	18.8
Media	3	75.0	1	25.0	0	0.0
Motorist	1	33.3	1	33.3	1	33.3
NGOs	4	21.1	12	63.2	3	15.8
Professionals/Consultants	17	85.0	0	0.0	3	15.0
Expert Opinions	5	83.3	0	0.0	1	16.7
Researchers	7	100.0	0	0.0	0	0.0
Other	1	20.0	1	20.0	3	60.0
Total	**414**	67.3	**111**	18.0	**90**	14.6

Thematic analysis of bikelash: Seven overarching themes relating to bikelash were identified (Figure 1). Negative critique of local and central Government, othering of cyclists and framing of bikelanes as ruining communities were dominant themes. Media framing positioned bikelanes as a battle in a wider culture war between motorists and cyclists and de-emphasised road design as a factor that could improve safety and reduce conflict, similarly, bikelanes were not emphasised as a safety solution.

Recommendations

The findings highlight a reporting bias in bikelane representation. Media reporting guidelines need established, through legislation or industry self-regulation. Media coverage de-emphasising road design and bikelanes as a safety solution may result from strategies of councils and planners positioning bikelanes as a ‘street renovation’ to avoid bikelash (Field et al., 2018). Government and cycling advocates need to promote bikelanes as a safety-based solutions rather than as urban regeneration projects.

Government framed as protagonist

Bureaucracy is not properly representing people

- Government/planners not respecting Māori
- Bikelanes legally challenged
- Environmentalist backlash
- Government/planners do not care about businesses
- Backlash directed at government/planners
- Government untrustworthy
- Government accused of not properly consulting people
- Opposition from within council

Bureaucratic incompetence

- Government/planners competence
- Bikelanes poorly costed
- Government/planners inefficient
- Complaints about delays OR timelines
- Backlash to cycleway design
- Cycleway route questioned

Government engages with backlash

- Government/planners working to improve bikelane safety
- Government working to reduce bikelash
- Government claims to have had adequate consultation period

Cycling is illegitimate

- Impact on pedestrians
- Cyclists receive abuse/blame for collisions
- Cyclists are dangerous
- Bikelanes are underutilised
- Cycleway is hazardous
- Motorists disregard bikelanes
- Cycleway is too expensive
- Bikelanes unnecessary
- Cycleway a waste of money

Cyclist safety

- Backlash from cyclists
- Cyclists feel unsafe
- Physical attacks against cyclists

Bikelanes harm businesses

- Impact on business profit
- Impact on vehicle access for businesses

Media self-reflection

- Media is reported to be fuelling bikelash for own gain
- Linking cases of bikelash
- Media commentators speak from a position of ignorance
- Media is reported to be biased against bikelanes
- Unrelated developments linked to bikelash or used to inflame bikelash

Bikelanes divide communities

- Bikelash as war
- Bikelash ongoing
- Bikelanes vandalised
- Backlash misdirected against cyclists
- Backlash misdirected against bikelanes
- Motorists don't want to share roads

Bikelanes are ruining communities

- Inconvenience to residents
- Bikelane aesthetics/Ugly bikelanes
- Backlash at loss of parking
- Impact on driving experience
- Community does not want bikelanes
- I'm not anti-bikelane BUT
- Bikelanes unnecessary
- Impact of roadworks

Figure 1. Main bikelash themes identified in articles and their constituent codes

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Driving for work crashes – A systems analysis

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Abstract

Work related road safety is a government priority. A Safe System analysis of 300 driving for work (DFW) crashes was carried out, along with an exploratory socio-technical analysis of one significant case, to better understand the context around DFW crashes. The Safe System analysis showed three distinct crash types – 1) multiple vehicle crashes often involving work vans, utes, and SUVs in side impact crashes; 2) vulnerable road users often involving professional drivers; and 3) single vehicle crashes involving people driving vans or light trucks for work losing control on rural roads with fatigue, non-seat belt use, and speed often implicated. There were a range of unique characteristics of DFW crashes, in particular injuries to others who are implicated in DFW crashes but not DFW themselves. Socio-technical systems analyses show promise for understanding the context around DFW crashes, but arrangements for better data access, coordination and use are needed.

Background

Work-related road safety is a strategic priority in New Zealand. Work-related road traffic fatal injuries are estimated to be 30% of all worker fatalities (McNoe, Langley, & Feyer, 2005) and 22%-36% of road fatalities (Lilley, et al., 2019). However, there remains a poor understanding of the contextual factors around work related crashes.

The aim of this research was to determine the Safe System factors associated with fatal, serious injury, and minor injury crashes that occurred while driving for work (DFW), and explore socio-technical analysis methods for understanding relevant contextual factors.

Method

Following a brief literature scan, a Safe System analysis (modified from Mackie, et al., 2017) of 300 driving for work injury crashes (100 each of minor, serious, and fatal) was carried out for light vehicles and some services vehicles such as buses and rubbish trucks. A case selection method was developed and applied prior to inter-rater testing and coding for each case. A multiple correspondence analysis then identified crash clusters. An AcciMap (based on Rasmussen, 1997) case study also explained the contributing factors in a single fatal DFW case.

Results

The Safe System analysis showed that DFW crashes are often linked to multiple system failures across Road and Roadside, Speed, Vehicle, and User pillars, and that higher severity crashes involve a greater number of pillars. Rural roads, high speeds and speed limits, a lack of traffic division, and user distraction or inattention were often implicated, as were vehicle size and mass particularly with respect to collisions with vulnerable road users in urban areas. Extreme or reckless user behaviours on the other hand were relatively uncommon, but fatigue and unpredictable manoeuvres were commonly implicated. Finally, injuries were often sustained by other users involved in crashes with people DFW, especially in vulnerable road user and fatal contexts, reinforcing the importance of bystanders in DFW crashes.

Three distinct DFW crash profiles were identified through a multiple correspondence analysis:

Multiple vehicle crashes (n=188), often involving work vans, utes, and SUVs in side impact crashes

Vulnerable road user crashes (n=72), often involving professional drivers

Single vehicle crashes (n=40) involving people driving vans or light trucks for work losing control on rural roads and hitting an object or rolling, with fatigue, non-seat belt use, and speed often implicated

The AcciMap of a single DFW case showed a range of regulatory and work related norms that have clearly influenced the crash outcome. This analysis also shows how system analyses can progress from 'Safe System' analyses (what happened) to Socio-technical analyses (why it happened).

Conclusions

DFW crashes have both unique and common characteristics with well identified road safety problems. The interactions between DFW vehicles and other road users, including vulnerable road users, is a particular area that warrants more attention. There are significant data access issues that need to be resolved however, as work related road safety extends across government agencies.

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Overcoming Regulatory Barriers - Personal Mobility Devices

Jeremy Wolter

Abstract

Australia has in place a ministerially approved national policy for the safe and legal use of Personal Mobility Devices (PMDs) on specific types of public infrastructure. Development of the national policy by Australia’s land transport reform agency, the National Transport Commission, highlighted the challenge of achieving complete national consistency in a federal system of government where sovereign states each have exclusive responsibility for road use policy and regulation. The policy recognises the growing global popularity of PMDs as people look for more innovative, efficient and individualised ways to move around cities and communities. The increased public demand for PMDs had placed many Australian jurisdictions under pressure to introduce regulations that permit the legal use of these devices, which had previously been operating in an undefined and increasingly inconsistent regulatory environment, leading to increased safety risks.

Background

Personal Mobility Devices (PMDs), such as electric scooters and electric skateboards, are typically small, portable and designed to carry one person over short to medium distances. These devices are growing in popularity globally as people look for more innovative and efficient ways to move around cities and communities. This shift in transportation preference, known as micro-mobility, is seeing people becoming less dependent on traditional forms of transport, such as cars, buses, trains and trams, in favour of these more individualised modes of transport.

Australian transport laws, however, predated the emergence of most of these devices. This meant most PMDs were not recognised within existing Australian road rules. Due to the public demand for PMDs, many Australian States and Territories were under increasing pressure to introduce regulations that permitted the legal use of these devices.

The Ntional Transport Commission- adopted a primary organising principle of pursuing nationally consistent road rules with assessment based on an implicit “averaging” of road and path conditions, dimensions and usage. Ministerially agreed legislative changes achieve as much consistency as possible in the rules, whilst also acknowledging the individual context of some state and territory urban environments.

Purpose of Policy

The policy objective of the PMD reform was to provide a nationally consistent approach to regulating PMDs that enables safe mobility and independence for all road users. Having a consistent set of rules across Australia that are easy to understand is likely to improve safety outcomes and encourage compliance.

Description of Policy

The overall assessment of viable options to achieve a nationally consistent approach to PMD regulation highlighted the challenge of establishing a common national approach to permitting access of PMDs onto public roads and paths. Each variation of road/path access and speed approach resulted in trade-offs between the safety and amenity of different user types, broader economic benefits, as well as compliance and enforcement challenges. In addition, a national response was made far more challenging by the very different nature of dimensions, condition and usage of road and path infrastructure across Australian urban environments. The agreed policy adopts the following:

- A regulatory framework for PMDs that outlines device characteristics, dimensions and weight specifications.
- Access to particular infrastructure
- Permitted speed variations on each infrastructure type

Conclusions and Next Steps

Australian model road rules legislation has now been amended to keep pace with the rate of change and growth of PMDs and deliver on the national policy to facilitate a nationally consistent approach to the safe and legal use of PMDs on certain public infrastructure.

The NTC intends to perform an evaluation exercise in the future to determine further areas of national reform for the use of PMDs.

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Long Term Speed Management Prioritisation

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Abstract

It is a challenging task to review the speed limits of more than a thousand roads over a wide-ranging transport network and to set up a long-term speed management programme in a consistent and efficient manner. By engaging with the community to understand their priorities and agreeing on criteria that is broader than just safety metrics, a prioritisation system can be developed to identify the roads that should have their speed limit reviewed first. These roads can then be reviewed spatially using a GIS portal to establish a speed management programme that can be used to implement change on a network-wide scale.

Strategic context

Speed is a key road safety issue in New Zealand and contributes to the high number of deaths and serious injuries on the rural and urban road network. Speed management is a key focus area of the New Zealand Government's Road to Zero 2020-2030, road safety strategy[1].

All Territorial Local Authorities are being asked to prepare a long-term Speed Management Programme, which needs to identify which roads to target to prioritise harm reduction as well as make sense spatially and meet community priorities.

Project Background

New Plymouth District Council (NPDC) has been reviewing speed limits within their road network, recently engaging with the community on rural speed limits in 2020 and urban speed limits in 2021. Following that, a prioritisation system was needed to prepare a long-term Speed Management Programme.

Methodology

The key roading databases that were used for further analysis and GIS mapping were the readily available Waka Kotahi/NZ Transport Agency MegaMaps Edition III and the RAMM carriageway dataset provided by NPDC.

An MCA workshop was held to confirm criteria used for prioritisation, conduct scenario testing by adjusting the weighting of scores of the prioritisation criteria and confirm a scenario for setting up the implementation plan.

The roads were grouped into homogeneous areas (e.g. urban area, rural area and schools) in the implementation plan. It allowed the prioritisation process to look at an area of roads with a similar environment at once to eliminate the need to assess all roads individually.

The indicative cost was on a per-kilometre basis for the typical engineering treatments associated with each implementation strategy based on Waka Kotahi Safe Network Programme and Standard Safety Intervention work.

Based on the input above, a long-term speed management plan over three New Zealand National Land Transport Plan (NLTP) periods from 2021 to 2030 was populated. The key information was then mapped in GIS to visualise the proposed speed management implementation plan.

Evaluation and Effectiveness

The first NLTP period from 2021 to 2024 would focus on the highest-scoring roads around schools with a strong community focus and rural areas with a high potential for high death and serious injuries savings. This arrangement programme would bring the most benefits to the first NLTP despite the number of roads reviewed in this period being the lowest among the three NLTP periods.

Conclusions

The early community engagement helps set up the implementation plan and builds momentum for future less palatable speed limit changes over the later years of the speed management plan. Readily available roading data can be effectively used to set up a speed limit review programme over a wide transport network regardless of the number of roads, as long as the community priority and key prioritisation criteria are understood.

The GIS mapping can be used to visualise the proposed implementation plan based on computation and automation. Following some ground truthing from local experts, it can then be used to develop a speed limit programme for public consultation and implementation

SMART ROAD

RAMM Road Name	SMART ROAD
NPDC Segment ID	992
MegaMaps ID	SMART_6658
Volume	100
ONRC	Access
Category	Rural
School (250m)	No
Speed Limit	100
SaAS	60
Speed Limit = SaAS?	No
DSI Saving per 10 Years (after implementation)	0.0634

Figure 1. Speed Management Implementation Plan GIS Mapping

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Facilitating lived experience story-telling in road trauma education programs

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Abstract

Working with people following traffic-related offences is an innovative part of Road Trauma Support Services Victoria's (RTSSV) community-based programs. Designed to promote awareness of the impacts of road crashes and behaviour change, RTSSV programs use trained volunteers to share their lived experience of road trauma with participants. However, there is little evidence to guide this lived experience engagement in such programs, and ongoing training and support. Using a mixed methods approach, we surveyed 42 RTSSV volunteers and of these, 23 participated in in-depth interviews. In this presentation, we highlight the key findings related to the motivation and benefits of sharing stories, along with the challenges of doing so and key areas identified for enhancing future training and support. Through describing the program and our research findings, we highlight the importance of lived experience in addressing future road safety.

Background

Working with people following traffic-related offences is an innovative part of Road Trauma Support Services Victoria's (RTSSV) community-based programs. The Road Trauma Awareness Seminar (RTAS) is 'a short, non-treatment based offender program which aims to bring about attitude and behavioral change, and reduce recidivism and hence road trauma' (Clark & Edquist, 2013). Designed to promote awareness of the impacts of road trauma and behaviour change, the RTAS program uses trained volunteers to tell their personal road trauma stories to share their lived experience with participants. Yet there is little evidence to guide this lived experience engagement in such programs, and ongoing training and support. A recent scoping literature review (Harms, Alexander, Harrison, & Cameron, 2018) identified only seven studies that examined the use of lived experience in road trauma programs, and six of these studies were supportive of lived experience being used constructively in such programs. However, the review identified the significant evidence gap in understanding the nature of their experiences and training and support needs, which led to the conducting of this mixed methods study of volunteers who had shared their lived experience in the RTAS program.

Method

Using a mixed methods approach, in 2019 and 2020, we surveyed 42 RTSSV volunteers (67% female, aged 24-77 years) and of these, 23 participated in in-depth interviews (65% female) to deepen the enquiry. Participants were self-selecting, recruited through the RTSSV database by email. Recorded and transcribed interviews were conducted by two Master of Social Work students (UP and AO), and the analysis undertaken in NVIVO by two others (EK and YR). A content analysis enabled identification of key themes relating to the motivations and benefits of sharing lived experiences, the challenges of doing so, and recommendations for training and program enhancements.

Results

From the analysis of both the survey and interview data, we found that the most common reason for starting to volunteer at RTSSV was to educate others about the impact of road trauma, and to make a positive change in the community. The most commonly endorsed reasons for continuing as a volunteer were the feeling of making a difference in the community, and finding the experience well-supported and rewarding. However, the challenges of sharing their live experience via storytelling were in managing their own traumatic memories and some of the responses of program participants. Key areas for enhancement of future training and support were identified.

Conclusions

Engaging volunteers in sharing their lived experience in road trauma programs had clear benefits for the participants in this study. In this paper, we consider the positive and negative dimensions of participants' experiences and identify the lessons learnt for best practice in engaging story-telling in road safety and education programs.

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Temporary Roundabouts – Safe System Solution?

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Abstract

Temporary roundabouts are increasingly being used on the highway network and offer a low-cost traffic management solution to reduce the crash risk, reduce conflict points, lower intersection speeds, and improve the flow of turning traffic. This paper focusses on a temporary roundabout that was installed for a few months to facilitate the construction of a new bridge. The purpose of this project was to better understand the level of safety provided by a temporary roundabout through its operation, speed and geometry and refinements for potential application elsewhere.

Background

Roundabouts have long been seen as the Safe System solution to intersection crash risks and the best facility for median barrier U-turn movements. However, Austroads compliant rural roundabouts come with an expensive price tag. Smaller temporary roundabouts could offer an interim solution to safely manage intersection movements and support early installation of median barrier, until funding is available for a standard roundabout. Could a roundabout be formed within the existing intersection footprint, not meeting Austroads standards still provide Safe System outcomes?

Methodology

The project undertook a drone survey to determine geometry and vehicle tracking. From this we were able to measure the size of the central and outer diameters and the entry path radius to confirm how well these compare with Austroads standards. The footage also meant a range of movements could be observed.

Figure 1. Temporary Roundabout Installation

The project undertook a conflict analysis by reviewing drone footage and static camera footage of the site and discussions with site staff. The analysis allowed the frequency of near-misses and unsafe behaviours to be determined, while the site staff confirmed how frequently the site was needing repair.

Speed data was collected from traffic count tubes installed on the immediate approaches for a week and from the installed Intersection Speed Zone (ISZ). The speed data was compared to Safe System speeds for side-impacts and revealed how well the roundabout had lowered the risk of fatalities at the site compared with the ISZ. The Safe System Assessment Framework was used to compare the risks of the major crash types causing death and serious injuries at the original t-intersection, ISZ, temporary roundabout and standard roundabout.

Conclusion

The temporary roundabout controlled intersection speeds, reduced conflict points, simplified decision making, and was generally supported. The temporary 50km/h speed limit and the temporary traffic management in place was likely a significant contributor to the lower speeds achieved.

Temporary or semi-permanent roundabouts have a great potential to support early install of median barrier functioning as a turnaround as well as significantly reducing the intersection safety risk.

Ongoing monitoring and development would be beneficial to refine designs and understand longer term effects. For longer term use, more permanent infrastructure would be required to minimise maintenance and associated safety-in-design issues as well as to reduce operational cost.

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A Proactive Methodology for Assessing Safety at Rural Priority Crossroads

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Abstract

In New Zealand, there have been several recent high-profile crashes at rural crossroads where a driver failed to observe a Stop or Give Way sign and travelled through the intersection at speed. This prompted Waka Kotahi NZ Transport Agency to analyse all rural priority crossroads in New Zealand to identify those intersections susceptible to this type of ‘tunnel vision’ crash. A literature review was undertaken to identify relevant intersection attributes which contribute to drivers mistakenly failing to detect a priority-controlled intersection. A geospatial methodology was then developed to identify and assess relevant intersection attributes for over 1,700 rural crossroads across New Zealand. Finally, statistical analysis was undertaken identify statistically significant attributes for ‘tunnel vision’ crashes and to develop a prediction equation to identify high-risk intersections. The results of this analysis are now being used to develop a treatment hierarchy for intersections within different risk profiles.

Background

There have been several high-profile, high-severity crashes at rural priority crossroads in New Zealand in recent years. A common factor in these crashes is a driver failing to observe a Stop or Give Way sign and travelling through the intersection at speed. This prompted Waka Kotahi NZ Transport Agency (Waka Kotahi) to analyse all rural priority crossroads in New Zealand to identify those susceptible to this type of ‘tunnel vision’ crash, and to prioritise the treatment of these intersections, based on their predicted level of risk.

Development of the Risk Assessment Methodology

Most rural priority crossroads in New Zealand have low traffic volumes. Due to the random nature of crashes this means that analysing crash data alone is insufficient for prioritising intersections for safety treatments. It was therefore necessary to apply a proactive approach to identify high-risk rural crossroads from their underlying physical and operational factors.

The first stage in this project was a literature review to identify relevant intersection attributes which lend themselves to drivers mistakenly not detecting a priority-controlled intersection, while driving at speed. This identified several factors that contributed to the risk of a ‘tunnel vision’ crash, including the monotony of the road environment, traffic volume, vehicle speed, skew angle, horizontal alignment, and vertical alignment.

A pilot analysis was then undertaken in the Ashburton District to develop and refine processes for the semi-automated coding of intersection attributes. This included a geospatial methodology for developing intersection data models and extracting attributes across different road centrelines and associated datasets.

Finally, the national roll-out of the methodology was undertaken, extracting almost 50 different attributes for each rural crossroad. Twenty years of injury crash data was then extracted from the Waka Kotahi Crash Analysis System. Crashes coded as intersection movement type ‘HA’ (right-angle), with cause codes that indicated a driver failed to give way or stop, were joined to each intersection. Statistical analysis was then undertaken to identify statistically significant attributes for ‘tunnel vision’ crashes, and to develop a prediction equation to identify high-risk intersections.

Findings and Application

This assessment demonstrated that injury crashes at rural priority crossroads where ‘tunnel vision’ may have been a factor are relatively rare. Of the 1,719 intersections identified and analysed, only 459 intersections (27%) had had at least one of these types of injury crashes reported in the past 20 years. This highlighted the need for the predictive model for predicting this type of crash risk.

The next stage of this analysis is the development of a treatment hierarchy. This will give advice around the types of treatments that should be considered for intersections within different risk profiles. For example at the high end, transformational treatments may be desirable (such as a rural roundabout) while at the lower end the minimum treatments prescribed by the Manual of Traffic Signs and Markings (Waka Kotahi, 2010) may be appropriate, provided they are well-maintained.

Reference

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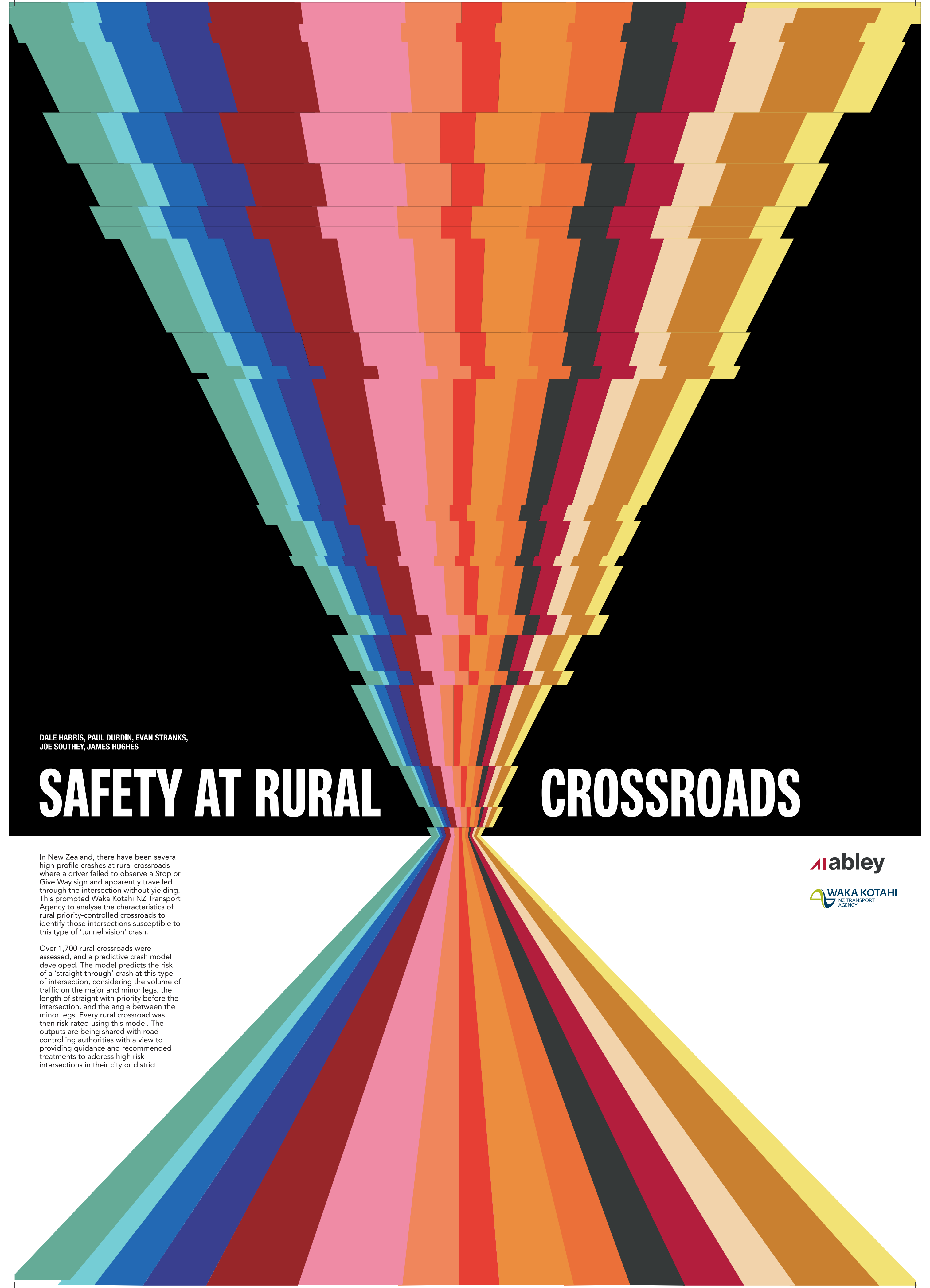

DALE HARRIS, PAUL DURDIN, EVAN STRANKS, JOE SOUTHEY, JAMES HUGHES

SAFETY AT RURAL CROSSROADS

In New Zealand, there have been several high-profile crashes at rural crossroads where a driver failed to observe a Stop or Give Way sign and apparently travelled through the intersection without yielding. This prompted Waka Kotahi NZ Transport Agency to analyse the characteristics of rural priority-controlled crossroads to identify those intersections susceptible to this type of 'tunnel vision' crash.

Over 1,700 rural crossroads were assessed, and a predictive crash model developed. The model predicts the risk of a 'straight through' crash at this type of intersection, considering the volume of traffic on the major and minor legs, the length of straight with priority before the intersection, and the angle between the minor legs. Every rural crossroad was then risk-rated using this model. The outputs are being shared with road controlling authorities with a view to providing guidance and recommended treatments to address high risk intersections in their city or district

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AGENCY

Nationwide Assessment of Safety Around Schools in New Zealand

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Abstract

Currently, speed limits around many schools in New Zealand do not make walking and cycling an appealing mode of transport for travelling to school. To address this, an assessment of risk and operating speeds around schools was undertaken to help prioritise schools for speed limit reductions and supporting Safe System interventions. The first stage involved classifying schools as either 'urban' or 'rural'. Then school boundary risk, road network risk, and walk/cycle risk (for urban schools) were assessed. Current vehicle operating speeds around schools were then compared against 'desired' safe speeds. Finally the accessibility of urban schools was assessed by comparing actual walk/cycle mode share against theoretical walk/cycle mode share. A final prioritised list of 2,487 schools was generated by combining the different assessments. This information is now included in the guidance to help Road Controlling Authorities develop a programme of interventions to reduce speeds outside New Zealand schools.

Background

Currently, speed limits around many schools in New Zealand do not make walking and cycling an appealing mode of transport for travelling to school. To address this, an assessment of risk and operating speeds around schools across New Zealand was undertaken to help prioritise schools for speed limit reductions and supporting Safe System interventions.

Methodology

Data requirements

The methodology required several national datasets, including:

- School locations, rolls and enrolment boundaries, sourced from the Ministry of Education.
- Walk and cycle networks developed from OpenStreetMap data.
- The Waka Kotahi 'MegaMaps centreline' for extracting land use, speed limit and other road attribute data.
- Census data on school-age population and travel to education by geographical area, from Stats NZ.

Urban and rural school classification

Urban schools are typically located within lower-speed roads, with multiple access points and higher rates of walking or cycling compared to rural schools. Rural schools are located on high-speed roads with fewer access points and a high proportion of students arriving via school bus or private vehicle. Because of these differences, urban and rural schools were assessed separately.

Assessment steps

There were four steps in the assessment:

1. Classification: Schools were classified as either ‘urban’ or ‘rural’ based on the land use classification and existing speed limit of surrounding roads.
2. Risk assessment: Three separate assessments were undertaken, generating collective and personal risk metrics that combined into an overall ‘school risk rating’:
    a. *School gate risk* – predicted risk on roads directly fronting the school, based on vehicle speeds and traffic volumes.
    b. *Vehicle network risk* – actual crash risk withing the school zone or walking catchment, based on crash data.
    c. *Walk/cycle route risk* (urban schools only) – predicted risk for students walking and cycling to school, using modelled walking/cycling routes and crash prediction models.
3. Operating speed assessment: Operating speeds on frontage roads were compared with ‘desired’ speeds for that road environment. Schools with the greatest difference between existing and desired speeds received higher ‘operating speed percentile’ ratings.
4. Accessibility assessment (urban schools only): The actual walk/cycle mode share from a census ‘travel to education’ dataset was compared against potential mode share based on the number of children who can theoretically walk/cycle to school. Schools were rated on a spectrum between “well below average” to “well above average” for accessibility.

Prioritisation

Finally, schools were prioritised by combining the ‘school risk rating’ and the ‘operating speed assessment with equal weighting. For urban schools, a further weighting was applied to lift the priority of schools which were rated as having ‘below average’ or ‘well below average’ accessibility. This ensured that speed management improvements are focused on schools that are performing worse than expected in terms of walk/cycle accessibility.

Outcome

The methodology rated and prioritised 2,487 schools across New Zealand for speed management treatment, including 1,962 urban schools and 525 rural schools. The results are now being used to develop a programme of interventions to reduce vehicle speeds outside New Zealand schools.

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Interplay between intersection design, risky behaviours and pedestrian safety

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Abstract

Vehicle-pedestrian road trauma is a significant cause of concern with one in six road deaths being a pedestrian and about a quarter of pedestrian crashes occurring at intersections in New South Wales, Australia. Intersection design has historically favoured drivers over pedestrians. We explore how these design choices relate to risky behaviours and to pedestrian safety. The work makes use of historical crash data and video footage to analyse pedestrian and vehicle trajectories. Hypothetical designs are explored through microsimulation, and the safety risks are quantified with surrogate safety measures. Defining personas with distinctive behaviours supports a nuanced differentiation between road users. We preliminarily find connections between design choices and pedestrian behaviour, but unintended behaviours such as crossing against the light or outside the crosswalk are not significantly associated with increased safety risk. The results therefore suggest that designs favouring pedestrians best impact safety by increasing the number of pedestrians.

Background

Historically, intersection design has favoured signal timings, road alignments and streetscapes that might not work for pedestrians. Some design features tradeoff between safety and delay, which introduces behavioural responses and concomitant safety risks. While the pathway from the intersection design to traveller behaviours to risk are intuitive, few studies have been able explore this multi-link mechanism with data. This work explores three questions about intersection design, behavioural responses and safety for vulnerable road users:

- What are the delay and safety impacts of the design of the signal timings and geometric design considered across all road users?

1. Are inequitable intersection designs associated with risky behaviours by disadvantaged road users?
2. Which risky behaviours are associated with road trauma?

Method

This work uses data from New South Wales, Australia. Historical crash records identify intersections with exceptional crash records. Video records behaviours at those and other locations. Video processing software is used to extract trajectories and delays from the video. The video recordings are also used to construct microsimulation environments to test hypothetical changes to signal timing and geometric design. The simulated and observed trajectories are used to generate surrogate safety measures that reflect the risk associated with a scenario. We layer this analysis with human factors approaches by creating *personas*, such as parent-with-child, mobile-phone-distracted, pedestrians in groups, with distinctive behaviours to understand who benefits from the design decisions.

Results

The analysis is on-going and we report findings based on preliminary results for this deadline. We find that pedestrians represent a disproportionate number of injuries and fatalities when controlling for number and length of trips. We expect to find that pedestrians experience more delay per person than drivers at our intersections.

Intersections are quantified as inequitable when the delay for one group of road users is disproportionate to another or when the excess distance travelled is large compared to the Euclidean distance. Inequitable intersections tend to disfavour pedestrians, and are associated with higher pedestrian non-compliance in terms of crossing against the light but no significant change in crossing outside the crosswalk.

Preliminary observation suggests that pedestrian road trauma is associated with low exposure locations (safety-in-numbers effect) and with specific categories of risky behaviour (low lighting, drug and alcohol use). Controlling for these effects, crossing against the light or outside a crosswalk is not associated with increased safety risk.

Conclusions

The analysis of historical crash data and video footage of intersections indicates that pedestrians are safest where there are lots of them. The riskiest situations occur when drivers are unaccustomed to sharing the road or when behaviours are less able to be predicted due to lighting or drug or alcohol use.

An unexplored avenue in this research is the role that intersection design plays in mode choice because the prevalence of pedestrians is shown to be important in determining safety. The results presented here suggest that equitable intersection designs are likely to have safety benefits because they increase pedestrian use.

Acknowledgements

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Evaluation of the National Road Safety Partnership Program

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Abstract

The National Road Safety Partnership Program (NRSPP) was created to bring together businesses, researchers, and government in a collaborative network and support organisations to improve road safety. This presentation will summarise findings from a program evaluation completed by the Monash University Accident Research Centre, measuring the program's activities, outputs and impact. The evaluation identified evidence that the NRSPP has increased its engagement in activities including knowledge production, advancement, and dissemination since its inception in 2013. Findings support the program's influence on key decision-makers, including government, external stakeholders, the research sector, and workplace organisations, as evidenced by reference to the NRSPP in policy papers, scientific reports, and stakeholder materials. Survey results additionally demonstrate the program's positive contribution to workplace health and safety outcomes (e.g. employee safety knowledge, workplace safety culture).

Background

The NRSPP was created to bring together businesses, researchers, and government in a collaborative network and draw on local and international good practices to support organisations to improve road safety.

In 2020, the Monash University Accident Research Centre (MUARC) undertook an evaluation of the NRSPP, aiming to assess the impact of the program's outputs and activities over the past nine years. Guided by a research impact model (Van Eerd et al., 2021), the evaluation focused on:

- Outputs of NRSPP activities including knowledge production, knowledge advancement and knowledge dissemination;

i. Influence of NRSPP activities on key decision-makers in workplace road safety (e.g., employers, policymakers); and
ii. Impact of NRSPP activities on improving individual and workplace health and safety outcomes.

This presentation will describe the evaluation outcomes and the future strategic direction of the program.

Method

Data (Table 1) was collected using academic and grey literature, a survey of program stakeholders, an extensive website review, and social media analytics tools. A subject matter expert in workplace road safety reviewed the evaluation to ensure scientific credibility.

Table 1. Evaluation data sources

Data type	Methodology
Academic literature	The Monash Library Search Engine (i.e. https://guides.lib.monash.edu/search), Google Scholar and ProQuest were searched using the terms "NRSPP" or "National Road Safety Partnership Program". The search was restricted to the period 2014 to December 2020, and resulted in 95 hits. Abstracts were examined for relevance
Grey literature	A Google search was undertaken to scan for mention of the NRSPP in grey literature materials. The search terms included "NRSPP" or "National Road Safety Partnership Program". This search yielded 31 pages of results, and all pages were visually examined for relevence.
Stakeholder survey	To explore the influence of the NRSPP on workplace safety outcomes, a secure survey was distributed to 111 key NRSPP stakeholders via Qualtrics. The survey included questions regarding key outcome indicators, stakeholder usage of NRSPP resources, and free-text responses. A total of 43 responses were recorded (response rate of 38.74%), however significantly less respondents (<25) answered all survey questions.
NRSPP Website	A search of the NRSPP website was undertaken to examine content it had published via its website. The search distinguished between content the NRSPP was involved in creating and externally-produced content disseminated by the program. This search yielded approximately 1790 results, and documents were examined according to resource type.
Digital analytics tools	WordPress and Google Analytics tracking information from the NRSPP's website was utilised to provide information on the program's user reach and activity. Statistics were collected based on the date period of August 2016 – August 2021. Social media follower counts were obtained directly from the relevant channels.

Results

Immediate outcomes

Between 2014 and 2021, the NRSPP has demonstrated notable program membership growth, with the number of program partners increasing from 23 in 2014 to 189 in 2021 and the number of working group members increasing from 16 in 2014 to 94 in 2021. The program demonstrated strong growth in social media followers (from a cumulative following of 32 in 2013 to 2,677 in 2021) and annual website users (from 3,468 in 2016 to 84,002 in 2021).

The NRSPP has engaged in producing, advancing, and disseminating knowledge, hosting >1,785 road safety resources on its website. Almost all knowledge creation content has demonstrated strong cumulative growth (e.g. the number of Quick Fact's increasing from one in 2014 to 71 in 2021).

Intermediate outcomes

The NRSPP has consistently influenced government, external influencers, and workplace parties. This was demonstrated through reference to the program in materials such as government strategy and action plans, external influencer submissions to government, and workplace policy documents and survey responses (indicating industry use of the NRSPP for education and awareness-raising, self-learning, and training purposes). Some evidence demonstrates the program's influence on the scientific community, demonstrated through reference in scientific reports. Program director Jerome Carslake has been widely recognised as a subject matter expert, and reference to the program in external media has demonstrated strong growth.

Final outcomes

50% of respondents indicated the NRSPP assisted them in improving employee safety knowledge, workplace safety culture, and integrating safety good practices into day-to-day operations. There was also evidence to suggest the NRSPP helped organisations introduce improved procedures, reduce workplace crashes and reduce compensation claims.

Qualitative feedback indicated that a significant benefit of program membership was access to a network of industry experts and previously unavailable support services and resources.

Conclusions

The evaluation findings provide compelling support for the impact of the NRSPP on workplace road safety. Future strategic directions of the program, informed by evaluation findings and identified areas of improvement, will be discussed.

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Motorists' Use of Facebook to Avoid Roadside Drug Testing Locations

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Abstract

This study explored the use of Facebook police location sites among a sample of 890 drug takers in Queensland, aged between 16 and 75 years (M = 27.41, SD = 13.32). One-quarter of the sample reported using Facebook police location sites, and 43% of these participants reported using them for the purpose of avoiding RDT. When comparing those who used the sites (for any reason) and those who did not use them, the former group reported significantly greater disordered drug use. Compared to those who used police location communities, but not for avoiding RDT, those who did use these sites to avoid RDT reported greater past offending and future offending intentions, greater disordered drug use and perceived the sites to be more accurate. The results suggest that how motorists use these sites is more important than whether they use them or not.

Background

Groups and pages now exist on Facebook where users can share the locations of police traffic operations (Wood & Thompson, 2018) such as Roadside Drug Testing (RDT), making it possible for offenders to see the police before the police see them. Several of these Facebook communities exist in Australia (Wood & Thomspon, 2018), however, much remains unknown with regard to how these sites are used and if they influence offending behaviour.

Method

To investigate this, a questionnaire was developed to assess the use of Facebook police location sites among drug users. Participants were recruited through Facebook and completed an online survey. To be eligible, participants had to be 16 years or older, have a Queensland drivers' licence (or be disqualified) and have consumed at least one of the three drugs tested for through RDT (MDMA, marijuana and/or methamphetamines) in the previous 12 months. Items in the questionnaire assessed the use of police location sites, frequency of drug use, drug driving behaviours and perceptions of apprehension certainty.

Results

Participants were aged between 16 and 75 years (M = 27.41, SD = 13.32), comprising of 532 males, 350 females and 8 people who reported an "other" gender. Over half the sample (58.5%) reported drug driving at least once in the previous 12 months. A quarter of participants reported using Facebook for police location information (N = 219), with 43% (N = 94) reporting using the sites to avoid RDT. Other reasons for using these sites included to avoid Random Breath Testing (N = 75), speed cameras (N = 99), mobile phone cameras (N = 49) and for traffic updates (N = 65). Independent samples t-tests revealed that compared to those who used police location sites, but not for avoiding RDT, those who used the sites for avoiding RDT reported a greater extent of disordered drug use, a greater extent of past drug driving and greater intentions to offend in the future, and perceived Facebook police location sites to be more accurate and reliable. Table 1 displays the means and standard deviations for these items, and *p*-values from the t-tests. Certainty of apprehension perceptions did not differ between these groups. Independent samples t-tests were also conducted to explore differences between those who used police location communities and those who did not use them. The only significant difference was identified for disordered drug use, with a slightly greater score reported by police location users (M = 14) than non-users (M = 12), $p = .004$.

Table 1. *Independent samples t-test, between PLC users who do and do not use the sites to avoid RDT*

Variable	*M*	*SD*	*p*
Past offending			
Avoid RDT	75.39	125.65	.036
No Avoid RDT	31.14	81.74	
Disordered drug use identification scale			
Avoid RDT	16.93	10.04	< .001
No Avoid RDT	11.82	8.58	
Future offending intentions			
Avoid RDT	2.65	1.57	< .001
No Avoid RDT	3.44	1.43	
Effectiveness of PLC to avoid detection			
Avoid RDT	5.57	2.52	<.001
No Avoid RDT	4.26	2.67	
Accuracy/reliability of PLC			
Avoid RDT	6.57	2.12	<.001
No Avoid RDT	5.20	2.36	

Conclusion

The results suggest that Facebook police location sites are being used by some drivers for the purpose of avoiding detection for drug driving. However, not all police location users were interested in avoiding roadside drug testing, and it appears that *how* motorists use these sites is more important than *if* they use them. Future research should explore the use of these sites further.

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Lessons from Implementing Road to Zero Infrastructure in New Zealand

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Abstract

Road to Zero (RtZ) is New Zealand's road safety strategy and aims to reduce Deaths and Serious Injuries (DSIs) by 40% by 2030, from 2018 levels. The RtZ Speed and Infrastructure Programme (SIP) was tasked to develop, design and deliver speed management and proven safety infrastructure interventions to help achieve approximately half of this target. Several challenges, successes and lessons have been learnt by SIP as part of the journey thus far including developing a deliverable programme, attaining funding for SIP projects and then implementing projects on a constrained network.

Background

The Road to Zero Speed and Infrastructure Programme (RtZ SIP) has systematically developed a 10-year programme of proven interventions which has already begun delivery, and will continue through until mid-2030. A number of successes and challenges have been encountered on the journey from developing a programme, attaining funding for projects within the programme and then moving into design and delivery.

Programme Development

Creating a balanced programme

The RtZ SIP is underpinned by a strategic model which identified a mix of high-level interventions which ranged from primary safe system transformation to supporting safe system treatments. The mix of interventions was developed in order to support a balanced programme which achieved some quick-wins, and also longer term transformative safety improvements.

Translating strategy into reality

The approach to developing a programme which was derived from a "top-down" strategic model will be presented outlining the process and highlighting various opportunities and challenges.

Investment Assurance

Programme approach to funding

The SIP Programme Business Case (PBC) was developed in order to justify investment in the SIP programme at a programme level, whereby individual projects could then be delivered under the SIP programme without further assessment. Inherently, this was to allow a programme approach to delivery that remained nimble.

In practice, the PBC has helped to achieve some streamlining of funding individual projects, however the programme funding approach has not been fully utilised and some elements of individual assessment remain when a new project is submitted for funding by SIP.

Benefit-Cost Ratio Analysis

A historical issue with calculating benefit-cost ratios for safety projects is that monetised travel time disbenefits often outweigh safety benefits, resulting in a low or negative BCR, even at high-risk corridors and intersections.

The approach taken to alleviate this issue was to use a 'do minimum' safety state as a comparator when assessing the BCR for a safety intervention. The 'do minimum' states adopted were the Safe and Appropriate Speed for corridors and the Safe System Speed for intersections.

Streamlining Investment Applications

The Standard Safety Intervention Toolkit (Waka Kotahi, 2021) is a document which outlines a series of well-researched and proven safety interventions which, if a series of criteria are satisfied at a particular site, qualify for a streamlined investment pathway

Implementation

Primary Safe System Interventions

There are challenges being faced with maintaining outputs throughout all stages of project planning. Championing innovation and cost-effective approaches in the coming years is going to be key in increasing rollout of proven primary safe system intervention, in particular median barrier, roundabouts and raised safety platforms.

Safer Corridors

Safer Corridors refers to a safety philosophy which is generally accepted to be wide centreline with roadside barrier installations at all high-risk locations. While a small number of Safer Corridor sections were identified by the RtZ Strategic model, in practice most corridor projects have been progressed as either partial or full transformative projects (median barrier) or lower cost supporting safe system projects (safety management) that do not necessarily install wide centreline.

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Using Virtual Reality to Guide Vulnerable Road Users Stakeholder Engagement

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Aurecon NZ LTD

Abstract

The school engagements originated out of an existing partnership programme with Te Wharekura O Mauao. Tauranga City Council (TCC) Travel Safe Team valued the digital medium used to engage students and therefore wanted to extend the engagements to schools which will be impacted by the Cameron Road multimodel upgrade which is currently under construction. The target audience for these sessions are the school's local road safety team. These sessions will provide them with the opportunity to virtually 'walk' the upgraded environment which will allow them to understand the safety benefits they will experience, help convey the message, assist in preparing the school for the pattern changes and gain the most out of the improvements. Due to Covid constraints, the remainder of the sessions will be continued in Term 2. The value of these sessions can be further investigated during the opening weeks of the upgraded road.

Background, Purpose of Policy (and/or Project), Description of Policy (and/or Project), Evaluation and Effectiveness (or Lessons Learned), Conclusions, Implications and Next Steps

The project originated as part of the tutoring and mentorship partnership Aurecon has with Te Wharekura O Mauao. As part of one of the engineering activities the emerging professionals had with the Year 9 students, the students were given the opportunity to experience the virtual reality (VR) model for Cameron Road multimodal upgrade which is a significant upgrade that TCC has undertaken. The upgrade will include new bus lanes along the major arterial as well as a separated bi-directional cycle-lane.

The output of the session was shared with TCC who wanted to extend the experience to include all schools that will be affected by the proposed upgrade. The intention is to provide the local school's road safety team with the opportunity to experience the changing road environment virtually ahead of the completion of work. In the school locations, bus stops will be relocated and new signalized pedestrian crossings will be provided which will alter local school patterns.

By providing the school's local road safety team the opportunity to 'walk' the completed street environments, they could get a clear understanding of what will be changing and what the final product will look like. They will understand the safety upgrades made within their immediate environment and will be briefed how these facilities are meant to operate in advance of construction completion. This will allow the team to plan how they will address the pattern shift prior to construction opening as well as to educate the rest of the school and what they should be aware of.

This stakeholder engagement brings the future of digital into the space of road safety and improves how businesses can reach out to the community. This allows the stakeholder of vulnerable road users to preempt pattern change as well as ensure they optimise the safety improvements at their specific location.

These sessions have not come without their challenges, especially during Covid which saw limited numbers in offices as well as strict health and safety measures required to work with school children. Due to these challenges and the current restrictions during the peak of the Omicron outbreak, sessions were postponed to Term 2 of 2022 and will include Tauranga Primary School, Tauranga Intermediate School, and Tauranga Boys College. Additional lessons learned from the previous sessions with Te Wharekura O Mauao is related to keeping the students engaged with a related activity while they wait their turn for the VR session. This will allow the students to be fully engaged during the session and not to run off topic during their time with the VR model.

These sessions have been deemed valuable by stakeholders who have experienced the model, especially TCC's Travel Safety Team who initiated these school sessions. The value of these sessions can be further investigated during the opening weeks of the upgraded road. The ease of pattern changes can be monitored as well as the investigation into the school's preparedness as they have had the opportunity to virtually run through the upgraded environment.

Figure 1. VR session with Te Wharekura O Mauao

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Saving lives through safer speeds

Hayden Trumper and Sarah-Lee Crellin

Beca Limited

Abstract

Waka Kotahi is seeking to reduce deaths and serious injury on its roads by reviewing speeds across the road network, as part of its Road to Zero policy. The programme divides the road network up into a number of corridors, which are individually assessed against technical criteria that support safe speeds. Outcomes from the safe speed assessments have been captured in feasibility assessments for these road corridors, and now the team are implementing detailed designs for many new safer speed locations in Northland and West Waikato. These corridors are to be consulted with local communities, and implementation is expected to commence once communities have had their say. This presentation looks at the process, lessons learned, and expected outcomes from this key safety programme.

Background, Purpose of Policy (and/or Project), Description of Policy (and/or Project), Evaluation and Effectiveness (or Lessons Learned), Conclusions, Implications and Next Steps

Waka Kotahi NZ Transport Agency is seeking to reduce deaths and serious injury on its roads by updating and rationalising speed limits across the road network, as part of its Road to Zero policy. The programme assesses a number of State Highway corridors around New Zealand which are individually assessed against technical and practical considerations to provide safe and consistent speed limits. As part of this project, the team either assessed the technical and practical considerations or aided in the engagement, consultation and design of proposed speed limit changes for approximately 1,300 km of New Zealand's State Highway.

The technical and practical considerations include a technical review of the Safe and Appropriate Speed for the sections of the road. This includes an assessment of road stereotype, alignment, road widths, roadside hazards, traffic volumes, vehicle access and safety risk metrics on the each section of road to determine the Safe and Appropriate Speed. Feasibility Assessments of the infrastructure required to implement the speed limit changes were also undertaken based on site observations and an assessment of constraints present at each location. Community engagement and consultation is one of the key challenges when changing speed limits as this often requires a change in mindset from the community, particularly when proposing changes to the open road speed limit. In order to facilitate this change in mindset, it is critical to talk to the right people at the right time. However, within the current environment, it is difficult for speed limit changes to cut through the noise of other issues. This makes it difficult for people to engage and for community safety champions to lend their voice to speed limit changes. The engagement process often includes helping the community connect the dots between speed limit reviews and other safety improvements to present a holistic picture of safety to the community.

This presentation looks into the process for assessing the technical Safe and Appropriate Speed and key considerations required for determining the feasibility for implementing speed limit changes. There is an exploration of impacts of community engagement and consultation on the success of speed limit changes as well as trends from community engagement and consultation from various speed limit reviews undertaken around New Zealand as part of this programme. This presentation will share the lessons learnt as part of these speed limit reviews to help attendees with their future speed limit reviews.

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Queensland Automated Enforcement: Changing Behaviour Today, Saving Lives Tomorrow

Alexander Jannink

Managing Director Acusensus Limited

Abstract

In July 2021, the Queensland Government and technology partner, Acusensus commenced the world's first automated seatbelt and mobile phone enforcement program utilising Artificial Intelligence. With more than 6,000 million vehicle images captured by the program per month, this whitepaper presents contemporary road safety data at a scale not previously available. Seatbelts represent a +50-year enforcement challenge, whereas mobile phones & smart watches are a more recent Road Safety issue. The data collected over the past 12 months through the Queensland program, and the capacity to change driver behaviour and compliance, represents one of the strongest cues to saving lives tomorrow. As an Australasian project with global implications for road safety, this program is an international first and is presented at the Australasian Road Safety Conference for the first time.

Queensland Government Automated Seatbelt Enforcement: Changing Behaviours Toady, Saving Lives Tomorrow

Despite decades of evidence that you are "10 times more likely to be killed or injured in an accident when failing to wear a seatbelt"[1] and the broad acknowledgement of the detrimental effect of mobile phone use on road safety, the Queensland Government identified a disturbing trend across the State;

- In 2020, 43 people who died in crashes in Queensland weren't wearing a seatbelt, 14 more than in 2019 and 15 more than the previous five-year average,
- On average, 29 people were being killed and more than a thousand others were seriously injured every year on Queensland roads due to driver distraction, specifically the illegal use of mobile phones. Overall, Driver distraction contributed to almost 20 per cent of serious injuries and 12 per cent of all lives lost on Queensland roads and
- Two-thirds of Queenslanders admitted to using their mobile phones illegally while driving ("Phone/seatbelt cameras out to catch drivers anywhere ...")2

Conceiving a solution to historic and contemporary Road Safety Problems

The prevalence of Distracted Driving & a lack of seatbelt compliance identified by the Queensland Government motivated a significant departure from traditional policing methods. The Queensland Transport and Main Roads (TMR) Minster Mark Bailey outlined the intention to use technology to increase road network enforcement coverage without taxing police resources stating "drivers should expect to be caught anywhere, anytime, whether they're driving in the city or on a regional highway."

Being the first globally to pursue technology to automatically enforce distraction and seatbelt compliance, the Queensland Police Service (QPS) and TMR evaluated the market and selected the Acusensus "Heads-Up" solution to conduct a roadside trial to validate:

- **Image Quality:** 12MP images of each vehicle, without motion blur and distortion via high performance sensor technology that is unaffected by darkness or sun glare,
- **Automation Accuracy:** AI recognition system that minimizes false positives while ensuring no true offences are discarded,
- **Privacy Controls:** The use of image distortion, cropping and other privacy protections
- **Evidence Chain:** encrypted and signed traceable packages from the camera onward.

The trial was conducted from July to December 2020 and was deemed a success with more than 15,000 people detected illegally using a mobile phone and more than 2200 not wearing a seatbelt. Following the trial legislative changes, technology accreditation and compliance processes required for maximum prosecutability were developed and approved.

On July 26th, 2021, Queensland Transport and Main Roads Minister Mark Bailey launched the automated enforcement program with a public awareness and education program by describing distracted driving as a silent killer on the state's roads, likening it to drink driving. Minister Bailey stated that, "using a mobile phone while driving has the same impact as getting behind the wheel with a blood alcohol reading between 0.07 and 0.10."

As part of the education program, a three-month grace period was extended to drivers, with those caught on camera using their phone were notified and made aware they had been caught, but not fined.

At the conclusion of the 3-month introduction period, drivers caught by the cameras received an AUD$1033 fine and four demerit points. Driver and front seat passengers not wearing their seatbelts were also enforced from this point in time.

The Impact on today and tomorrow of the World's First Automated Seatbelt Enforcement Program

The Queensland Department of Transport and Main Roads issued 21,599 warning letters between July 26 and October 16, which, had there not been a grace period for fines, would have resulted in more than $20 million in fines. The vast majority of these letters – 84 per cent – were for mobile phone use. ("Queensland's permanent phone detection cameras are online ...")3 During the corresponding period the Queensland rolling fatality average declined from 101 in August to 97 deaths (see figure 1).

When the Acusensus "Heads-Up" fleet of cameras used to monitor mobile phone and seatbelt use in Queensland were switched on for live enforcement on November 1, 2021 the fatality rate fell to 91 and has remained below the Australian rolling average since the program's inception.

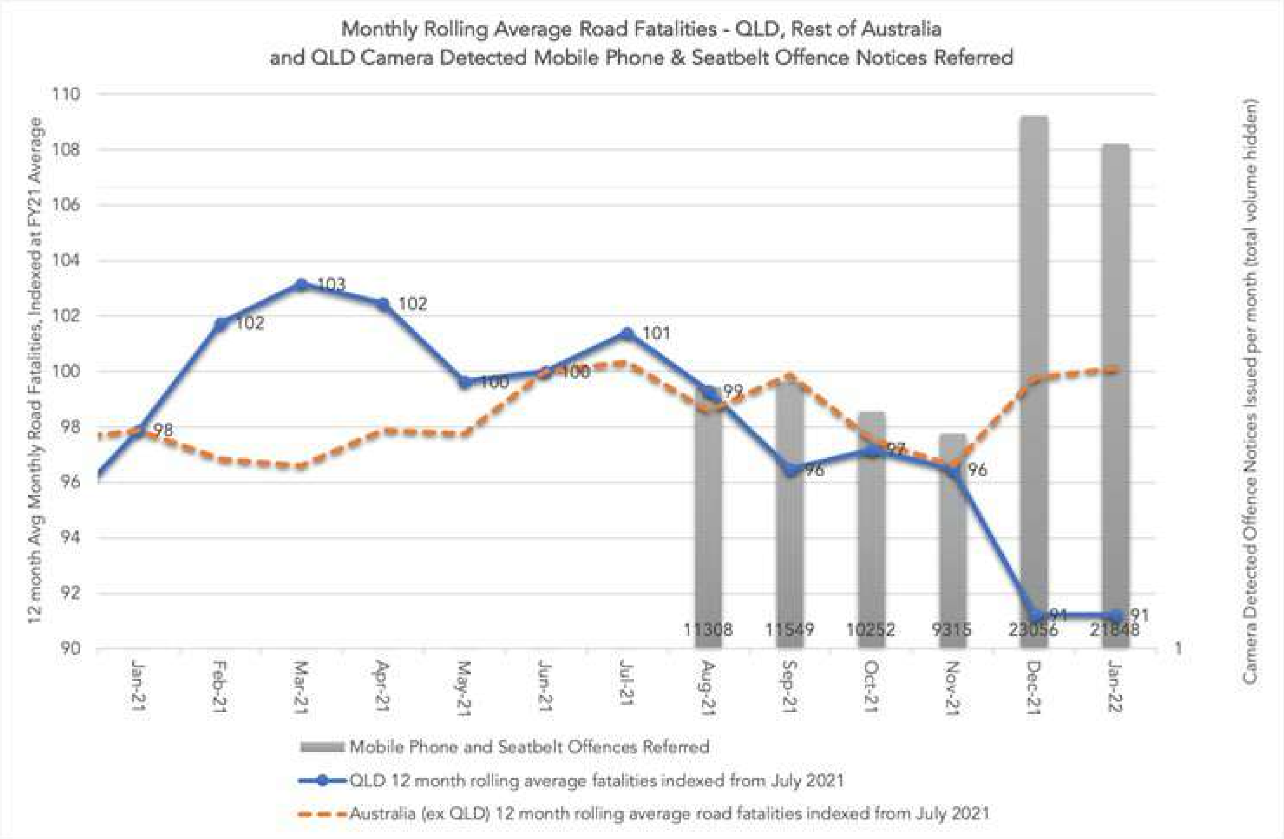

Figure 1. Relationship between Offences Referred, Fatalities in the State of Queensland compared to Australia, 1/7/21-31/1/22)

Enforcement equals Behavioural Change?

The Queensland Seatbelt and Distracted Driving and the New South Wales (NSW) Mobile Phone Detection programs provide a compelling argument for automated enforcement.

Since the NSW Mobile Phone Detection Camera Program started two years ago, there has been a 22 per cent reduction in Road deaths on the two years prior. This equates to 83 people alive today that would not be, based on past trends.

Over the last two years, there has been a decline in camera detected mobile phone offences in NSW, with the offending rate falling from 1 in 82 drivers during the pilot period in 2019 (1.2 per cent) to 1 in 478 drivers by the end of October 2021 (0.21 per cent).

A similar pattern can be identified in Queensland (Figure 2) where the inverse relationship between vehicles monitored and the distracted driving offence rate is observed over the 7 months to January 2022.

An effective enforcement program requires community support via education and awareness to ensure success and acceptance. However, the impact of enforcement in an anytime-anywhere context clearly has a material impact on driver behaviour today and a track record that promises lives saved tomorrow.

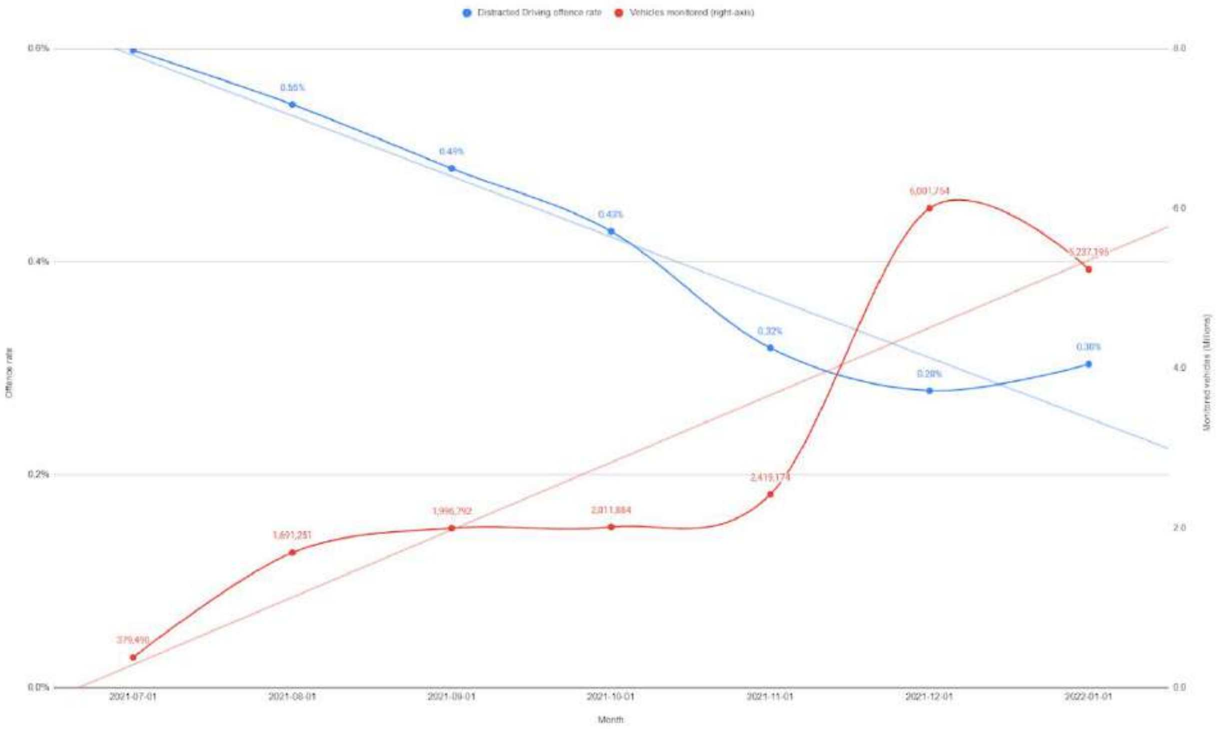

Figure 2. Relationship between Vehicles Monitored and the Distracted Driving Offence Rate (State of Queensland, 1/7/21-31/1/22)

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3. Queensland's permanent phone detection cameras are online" ABC News (July 2021)

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Low-Cost Urban Road Safety Program, Western Australia

Ryszard Gorell[a], Adam Wilmot [a], Ian Thompson[b], Jerko Ostoic[b]

[a]GHD Pty Ltd, [b]Main Roads Western Australia

Abstract

The goal of the Urban Road Safety Program (URSP) is to reduce road trauma on Perth's local road network, by implementing low-cost road safety treatments targeting high-casualty or high-risk locations on a whole of street or area-wide basis. Using higher order roads as boundaries, the Perth Metropolitan area was divided into 647 local neighbourhoods. Each was assigned two metrics; Casualty Crash Bias (a measure of whether an individual neighbourhood has more casualty crashes than expected given the layout of its roads and intersections) and Activity Attribute (based on amenities, providing a measure of Vulnerable Road User (VRU) interaction). These metrics were combined and the highest ranked neighbourhoods targeted for treatment. A geospatial data analytics platform, Low-Cost Treatment strategy and implementation Framework document have been developed to support the program. In collaboration with Local Government Authorities (LGAs), the program has progressed from a initial pilot to a multi-year fully-funded program.

Background

Local roads and intersections represent a substantial proportion of all crash risks, including fatalities and crashes causing serious injury. In the five-year period 2015 to 2019 inclusive, crashes resulted in injuries at over 4,500 of the 51,000 intersections within the Perth metropolitan area. (Source: Main Roads Verified Crash Data) Over 3,500 of these crash sites are intersections under local government control, with the majority not meeting criteria for upgrade funding under either WA's current road safety programs or Federal Black-spot programs.

Implementation

To address the above crash risk, Main Roads Western Australia required a methodical approach that could prioritise investment to urban areas with objectively higher casualty crash risk, with investment decisions based on data, not judgement.

Local neighbourhood selection and ranking

Having divided the Perth Metropolitan area into 647 local neighbourhoods, the likelihood of casualty crashes within each was determined through consideration of their network features. The casualty crash likelihood was then compared with the actual number of casualty crashes. Local neighbourhoods with a higher number of casualty crashes than expected were determined to have a high Casualty Crash Bias.

To account for potential VRU (pedestrian and cyclist) interaction with other vehicles, an Activity Attribute was also devised to prioritise neighbourhoods based on amenities such as schools, shops, local parks and bus stops.

For each local neighbourhood, the Casualty Crash Bias and Activity Attribute were combined to determine a rank, with the highest ranking local neighbourhoods targeted for investment.

Treatment development and consultation

Main Roads worked collaboratively with LGAs to ensure road safety treatments for a chosen local neighborhood aligned with community priorities. Low Cost Treatment Guides and community consultation materials, developed for URSP and incorporated in a Framework document, facilitated this process.

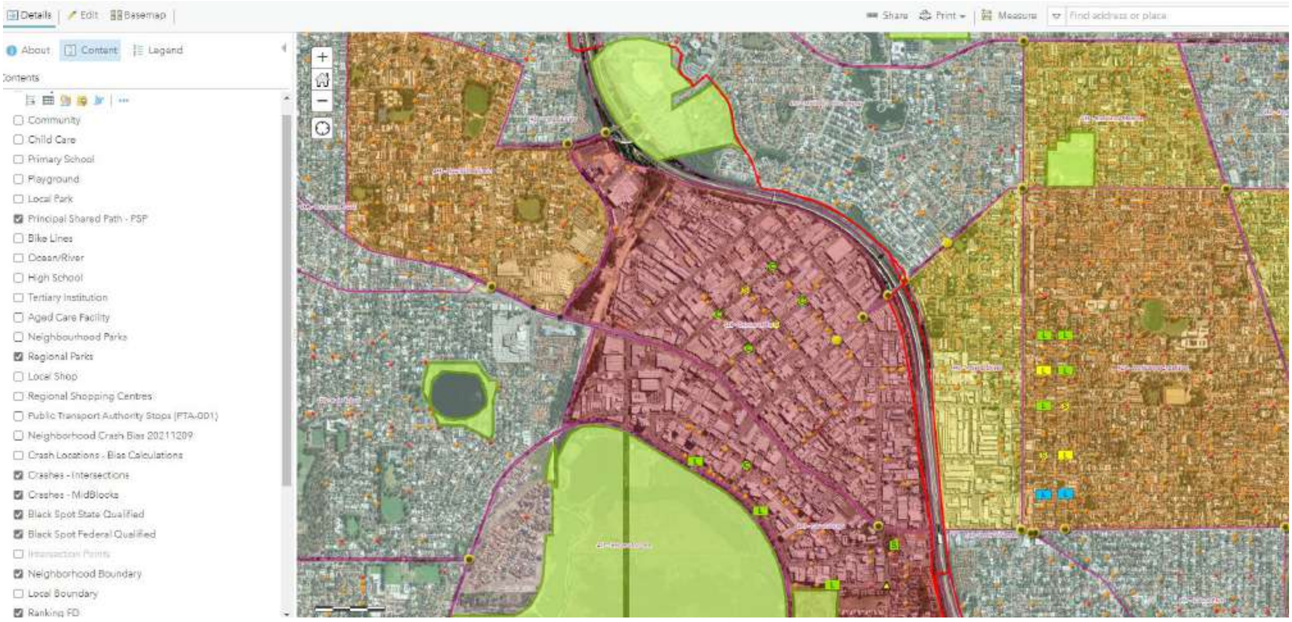
Design, construction and feedback

Main Roads and LGA's work collaboratively to amend standard drawings and template designs to suit specific site requirements. Feedback and lessons learned are incorporated as part of the annual review of the URSP to ensure implementation of effective low-cost road safety treatments.

Analytics Platform

The URSP geospatial data analytics platform enables Main Roads to objectively identify where the greatest risk of road trauma exists in the Perth metropolitan area.

The platform uses data sets including network topology, asset records, speed zone, land use, crash records, and population data to assess road casualty rates associated with various features of local road networks. The platform displays each local neighbourhood and its ranking, as well as supplementary information such as crash locations, Casual Crash Bias, casualty crash frequency and Activity Attribute.



☐ Community
☐ Child Care
☐ Primary School
☐ Playground
☐ Local Park
☑ Principal Shared Path - PSP
☐ Bike Lines
☐ Ocean/River
☐ High School
☐ Tertiary Institution
☐ Aged Care Facility
☐ Neighbourhood Parks
☑ Regional Parks
☐ Local Shop
☐ Regional Shopping Centres
☐ Public Transport Authority Stops (PTA-001)
☐ Neighborhood Crash Bias 20211209
☐ Crash Locations - Bias Calculations
☑ Crashes - Intersections
☑ Crashes - MidBlocks
☑ Black Spot State Qualified
☑ Black Spot Federal Qualified
☐ Intersection Points
☑ Neighborhood Boundary
☐ Local Boundary
☑ Ranking FD

Figure 1. Analytics Platform

Outcome

The pilot phase of the program included installation of mini and compact roundabouts and raised safety platform treatments at 19 intersections throughout Joondanna, Osborne Park and North Perth in collaboration with the City of Stirling and City of Vincent.

Future areas, including midblock sites, have been identified and approved for implementation in several other local government areas. Over the next four years the program will continue to roll-out treatments to reduce road trauma across the local road network.

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Medicinal Cannabis and Driving: Managing Usage and Enforcement Avoidance Behaviours

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Abstract

A range of medicinal cannabis products are currently legally prescribed for various medical issues. There is considerable academic and political debate regarding the 'ethical' nature of current drug driving legislation for individuals prescribed medicinal cannabis in Australia. Exploratory qualitative research investigated medicinal cannabis users' knowledge and perceptions regarding managing cannabis usage and legislation associated with drug driving. Heavy users reported limited driving impairment compared to new/irregular users of medicinal cannabis. Users also managed consumption and driving, at times, minimizing potential impairing effects or police enforcement. Further, limited notification of the potential impairing effects of cannabis or related drug driving legislation were provided by doctors including the presence of warning labels on products. Further research is required to assess the level of impairment of various user groups, especially identifying factors associated with high-risk groups (i.e., new/irregular users) or driving situations, as well as inform future drug driving legislation.

Background

A range of legal cannabis related products have become available for prescription and treatment of specific medical conditions (Therapeutic Goods Administration, 2021). Many products contain high concentrations of the psychoactive compound THC, which can impair psychomotor control (Desrosiers et al., 2015; Armentano et al., 2013) and increase the risk of a road traffic crash (Rogeberg, 2019). This project aimed to explore medicinal cannabis users' perceptions regarding drug driving legislation, managing consumption, avoiding enforcement and driving while impaired.

Method

Utilizing a qualitative approach (Braun and Clarke 2006; 2019), a thematic analysis was undertaken via a series of individual semi-structured telephone interviews ($N = 59$). Participants were recruited using Facebook advertising, were aged between 19-73 years (M = 42.46, SD = 14.02), male (n = 41, 69.5%) and unemployed (n = 32, 54%).

Results

Issues related to impairment

Regular/heavy users perceived no adverse driving impairment (see R1) and indicated their driving improved due to them feeling relaxed (e.g., devoid of aggression) and travelling at slower speeds. First time or irregular users indicated impairment and would not drive.

Knowledge of medicinal cannabis and driving legislation

Most participants were aware of the zero tolerance approach taken by Police for individuals driving with cannabis detected in their saliva (R2). However, some believed their prescription legally allowed them to drive and many were not aware of drug driving legislation. Participants needed to drive (e.g., food/groceries, children to school, and drive to work or doctors). Regional area participants suggested driving a vehicle was a necessity due to travel distances and lack of public transport. No warning labels were evident on cannabis products and limited information was provided by prescribing Doctors. Many were concerned by the lack of specificity surrounding drug driving laws and the detection of THC in their system (i.e., time cannabis is detectable within their saliva).

Managing consumption and driving

Medicinal cannabis was primarily used in the afternoons/evenings before driving the next day, thereby limiting any impairing effects and reducing the risk of aprehension (R3). Many heavy users would drive anytime, citing the lack of Police enforcement as the major reason for continued drug driving. Participants also indicated supplementation of medicinal cannabis with illegally obtained/black market cannabis due to the cost.

Police avoidance measures

The probability of being aprehended for drug driving was perceived as low (R4). Users travelled routes/roads not usually patrolled by Police (e.g., roadside drug testing). Participants also attempted to mask the presenece of cannabis, including mouthwash, breath/cough losenges (e.g., fisherman's friend), rinsing mouth with vinegar, bleach or peroxide, etc, before driving (R5).

Table 1. Medicinal cannabis user semi-structured interview responses

Response No.	**Participant Responses**
R1	*You'd call me a heavy user. If someone has never used this before, I would say 'Do Not Drive'. Its going to effect them alot more than what it would effect me, if that makes sense. You do have a tolerance to it.*
R2	*I've been told I'm not meant to drive for five days after my last dose, which makes trying to medicate and go about life impossible. I do require my licence, so its not something I can afford to lose. I don't drive intoxicated, I don't believe I am under the influence, but under laws, I definitely would fall under that.*
R3	*I generally take my medication in the evening prior to have to drive the next day ... don't know if I would test positive but at least I don't feel any effects.*
R4	*I'd say extremely unlikely. The chance you'd get pulled over are slim to nothing. It would take something like coming across a random drug test, or if you were doing some other illegal stuff, like speeding or driving erratically.*
R5	*I know people that are everyday smokers or smoked that day and got a drug test but tested negative. They ate a bunch of Fisherman's Friends before being tested, as long as you have that flavour in your mouth it will definitely mask the presence of cannabis.*

Conclusions

Research identified two different groups of medicinal cannabis users, namely heavy or new/irregular users. Although heavy users perceived limited impairing effects when driving, they were more likely to avoid enforcement or try to mask the presence of cannabis in their saliva. In contrast, new/irregular users were more likely to report impairment and limit their driving. This project suggests there is need for further research into high-risk concerns regarding medicinal cannabis and driving, including potential for policy/legislation changes.

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Effectiveness of anti-speeding messages on young drivers' speed management behaviour

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Abstract

This project aims to examine the effect of anti-speeding messages on young novice drivers' speed management behaviour. 30 provisionally licenced drivers, between 18 and 25 years of age will be randomly allocated to one of two groups (Control and Test Group). All participants will complete three drives in a computer-based driving simulator and two online surveys. The test group will complete simulation scenarios showing both speed limit signs and anti-speeding signs. While the control group will complete scenarios showing only speed limit signs. Quantitative data will be collected including mean speed, maximum speed, and percentage of time speeding. Different anti-speeding messages (performance, financial and safety implications of speeding) will be included to observe its effect in reducing young novice drivers' speeding behaviour. Qualitative data will be collected including the perceived effectiveness of anti-speeding messages, self-reported speeding behaviour and reasoning for drivers' speed choice.

Background

Speeding is the most common cause for road fatalities and hospitalisations every year. Studies have shown that speeding increases the risk and severity of road crashes (Aarts & van Schagen, 2006). Approximately 19% of Australian road fatalities in 2021, consisted of young novice drivers aged from 17 to 25 years old (Bureau of Infrastructure and Transport Research Economics, 2021). More concerted effort is needed to address the speed management problem for young drivers.

This study will further extend previous research conducted by (Molloy, Molesworth & Williamson, 2018), which examined the effectiveness of verbal feedback in reducing the speeding behaviour of young drivers. The results found that verbal feedback about the performance, financial and safety implications of speeding were more appealing for young drivers in reducing their mean speed and percentage of time speeding using a driving simulator.

This study is also based on research conducted by (Glendon & Walker, 2013), which investigated the effectiveness of anti-speeding messages on driver behaviour using a questionnaire. The results from the study indicated that messages which emphasised the safety consequences, were perceived as most effective by young drivers in reducing their speeding behaviour. In addition, a study conducted by (Glendon & Cernecca, 2003) indicated that anti-speeding messages were effective in reducing speeding behaviour in general.

This study is significant because no study has previously explored the quantitative effect of anti-speeding messages in reducing the speeding behaviour of young drivers. This study will provide valuable background in understanding the effectiveness of current speeding-related messages via anti-speeding road signs and provide recommendations regarding its effective utilisation.

Method

Participants will be randomly assigned and evenly split into the control group and the test group. Firstly, all participants will complete a demographics survey to obtain basic details such as age and driving history. The young drivers will then conduct three drives in a fixed-based, low fidelity driving simulator, placed in UNSW Sydney. These drives include the practice, baseline, and test drive and involve multiple speed zones (50 km/h, 60 km/h and 80 km/h). In the practice drive, all participants will be given five minutes to familiarise themselves with simulator controls. In the baseline drive, all participants will complete an 11km drive to test individual performance using the driving simulator. In the test drive, the test group will complete simulations showing both speed limit signs and anti-speeding signs, with messages about the performance, financial and safety implications of speeding. While the control group will complete simulations showing only speed limit signs. Quantitative data will be collected to gather the participant's mean speed, maximum speed, and percentage of time speeding in each speed zone. Finally, all participants will complete a post-drive survey to gather the perceived effectiveness of the anti-speeding messages, self-reported speeding behaviour and reasoning for drivers' speed choice.

Results

The study will be conducted according to the following timeline:

- UNSW ethical approval of research project: Granted on 10-March-2022
- Recruitment of Participants: March-April, 2022
- Data Collection: April-July, 2022
- Analysis of Data: July-September, 2022
- Publication of Research: November, 2022

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NZ TCD Manual: Getting it Right so Road Users Understand

Glenn Bunting[a], Steve Dejong[a], Mark Edwards[a], Simon James[b,] George Lane[b,] Robert Swears[b]

[a]Waka Kotahi NZ Transport Agency, [b]WSP NZ Limited

Abstract

The policy and practice of today may not be suitable for tomorrow, address existing issues with our road networks, or present consistent appropriate messages to road users so that safety is optimised and decision-making demands on road users are minimised. While practitioners in New Zealand have applied a reasonably consistent approach with the application of traffic control devices, that approach is not necessarily suitable for tomorrow. Two of the most important parts of the Traffic Control Devices (TCD) Manual are now complete or very close to completion. The paper describes development of Parts 4 and 5 of the Manual, which are the tools to be used by practitioners to provide clear and consistent guidance to road users for and between intersections. The authors have prepared an informative overview regarding the new parts of the Manual, and the technical background and complex process followed for their development.

Background

The Manual of Traffic Signs and Markings (MoTSaM) has been the primary reference source for practitioners to identify the most appropriate signs and markings to be used for guiding road users through road transport related networks. Although MoTSaM has been the “go to” source for approximately 25 years, it has not been updated recently and does not provide a comprehensive source of information to allow practitioners to determine the most appropriate manner in which to apply traffic control devices. The suite of TCD Manual documents is broader than signs and markings, however, the signs and markings most commonly used to guide road users through and between intersections are arguably the most important from a road safety and transport efficiency perspective. Parts 4 and 5 of the TCD Manual bring together a range of rules and guides and provide practitioners with the comprehensive source that has been needed.

Purpose of Policy

The purpose of the project is to provide practitioners with comprehensive, accurate, complementary information and guidance for appropriately combining traffic control devices for the road network. This will provide road users with clearer, safer, and more consistent information and guidance. The project also provides practitioners with absolute clarity regarding those traffic control devices they must use, and the manner in which the devices must be used, as well as information regarding the best practice approach, and optional applications that can be used.

The Land Transport Rule (Traffic Control Devices) 2004 (TCD Rule) defines the traffic control devices that can be used in New Zealand and the manner in which those devices must be used. MoTSaM did not always consistently and accurately reflect the requirements of the TCD Rule; this has resulted in some inconsistencies in the manner that TCDs have been installed on the road network, which in turn presents inconsistent messages to road users.

The “today” associated with MoTSaM, the various referenced other sources, and inconsistent application of traffic control devices by practitioners, results in potential adverse effects for road users from a safety and efficiency perspective. Parts 4 and 5 of the TCD Manual are the "tomorrow" that provide practitioners with current, clear, comprehensive, and consistent guidance.

Policy Development Process

The project broadly involved bringing various reference sources together into two complementary documents that specifically focus on traffic control devices for intersections and for locations between intersections. An industry working group was established to provide feedback on the draft documents before they were distributed to industry for broader feedback. Industry feedback was then incorporated into subsequent drafts that were further reviewed by the working group and ultimately by a TCD steering group tasked with making final decisions on matters of potential contention.

Conclusion

While it is easy to dismiss the importance of reference documents such as the TCD Manual, the reality is that these documents form the technical backbone of the solutions practitioners will create to instruct and guide road users of tomorrow.

TRAFFIC CONTROL DEVICES MANUAL

Part 4
Traffic Control Devices for General Use – for Intersections

Figure 1. Image of part of cover of TCD Manual Part 4

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Urban Street Speed Prediction

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Abley

Abstract

This research explores how street design influences driver behaviour to evaluate the feasibility of developing a speed prediction model for urban streets. The literature review phase of this research showed that there is a gap in design guidance on how design elements affect operating speeds. Being able to predict the operating speed for a street design would be a very useful tool for transport practitioners to achieve safe and appropriate speeds through design. Findings from this research indicated that developing such a model will be challenging due to the significant impacts human behaviour has on speed choice. The behavioural aspect of speed choice is difficult to quantify and implement in a mathematical model. Additionally, combinations of design elements have different impacts on operating speed. Quantifying these also poses a major challenge. Therefore, more research is required to create a robust speed prediction model.

Background

There is a well-established relationship between speed and crash severity. Often, lower speed limits are imposed as a method of speed reduction. However, this often does not work due to the speed not reflecting the street design appropriately.

This research explores how urban street design influences traffic speeds to evaluate the feasibility of developing a speed prediction model. Transport practitioners have the opportunity to design streets that reflect safe and appropriate speeds. Such a model will be useful for this.

Method

This research involved a literature review, desktop data collection and analysis, and site visits to collect speed data for case studies.

The literature review included local and international design guidance and research. This phase aimed to determine what information was available on how design elements affect traffic operating speeds and whether these are communicated to practitioners in guidance.

Christchurch, New Zealand was used as the sample urban area for this research as there was good traffic volume and speed data available for the city. Christchurch has generally flat topography, therefore, gradient could be ignored. 85th percentile speeds were obtained from Christchurch City Council's Links Traffic Count Dashboard for 79 streets. Canterbury Maps, Google Maps Street Viewer, and local knowledge were used to collect information on the design of these streets. The data were analysed manually on Excel as the data had to be filtered such that as many variables as possible could be controlled.

Additional streets were visited to take speed measurements and observations to develop in-depth case studies. Colombo Street North, Trafalgar Street, and Hereford Street were visited for this purpose.

Results

Some key findings from the literature review were:

- Drivers choose their speed based on road and roadside characteristics.
- There is generally a lack of homogeneity in street design and discrepancies between the streets design and function. This can lead to drivers choosing inappropriate speeds.
- Vertical deflection devices are effective at reducing 85th percentile speeds but their effectiveness depends on their profile and spacing.
- Combined horizontal and vertical speed calming devices are more effective than just horizontal or vertical devices.
- There is a lack of literature regarding the impact of traffic lane width and cycle facilities on traffic speeds.

Some key findings from the desktop analysis were:

- The length of uninterrupted straight sections influences operating speeds on streets with and without traffic calming devices
- The absence of centre lines and edge lines result in faster speeds on wider streets, and slower speeds on narrower streets when there are no traffic calming devices.
- The impact of traffic lane width and the presence of cycle facilities on operating speeds could not be determined.
- Parking occupancy has some impact on operating speeds by generating some side friction – particularly on narrower streets.

Conclusions

The results of this research indicate that there are aspects of street design that influence operating speeds. However, more research is required to establish robust relationships between them to then develop a useful mathematical model. The impact of human behaviour on operating speeds appears to be significant.

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Influencing projects for safe system outcomes – Safe system framework assessments

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Abstract

Reviewing a project under a safe system lens is essential at the outset, and throughout a project lifecycle, to maximise the potential for road safety. Often projects are focused within the constraints of the current road corridor where there are competing requirements. Maintaining access to property and parking as well as serving the needs of walking, cycling, buses and freight can result in unintended consequences for road safety. While a setting a project philosophy up front can help with direction, as a project evolves through the design process, safety benefits can be eroded or reversed due to meeting other project objectives. It is important that the road safety consequences of project evolution are recognised and quantified to enable these to be mitigated. This paper explores the benefits and limitations of using the Safe System Assessment Framework gained over a range of projects.

Background

Applying a Safe System philosophy from an engineering perspective is relatively straight forward in theory, we reduce conflicts, separate users and manage speeds to tolerable levels. However, in practice road safety is not always the primary project objective. Within a business case there may be dozens of options which will be subject to a multi-criteria assessment before a short list of options are determined for more detailed consideration. It may be that none of the primary investment objectives are safety focussed, but at this point projects can be still be influenced effectively towards safe system conditions. Historically we may have relied on crash prediction models for different road stereotypes and speed environments and used research and other crash reduction factors to adjust for various project elements. Often there is an absence of data, (pedestrian crossing counts for example are seldomly available) or a lack of detail at optioneering stage to sufficiently model the crash risk. We also have new challenges such as how to model effects of mode shift. Unlike crash prediction modelling, the Safe System Assessment Framework enables project options to be easily compared and understood at the optioneering stage and can be used throughout the design evolution process.

Common challenges

There are some common challenges which present themselves with the desire for more active travel and public transport. Typically these will require reallocation of road space to provide separate facilities and provide an efficient as well as safe journey to encourage uptake. However, these can increase risks elsewhere, an example would be the addition of bus priority lanes which increase the road width, number of lanes and introduce masking of vehicles which make it less safe for pedestrians to cross the road or the risk of a vehicle in a right angle crash at an intersection. Separate cycle facilities for cyclists may be ideal for commuting but can present a hazard for pedestrians at crossing points and bus stops. Roundabouts are a safe system silver bullet, they manage impact angles and crash forces but can be problematic for cyclists.

Identifying these risks and quantifying these using the SSAF at an early stage, allows us to both understand the effect of compromises and also to identify mitigations.

Changing the conversation

Climate change, health, congestion, new transport modes such as e-mobility and a desire for more liveable cities all contribute to a significant change to way we use our transport networks both now but more so in the future. Traditional methods of solely identifying a site specific crash problem are likely to ignore risks that have not yet eventuated in injury and may not contribute to a future safe system environment. The use of safe system assessments is fundamental to lifting thinking above this to keep pushing towards vision zero. This paper outlines examples using safe system assessments to influence project outcomes and lift safety outcomes and also shows how safe system scores can be improved whilst achieving other project objectives.

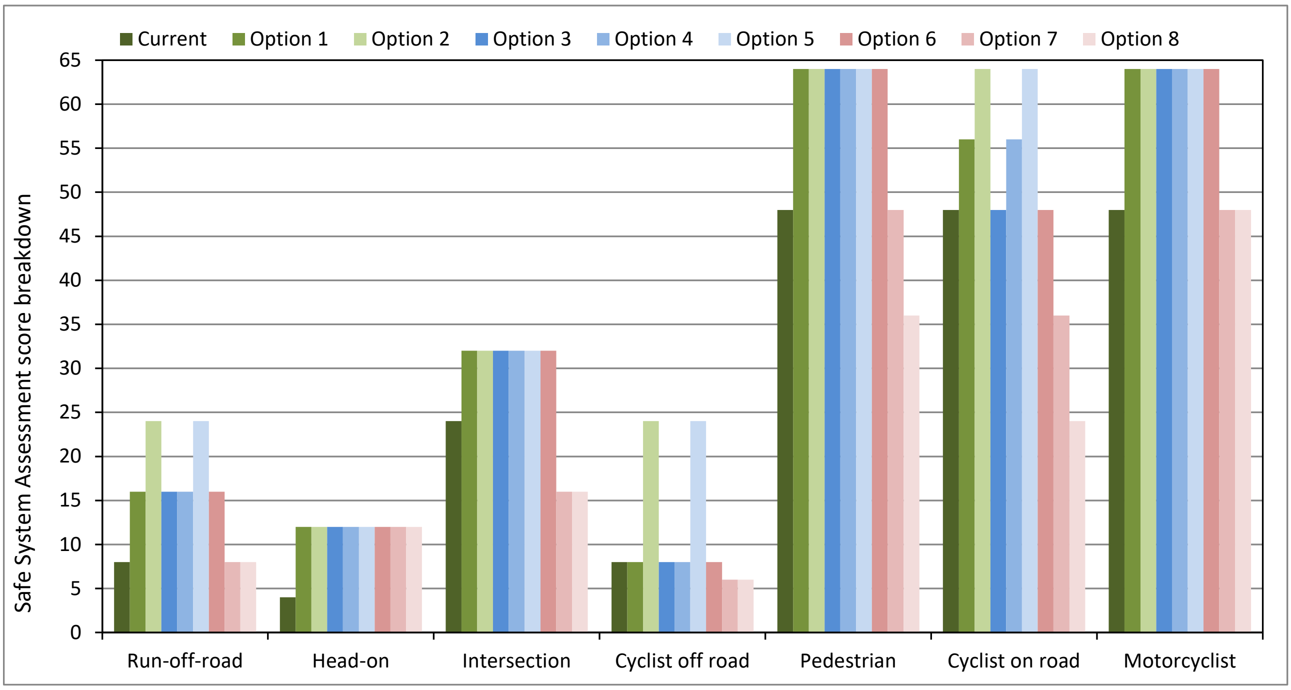

Figure 1. Option Comparison of Safe System Scores

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Examining NCAP distraction behaviours in a naturalistic driving dataset

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Abstract

New Car Assessment Program (NCAP) agencies are set to award points for driver monitoring technology that detects three types of distraction behaviours. The prevalence of these behaviours according to the NCAP definitions has not yet been closely examined in everyday driving. Therefore, a naturalistic dataset with 20 drivers who were monitored by a driver monitoring system was analysed. Single long glance events were the most frequent distraction behaviour (0.95 events per hour). More complex visual attention time-sharing events (repeated glances between the road and other areas) occurred at 0.47 events per hour. Time-sharing events to the driver lap region (often indicative of phone use) occurred once every 8.4 hours. Most events featured little or no head movement. Findings support the differential treatment of systems based on whether they perform well on both eye-dominant and head-dominant distraction. When in-vehicle alerts are provided, frequencies are likely to be lower than observed here.

Background

Driver monitoring systems (DMS) are now recognised as an important tool for addressing the concerning number of road fatalities related to distraction and drowsiness, through detecting these states and alerting the driver in real-time. European NCAP, Australasian NCAP and other agencies will require vehicle manufacturers to incorporate DMS from 2023 to get maximum points in the Occupant Status Monitoring area. ENCAP defines 3 categories of distraction that DMS-equipped vehicles will be tested against: 'long distraction' (single long glances), 'short distraction' (repeated short glances) and 'phone use'. A key question concerns the real-world prevalence of these behaviours according to the ENCAP definitions and thresholds. Here, ENCAP definitions were applied to a naturalistic driving dataset, affording the first evaluation of how these defined behaviours present in real-world driving.

Method

Dataset

Twenty drivers were observed with Seeing Machines' automotive-grade DMS during their day-to-day commutes for two weeks, yielding 168 hours of trip data. Real-time computer-vision algorithms were used to continuously track participants' eye and head movements.

Application of NCAP definitions

Detailed definitions can be found on the ENCAP website (ENCAP, 2022). Due to camera view restrictions, phone use could not be verified. 'Driver lap' was used as a surrogate. Despite support for this region being the most common location of phone use (Faulks, 2020), it should be interpreted cautiously.

Table 1. Distraction definitions (summarised)

Long distraction	"a single long duration driver gaze away from the forward road to one consistent location of ≥3 seconds."
Short distraction	"visual attention time sharing … repeated glances away from the forward road view either repeated towards one location, or to multiple different locations."
Phone use	"a visual attention time sharing event where the driver's repeated gaze is towards their mobile phone."

Results

Long Distraction

There were 160 long distraction events (0.95 events per hour). Non-driving related regions accounted for 87 events and driving-related regions accounted for 73 events (see Figure 1). Manufacturers will be able to choose how glances to driving-related regions are managed (e.g., raising the threshold to 4 seconds). Given the high proportion of events to driving-related regions and that these regions tend to pose less risk, adopting a higher threshold may achieve greater driver acceptance without compromising safety. Approximately twice as many were 'lizard' glances (head remained relatively still while the eyes moved; Fridman et al., 2016) compared to 'owl' glances (eyes and head moved together).

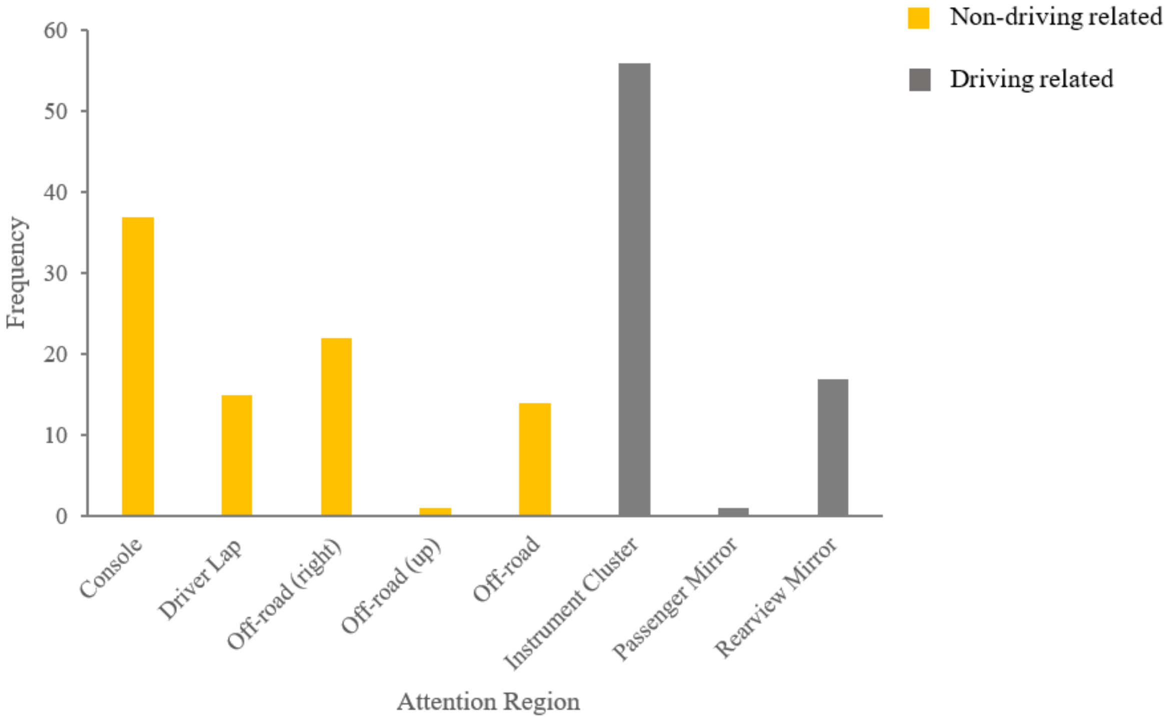

Figure 1. Long distraction events by attention region

Short Distraction

There were 80 visual time-sharing events (0.47 events per hour). Most were a combination of glances to non-driving related and driving-related regions, highlighting the complexity of this behaviour relative to long single glance events.

Phone Use

Twenty short distraction events contained glances to the driver lap region (1 event every 8.4 hours). All represented lizard glance behaviour.

Conclusions

The findings support differentiating between detection capabilities (e.g., head and eye tracking vs. head-only) in test scoring; distraction clearly manifests in different ways and certain ways are more challenging to detect (Fredriksson et al., 2021). The high incidence of lizard distraction indicates that less sophisticated DMS that rely on head pose only (no gaze tracking) to infer gaze region may miss a substantial amount of distracted behaviour, particularly phone usage (also see Yang et al., 2021). While it remains to be seen how distraction prevalence will change as drivers experience in-vehicle warnings, Fitzharris and colleagues' (2017) observation of a 66% reduction in fatigue events following the introduction of real-time warnings suggests distraction alerts will also reduce.

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Rural vs Urban Enforcement of Phone Use Road Rules

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Abstract

Preventing phone use while driving is critical for road safety. Research into enforcement of phone use while driving has primarily focused on urban areas, with limited attention given to rural areas, where most crashes occur. Therefore, this study explored differences in police enforcement of the phone use while driving law in rural compared to urban environments. Police officers (n = 26) with rural and/or urban experience enforcing the phone use while driving road rules in an Australian police jurisdiction were recruited to participate in an interview. Several different challenges emerged for enforcing the phone use while driving law in rural compared to urban environments, such as different types of phone offending behaviour, as well as different infrastructure, resources and management that can impact police enforcement. These results highlight the various factors that need to be considered for enforcing the phone use while driving law in different environments.

Background

Illegal engagement in phone use while driving remains a pervasive problem in Australia. Enforcement of the phone use while driving road rule primarily occurs through police officers. However, a number of challenges have recently been identified that impact enforcement of this road rule (Nevin et al., 2017; Rudisill & Zhu, 2021). Notably, research has primarily looked at enforcement of this road rule in urban areas. Nevertheless, it has been identified that there can be numerous differences in policing between urban and rural environments but its impact on the enforcement of mobile phone use while driving road rule is unknown (Fenwick, 2015; Rantatalo et al., 2021). Therefore, this study took an exploratory approach to address this gap in the literature. First, in order to provide a contextual understanding of the challenges associated with enforcement of the phone use while driving law, this study aimed to explore how police officers perceive differences in drivers' engagement in phone use while driving between rural and urban environments. Next, this study aimed to explore how police officers perceive the differences in enforcement of phone use while driving between rural and urban environments.

Method

A total of 26 police officers were recruited from an Australian police jurisdiction who had experience enforcing the phone use while driving law. In total, 18 participants had experience in both rural and urban areas, 6 had experience in rural areas and 2 had experience in urban areas. Participants first completed a short demographic survey, followed by an over the phone interview where they were asked questions related to enforcement of the phone use while driving law in their area. An inductive thematic analysis guided by Braun and Clarke (2006) was conducted on the data. University human ethics approval (approval number A211520) and senior police management approval was obtained for this study.

Results

A total of 7 themes were created (see outline in Figure 1). The themes suggest that engagement in phone use while driving behaviours is different in rural compared to urban environments, and the nature of this behaviour was influenced by differences in infrastructure and enforcement strategies in the distinct environments (e.g., phone does not work in all the areas and road design makes very risky to stop vehicles to enforce the road rules). Furthermore, the enforcement strategies used by police officers in urban and rural environments was influenced by differences in management (such as different duty responsibilities), resources and infrastructure. Meanwhile, the differences in both enforcement and the nature of the phone use behaviour influence strategies used by police officers to apply penalties in the rural and urban environments.

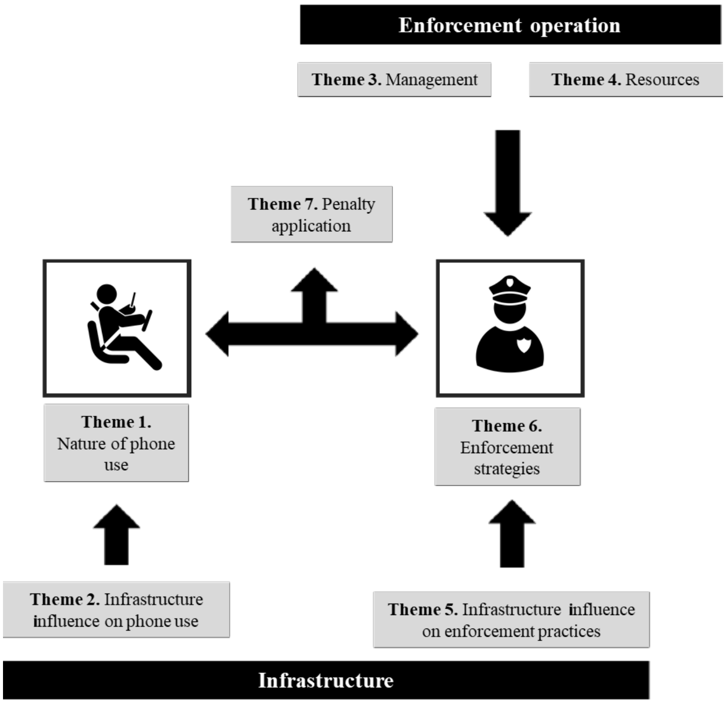

Figure 1. Schematic representation of the study themes

Conclusions

The results from this study can help to optimise best practice for enforcement of the phone use while driving road rules across regions. Further, the results provide important contextual information for research surrounding enforcement of the phone use while driving law.

Acknowledgements

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Creating and Implementing a Road Safety Strategy for Local Government

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Eurobodalla Shire Council

Abstract

The Eurobodalla Road Safety Plan (RSP) 2019-2022[1] aims to drive road related trauma down for our community, our families and 1.5 million visitors who visit annually. Eurobodalla Shire Council (ESC) accepts the responsibility for local and regional road network whilst highlighting our high reliance on funding from Government agencies to deliver a whole of network approach including local road safety behavioural programs. Our strategic focus continues to be on progressive upgrades to deliver integrated whole of route solutions within the funding streams available. Acknowledging addressing road related trauma is a whole of Government and community challenge. The plan outlines specific measures Council requires to undertake to achieve reduced trauma for all road users travelling local and regional roads. The plan includes specific actions to build a safer road network, educate people to behave in a safe manner, transition to safer vehicles and work with NSW Government to ensure appropriate speeds.

Background to the Road Safety Plan

Across Australia, more than 13,000 people died, and more than 360,000 people were seriously injured from road related trauma over the 2008-2017 period[2]. Across New South Wales 3,724 people died and 119,988 people were seriously injured[3]. In Eurobodalla 30 died and 520 people were seriously injured from road related trauma over the 2008-2017 period[4]. Many more people received minor or moderate injuries or experienced non-injury crashes The ERSP 2019-2022 provides the framework and direction to improve road safety outcomes across Eurobodalla using the safe system approach of safe roads, safe speeds, safe vehicles, and safe people.

The Road Safety Plan

The ERSP aligns to the NSW Road Safety Plan 2021[5] with specific attention to the Eurobodalla context acknowledging that significant collaboration between government agencies is required to achieved shared goals.

This plan identifies those actions on the local and regional road network where Council has directly responsibly as the road authority as well as Council's role to advocate on behalf of the Eurobodalla community on the state highway network. The plan also acknowledges that implementation of proposed actions is dependent of funding and support from other levels of Government.

The plan aims to improve safety outcomes for all road users including people using motor vehicles, pedestrians, and cyclists as well as our workers who build and look after our transport infrastructure. This plan focuses on the key aspects Council action by continuing to make a positive difference to the community now and into the future.

Turning the plan into action

ESC, after extensive community engagement, developed One Community – Eurobodalla Community Strategic Plan 2017[6] including goals where 'our integrated accessible transport system grows to ensure social and economic needs are met now and into the future'. Council's strategies are developed into action plans through inclusion of specific items in the Delivery Program 2017-2021[7] and Operational Plan 2017-2018[8] with key items specific to improving road safety.

The statistics and the action

Reviewing the crash statistics 2011-2017

- speed attributes to 71% of crashes,
- fatigue attributes to 17%
- alcohol attributes to 9%
- local people were involved in 63% of all crashes,
- almost a quarter of controllers were 25 years or younger,
- 46.9% of crashes on local, regional, and other roads occurred on 9% of the Council network
- vehicles involved in crashes
    - 66% cars,
    - 22.5% light and heavy trucks and buses and
    - 7.4% motorcycles and
    - 5.5% of all casualties were vulnerable road users of pedestrians and cyclists.

The overall trend for casualty crashes in Eurobodalla is downward whilst the number of fatalities remains steady at an average of three a year.

Using the safe systems approach, ESC is determined to work toward the ultimate goal of zero deaths by 2056 by actions to be taken to save lives now and into the future. Examples of actions stemming from the Action Plan, within each pillar of safe systems are highlighted in Table 1.

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Table 1 – Safe System Action to be Taken to Save Lives

6.1 Safe Roads – Actions We Will Take to Save Lives		
Aim	**Action**	**Priority**
6.1.1	Advocate to and work with Transport for NSW for the completion of the $30m upgrade to the Princes Highway at South Batemans Bay incorporating connection to Glenella Road (Sth BBay Link Road) by Transport for NSW	**High** **Continuing**
6.1.3	Fund Council's long term financial plan, delivery program and operational plan to achieve a Maintenance Ratio of 100%, including provision for growth of assets and the actual increase in cost of undertaking work	**High** **Continuing**
6.1.4	Continue to provide an annual program of gravel resheeting to the unsealed road network that meets a Renewal Ratio of 100%, incorporating minor road safety improvements, where practicable and affordable	**High** **Continuing**
6.1.12	Undertake road safety reviews of all rural and regional sealed roads to identify and prioritise progressive network improvements	**High** **completed**
6.1.13	Continue to pursue grant funding for road safety and capacity improvements to major roads that contribute to achieving network and route planning outcomes	**High** **Continuing**
6.1.17	Complete upgrade of Beach Road between Orient Street and Princes Highway including dedicated turning capacity and integrated pathway networks (funded)	**High** **completed**
6.1.19	Complete a continuous median island on Beach Road between Herarde Street and Country Club Drive to prevent right turn manoeuvres	**High** **completed**
6.1.34	Collaborate with Transport for NSW and John Holland throughout the Batemans Bay bridge project to ensure a safe local and regional road network in Batemans Bay CBD and North Batemans Bay	**High** **completed**
6.2 Safe Speeds – Actions We Will Take to Save Lives		
6.2.5	Progressively implement additional speed management controls within Moruya CBD east to reduce the actual speed of travel and improve pedestrian movement	**High** **Continuing**
6.2.6	Implement additional speed management within Clyde Street Batemans Bay in conjunction with the new Batemans Bay bridge project (to be funded by Transport for NSW)	**High** **Continuing**
6.3 Safe Vehicles – Actions We Will Take to Save Lives		
6.3.1	Demonstrate leadership through the purchase of 5 Star ANCAP rated passenger vehicles and 4 Star ANCAP commercial vehicles **(DPOP 9.2.3)**	**High** **Continuing**
6.3.4	Build Chain of Responsibility provision into all new contracts for all works for Council	**High** **Continuing**
6.4 Safe People – Actions We Will Take to Save Lives		
6.4.1	Support the Local Government Road Safety Officer Program **(DPOP 1.1.1)** in a co-funded arrangement with Transport for NSW to identify and address local road safety issues	**High** **Continuing**
6.4.2	Develop and undertake education programs to target behaviours representing primary causal factors in local crashes including speeding, alcohol and fatigue	**High** **Continuing**
6.4.4	Kings Highway Road Safety Partnership, continued to strengthen the partnership between ESC, NSW Police, Australian Federal Police and Local Government Agencies including Queanbeyan Palerang Regional Council and ACT Government.	**High** **Continuing**
6.4.10	Continue to liaise with community during festivals including Red Hot Summer Tour, Granite Town, Toddler and Baby Expo, NAIDOC Week Celebrations to promote responsible behaviours	**High** **Continuing**

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Can simple metrics define safe transition to adult seat belts?

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Abstract

We aimed to examine the relationship between metrics used to define common thresholds for appropriate transition to adult belts, vehicle characteristics and seatbelt fit in children aged 7-12 years. Seat belt fit was assessed by observing 40 children in their own cars. The association between factors of interest and belt fit was examined using logistic regression. Sixteen (40%) children had a good overall seat belt fit. The odds of achieving good overall belt fit increased by 15% (OR 1.15, 95% CI 1.04–1.27) with every centimetre increase in height and by 5% (OR 1.045, 95% CI 1.001–1.10) with every 1-month increase in age. However, no metric could accurately predict good belt fit for all children in all cars. While older and taller children are more likely to achieve good belt fit, no single metric clearly defines appropriate transition due to variations in seat and seat belt geometry among vehicles.

Background

The transition to an adult seat belt for children is often guided by legislation and/or best practice advice. Different countries use different thresholds and metrics to define the transition, such as age (6/7 years onwards), height (145-148 cm and above), and weight (29-36 kg or more)(European Consumer Centre Germany, 2020; Klinich et al., 2017; National Transport Commission, 2019). The aim of this study was to investigate the relationship between metrics used to define common thresholds for appropriate transition to adult belts, vehicle characteristics and seatbelt fit.

Method

Data was collected from observations of children aged 7-12 years using adult seat belts (n=40) as they arrived at five schools in the Greater Sydney region. Belt fit was assessed visually on site and verified from photographs of the child in their restraint within the vehicle. Figure 1 illustrates definitions of good sash belt and lap belt fit. Overall good fit required both good sash and lap belt fit. If sash or lap belt fit was poor, overall belt fit was coded as poor. Demographic data was obtained via survey with driver and anthropometric data was measured. Logistic regression was used to investigate the relationship between anthropometric and vehicle factors on achieving a good seat belt fit. Cases where tall children failed to acheive good belt fit, and small children achieved good fit were qualitatively examined to identify potential enablers and obstacles to good belt fit.

[redacted]

Figure 1. Good sash belt fit (sash across mid-shoulder), left, and good lap belt fit (lap belt across lower-abdomen contacting upper thigh), right. (note: Green shading indicates belt position for a good fit and red shading indicates the belt position for a poor fit)

Results

Sixteen (40%) children achieved overall good seat belt fit, while 7 (17.5%) children failed to acheive good sash belt or lap belt fit. Twenty-four (60%) children achieved a good sash belt fit and 23 (57.5%) children met criteria for a good lap belt fit. Univariate logistic regression revealed the odds of achieving a good sash belt fit and a good overall seat belt fit increased by 15% (OR 1.15, 95% CI 1.04–1.27) and 8% (OR 1.09, 95% CI 1.00–1.16) with every centimetre increase in height respectively. Furthermore, the odds of achieving an overall good seat belt fit increased by 5% (OR 1.05, 95% CI 1.00–1.10) and 80% (OR 1.77, 95% CI 1.01–3.10) with every 1-month and 1-year increase in age respectively. The probability of acheiving good belt fit was 15.1% for 7 year olds, 36.0% for 9 year olds & 75.8% for 12 year olds. At 145cm, the probability of good fit was 46.6%, and at 148cm it was 52.3%. Qualitative analysis revealed variations in seat belt anchorage locations and depth of seat cushion may impact belt fit.

Conclusion

Findings indicate that no single metric clearly defines appropriate transition to the adult seat belt.

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A holistic approach to improving our tamariki travel to school

Ashley Beaton and Georgia Greene

Christchurch City Council

Abstract

The series of small actions we can take today will see greater safety gains for the school community tomorrow. School travel planning in Christchurch is a holistic approach encompassing a wide range of issues faced by the school community whilst travelling to school. Consulting with the school community through a school travel survey and creating a working group, allows us to work together to find locations of concern and create a clearer roadmap for the future. While Christchurch City Council provides the infrastructure on the ground, the key behaviour changes come from empowering the school and student leaders with a set of tools to improve road safety and encourage active modes of travel. Making active travel safer and more accessible, enables students to form new sustainable travel habits, safer neighbourhoods, and leads us in the direction of creating a more sustainable tomorrow.

Holistic School Travel Planning in Ōtautahi

School Travel Planning is an internationally recognised process where schools work in conjunction with their local council, to promote safer and more sustainable travel options for their students. Currently there are 36 schools in Christchurch implementing or working towards school travel plans.

During the school travel planning process a travel survey is conducted to identify the mode split and locations of concern. Allowing for the school community to be consulted with before implementing changes, ensuring everyone has their concerns heard.

Schools create a working group which includes students, staff, parents, Board of Trustee members, Police, and Christchurch City Council (CCC) staff. The key Council staff working with the schools are the Community Travel Advisors and Traffic Engineers. This diverse group looks at the locations of concern and barriers to active travel to create a clear roadmap of the direction that Council and the school should be taking.

Where the Council can provide the infrastructure to improve safety, we also work with the school to identify how they can promote active modes and safe road usage. To help promote active modes we provide them with cycle skills training for year six students and help implementing walking school buses.

To celebrate students walking and wheeling to school CCC has a Walk or Wheel to School Week event annually in March. This event encourages whānau to give an active mode a go focusing on the health and well-being benefits involved. In 2022, the event attracted 74 schools across the Christchurch and Waimakariri area to register growing from 59 in 2021.

The allocated school safety budget allows for school safety projects to be prioritised and implemented. Kea crossings are a safe way for tamariki to cross often busy roads and are used to assist children on their journey to school. They are operated during peak drop-off and pick-up times and are led by road safety leaders who are trained by the New Zealand Police alongside adult supervisors. Road safety leaders at Roydvale school identified behavioural issues at their kea crossing during the school travel planning process. Students created a video to show the school community how to use the crossing safely, which addressed their safety concerns.

Parking changes are also used outside schools to promote effective drop-off and pick-up behaviour and ease congestion. Three minute parking areas (P3) are placed at the safest points to drop tamariki off to walk into school on their own. No stopping restrictions are also used to improve sightlines for children crossing, or where parking may be unsafe. CCC offers a two week Park Smart programme which is designed to encourage a safer and less stressful parking environment around schools. The first week focuses on public education to promote safe ways to park around schools. The second week involves the enforcement of safe parking practices.

School travel plans equip young road users with the skills to become safe and competent on the road. So no matter the mode our tamarkiki can get to where they’re going safely.

A holistic approach to improving how our tamariki travel to school

Our school travel plans are a holistic approach to working with schools, staff, Police, and communities to make active travel safer and more accessible, enable students to form new sustainable travel habits, and create safer neighbourhoods. This approach supports our communities in creating a more sustainable tomorrow, so no matter the mode our tamariki can get to where they are going safely.

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Regional road safety education: Towards independence, skills, and safety.

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Abstract

School-based road safety education can develop independence and work-readiness in students and obtaining a licence is one of the ways in which they can significantly improve employment prospects. In addition, a licence can assist students to develop the social and emotional capabilities, and road safety skills and knowledge to use roads and vehicles safely. AISNSW Wellbeing and Personal Development, Health and Physical Education (PDHPE) Consultants supported Riverina Community School in Griffith, regional NSW Australia to achieve sustainable outcomes related to their road safety education project in 2020/2021. Through professional learning, support and connections to the NSW Advocate for Children and Young People, NSW Government and NSW Police, successful intersectoral collaboration has enabled two cohorts of students (40% of whom are Aboriginal and Torres Strait Islander students from considerable disadvantage) overcome a range of barriers experienced by students in regional and rural locations to attain their Learners Permit with a process enacted to gain Provisional Licences. The Griffith project became a case study that was discussed in a 2021 NSW Parliamentary Inquiry related to regional and remote drivers licence attainment.

Background

Road Safety Education (RSE) in schools aims to prepare and equip children and young people with the knowledge, skills and positive attitudes that will enable them to stay safe in and around different traffic environments.

Proudly funded by Transport for NSW, AISNSW shares in a partnership with Catholic Schools NSW, the NSW Department of Education, and Kids and Traffic (the Early Childhood Road Safety Education Program at Macquarie University) to support the delivery of RSE by providing resources and professional learning to teachers in schools throughout NSW.

AISNSW invited schools across the sector to apply for a RSE Funding project ($3,000 plus consultancy support). Western Riverina Community School submitted an application that they were then supported to develop into an impactful, sustainable and meaningful initiative that resulted in positive outcomes for students at the school.

Western Riverina Community School is a Special Assistance school where approximately 40% of students identify as Aboriginal or Torres Strait Islander and less than 10% had previously been successful in gaining their learner's permit.

Regional Road Safety Education in Griffith NSW

The Griffith project aimed to develop independence and work-readiness in students. As well as helping develop knowledge and skills related to road safety education, an important component of this is achieved by providing a practical response to structural barriers preventing or restricting these students obtaining a licence to drive.

In many regional areas, access to education, employment, and important services (as well as active social participation) requires young people to drive. Removing barriers to students obtaining a driver's licence reduces the likelihood of them taking the risk to drive unlicenced.

Essential documentation required for licencing were unavailable to these students e.g., proof of identity, birth registration, birth certification. AISNSW collaborated with the Department of Births/Deaths/Marriages to ensure access to these documents and create a sustainable process into the future.

Schools in regional centres can have challenges navigating the administrative processes related to documentation and licences. The school and students were supported to identify services already available, expunging of fines, fee relief on compassionate, financial or vulnerability criteria, waving/expunging unaffordable fines via Police and Community Youth Club (PCYC) and NSW Police which preclude obtaining a licence.

Low levels of literacy and numeracy posed potential problems for students sitting a Learner test successfully and AISNSW made available to the school the expertise of Literacy and Numeracy Consultants to address this barrier.

Mental health challenges such as anxiety, past trauma and low confidence which discourage some students from attempting the process of getting a licence were addressed through mental health support and social and emotional skill development.

Road safety knowledge and skills were developed through project-based learning pedagogy in both the PDHPE curriculum and through a whole-school approach to wellbeing.

The model created by Western Riverina Community School with support from AISNSW and additional agencies has potential to be replicated in other communities and was examined by a NSW Parliamentary Inquiry in 2021.

Supporting road safety education in schools

Students are an important resource in influencing their peers positively to improve road safety behaviour.

Figure 1. Regional road safety education: Towards independence, skills, and safety.

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https://www.aisnsw.edu.au/teachers-and-staff/funded-programs-and-projects/road-safety-education

NSW Parliamentary Inquiry Support for Rural and Regional Learner Drivers (2021)

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Transport for NSW

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Western Riverina Community School

https://www.wrcs.nsw.edu.au/

Understanding Patterns of Pedestrian – Motor Vehicle Crashes at Signalized Intersections Using Cluster Correspondance Analysis

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Abstract

Pedestrians account for over a quarter (23%) of the 1.35 million deaths caused by road traffic crashes each year. Pedestrian traffic crashes are a major road safety issue worldwide, particularly in developing countries like India. According to the Ministry of Road Transport and Highways in India, around 28600 pedestrians were killed and 61900 were injured in 2018 (MoRTH,2020), and these figures have been historically high since 2010. In 2019, fatal pedestrian crashes increased by nearly 19 percent compared to 2018, while injuries increased by nearly 13 percent. Intersections are among the most dangerous road locations, with a high pedestrian flow and a mix of pedestrian and vehicle traffic. The safety of these locations necessitates special care, and the MoRTH has made it a primary goal. Researchers in developed countries such as the United States and Europe and emerging economies such as Brazil, China, Hong Kong, and Singapore have extensively examined pedestrian safety at signalized intersections. These studies have found that several risk factors are linked to the occurrence of crashes at signalized intersections, which can be classified as infrastructure planning and design factors, traffic-related factors, and driver and environmental factors. The purpose of this study is to answer two research questions: 1) is there a cluster or sub-group effect in pedestrian crashes at signalized intersections, and 2) what are the patterns of key contributing factors in pedestrian crashes at signalized junctions. This study will collect ten years of traffic crash data from police records in Tamilnadu, India, to answer these research questions.

Data and Methodology

The pedestrian-vehicle crash data used in this study came from police department crash reports (RADMS database), which included 1669 pedestrian crash records at signalized intersections across Tamilnadu, India, from 2009 to 2018. Possible injury (no visible damage) or non-injured crashes were not included in the evaluation to meet the goals of the current study. The pedestrian injury severity was classified into three categories: simple (hospitalized and non-hospitalized), severe, and fatal injury. The research team identified contributory factors that influence the severity of crashes. The identified variables include driver characteristics (driver gender, age, license status, driver error), crash-related factors (crash cause, presence of median separators, number of lanes, road category, road conditions), traffic-related factors (traffic movement), vehicle (vehicle type, vehicle manoeuvre), environment-related factors (population setting, light condition, region, season, day of the week and crash time, locality) and pedestrian-related factors (pedestrian age, gender, pedestrian action, pedestrian position at the time of crash).

This study uses an unsupervised machine learning approach called correspondence analysis (CA). This approach evaluates two-way and multi-way tables from datasets with a wide range of nominal variables that contain associations between the rows and columns. The CA framework has a version called cluster correspondence analysis (CCA). For categorical data analysis, this method employs both dimension reduction and grouping. This method is unique among all dimension reduction strategies since it can assign individuals to clusters while also applying optimal scaling measures to variable categories.

Results

This study randomly conducted the k-means runs multiple times to gain an optimal number of clustering. For this analysis, the objective criteria value is 3.58. The origin represents the mean profile in CA analysis, whereas all other coordinates represent the deviation from the average profile.

The biplot visualization (Fig.1.) helps to view the general location of all variables. Two clusters (clusters 1,3) are shown on the right side of the y-axis in the biplot display. The third cluster is located in the first quadrant, while the clusters 4 and 6 are located in the second quadrant. Clusters 2 and 5 have their centroids in the third quadrant. Around 82% of the data is contained in the first four clusters. Cluster 6 has the least information (only 7.8 % of data).

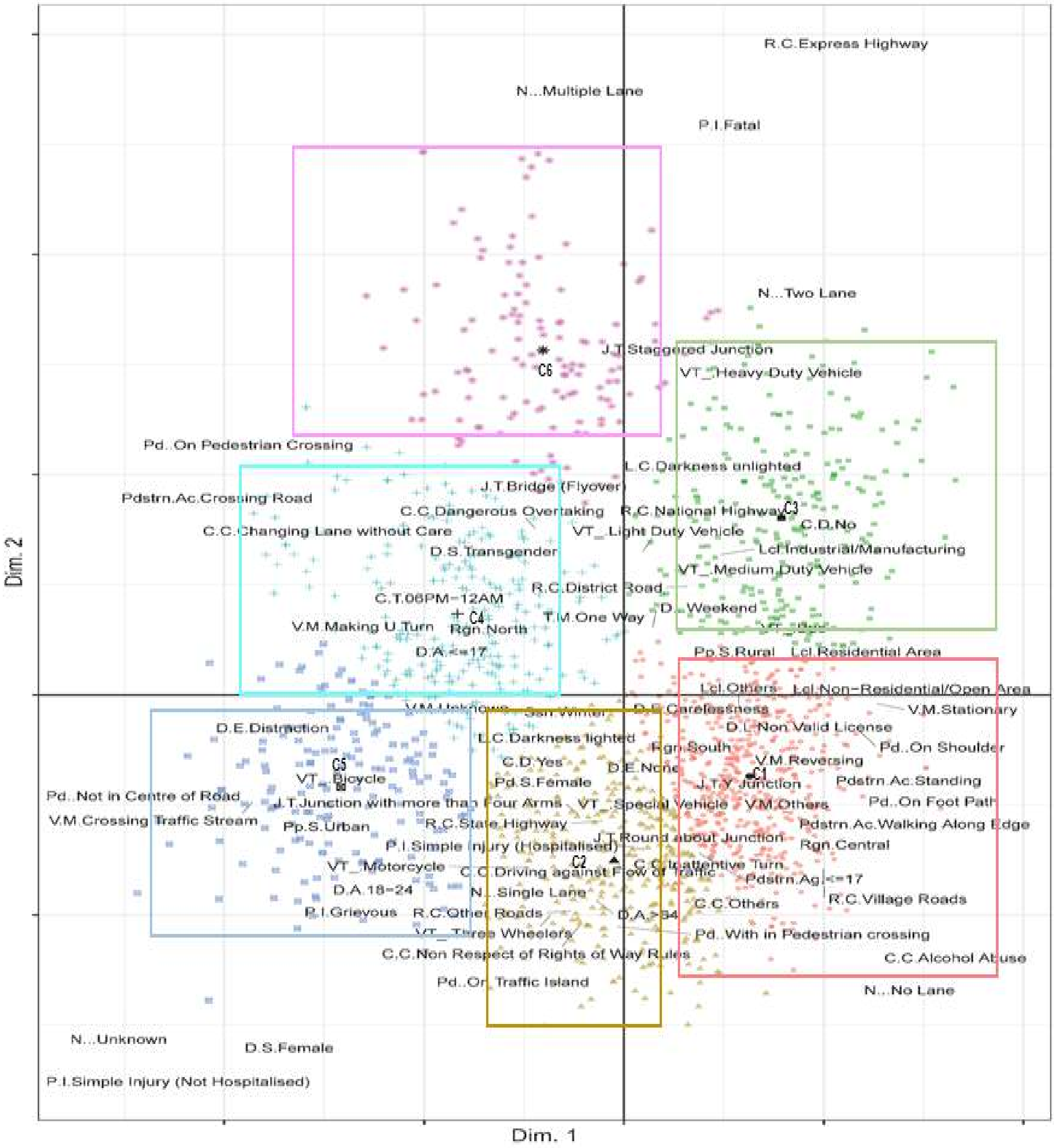

Figure 1

The locations of the cluster centroids answer research question 1 by indicating that there are cluster or sub-group effects in pedestrian crashes at signalized intersections. Cluster-based analysis answers research question 2 by explaining the patterns of the risk factors that are associated with pedestrian crashes at signalized intersections.

Cluster 1 has ten attributes with positive residual means: pedestrian on the footpath, walking along the edge of the road, central and south region, simple injury (non- hospitalized), rural single lane roads, non-residential and open areas, standing pedestrian and drivers who do not possess valid driving license. Cluster 1 does not have drastically high odds measures for any other attributes. The highest odds measures for each of the variables are: No of lanes (no lane = 2.80), crash cause (alcohol abuse =2), locality (Non-residential area/open area=2.16), This cluster represents around 30.8% of the overall information. Similarly, Cluster 5 is associated with a high proportion of crashes where pedestrians were not in the centre of road. The proportion odds show a high value of 5.20 for this crash contributory factor. The other categories with higher odds value for this cluster are urban settings, bicyclists, and pedestrians crossing the road. Similarly other clusters can be evaluated.

Conclusions

Based on the findings of the above results, targeted countermeasures may be designed in light of the injury severity for pedestrians at signalized intersections. For example, Since the law enforcement tends to be less strict in developing countries, design issues associated with higher risk-taking behaviour or violations should be removed and/or relocated wherever possible at signalised intersections.

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Designing out Driver Distraction: A Sociotechnical Systems Approach to Distraction

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Abstract

Recognising the role of contributory factors beyond the road user, their vehicle, and road environment in crash causation, research has called for a 'whole of system approach' to driver distraction (e.g., Bates et al. 2021; Young & Salmon, 2015). This study uses a systems thinking approach to develop prototype tools to support key transport system stakeholders in fulfilling their responsibilities around the management of driver distraction. This involved developing a systems thinking 'control structure' model of driver distraction in the Australian Road Transport System. Following this, fleet management, driver education and training, and government transport agency stakeholders participated in interviews and design workshops to develop prototype tools to support the management of driver distraction. All stakeholders identified that evidence-based resources could assist them in meeting responsibilities around distraction. Similar guidance needs amongst stakeholders suggests development of a core toolkit set could assist multiple stakeholders in managing and preventing driver distraction.

Background

Distracted driving continues to present a significant threat to road safety (e.g., Bates et al. 2021). Given the proliferation of new technologies being brought or designed into modern vehicles, it is likely that distraction-related crashes will continue to increase over the next decade. Historically, road safety interventions such as education or enforcement have been used to prevent distracted driving. However, critics argue that driver-focussed interventions do not address the complex and dynamic factors influencing driver engagement in adverse behaviours (e.g., distracted driving). Instead, a systems thinking approach is required, to understand and respond to the dynamic interactions underpinning driver behaviour.

The road transport system is known to be complex; comprising multiple stakeholders, controls, and feedback loops (Salmon et al., 2012). Thus, the management of driver distraction should be based on a systems thinking approach, and a shared responsibility across stakeholders (Young & Salmon, 2015). Whilst the shared responsibility for road trauma is an accepted component of most road safety strategies, previous research has highlighted the need to clarify exactly who shares the responsibility for different forms of road trauma, what activities are required to fulfill these responsibilities, and provide targeted support for stakeholders to do so (Salmon et al., 2016; Salmon et al., 2019). This research aimed to identify who shares the responsibility for driver distraction in Australia; and test a toolkit development methodology designed to support road transport stakeholders in fulfilling their responsibilities around the management of driver distraction.

Method

The project consisted of three phases: 1. development of a 'control structure' model of distraction in the Australian Road Transport System; 2. identification of stakeholder roles and responsibilities around driver distraction; and 3. development of prototype tools for its management and prevention. Representatives from three stakeholders identified within the model (fleet management, driver education and training, and government transport agency) participated in interviews and design workshops.

Results

The model identified the diverse stakeholders sharing the responsibility for driver distraction across the road transport system. A key finding was the need for a coordinated multi-stakeholder approach to manage risks associated with driver distraction. Interviews and design workshops highlighted the overlaps between stakeholders in roles and responsibilities as well as potential tools that could be developed to support them. Using the sociotechnical system design toolkit (Read et al., 2018), protypes were developed for two tools: a fleet management checklist and interactive resource portal.

Conclusions

This research demonstrated that driver distraction is a complex issue that can only be successfully managed through action from multiple stakeholders across the Australian Road Transport System. It showed that, though stakeholders understand their responsibilities around the management of driver distraction, they require various tools and support mechanisms to fulfill them. Interventions targeting one level of the system (e.g., direct driving environment), will not address systemic contributing factors perpetuating distraction. All stakeholders echoed similar challenges associated with driver distraction and called for evidence-based tools to assist in its management. Despite differences, similarities were evident in stakeholder requirements, demonstrating the key advantage of a ‘whole system’ approach.

Acknowledgements

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Elderly Pedestrian Crash Contributing factors in Tamilnadu, India: Application of Interpretable Machine Learning Method

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Abstract

According to the National Statistical Office's (NSO) report in 2021, India's elderly population (aged 60 and more) is expected to reach 194 million in 2031, up 41% from 138 million in 2021. Living and working environments must be created to satisfy the aging population's needs as the population grows older. While vehicles are the primary form of transportation for the elderly, walking is the second most popular mode. In 2019, a total of 2454 males and 892 female elderly pedestrians (above 60 years) were killed, according to report by the Ministry of Road Transport and Highways (MoRTH, 2020). Crashes involving elderly pedestrians are becoming more common. They are more likely to be involved in fatal crashes due to their increased frailty, as well as factors such as reaction time and street confidence. The overrepresentation of older pedestrians in fatal crashes and issues linked with an ageing pedestrian population need examination in developing nations like India. As a result, more research is needed to understand the patterns of elderly pedestrian crashes better using newer data resources and analytical tools. This study has two major objectives: 1) to create a context for using machine learning models to categorize injury levels in elderly people, and 2) to use an interpretable machine learning (IML) framework to provide probability values for injury classification. This work examines a ten-year (2009-2018) elderly pedestrian crash dataset in Tamilnadu and classifies each crash according to crash injury levels using a random forest (RF) approach. The contributory factors and their relationships with the injury level classification were then explained using IML approaches applied to the crashes.

Data and Methodology

The dataset for elderly pedestrian crashes examined in the study was derived from the Road Accident Database Management System (RADMS) of Tamilnadu. These data include crash characteristics of both pedestrians and drivers, the severity level of the injuries, vehicle information, temporal and locational factors at the time of the event. From this dataset, elderly pedestrian-vehicle crashes were extracted. The study categorized pedestrians into four age groups, namely, 65-69 years old, 69-74 years old, 74-79 years old, over 80 years old. To focus on the prime objective of this study, the research team identified contributory factors that influence the severity of crashes among elderly pedestrians. The identified variables include driver characteristics (driver gender, age, license status, driver error), crash-related factors (presence of central divider, number of lanes, junction type, road category, road conditions, crash cause, locality, hit-and-run status), traffic-related factors (traffic movement), vehicle (vehicle manoeuvre, vehicle type) and environment-related factors (population setting, weather condition, light condition, region, season, day of the week and location) and pedestrian related factors(pedestrian sex, pedestrian age, pedestrian action and pedestrian position).

In this study, the KABCO scale developed by NSC was used. Due to the low frequency of some crash severity categories using the KABCO scale. Fatal injuries (K) and Incapacitating injury (A) were combined and referred to as fatal/ grievous crashes. Non-capacitating injury (B) and Possible injury (C) cases were combined and referred to as simple injuries. Due to underreporting of no injury/property damage only(PDO), such crashes are neglected in the current study.

Random forest is a supervised classification technique that subsets the training dataset to build a large number of decision trees and then aggregates the predictions from each tree using voting.

However, it is not always possible to make a precise prediction. Random Forest is based on many decision trees with samples and variables chosen at random.

Results

The dataset is split into two parts: a training dataset containing 70% of randomly selected observations, and a testing dataset containing the remaining 30% of observations. The training dataset has 13,727 observations, whereas the testing dataset has 5,743 observations. The dataset has 25 variables, including one response and 24 attributes. The RF was fitted as follows. The accuracy score of the fitted RF Model is 99.8% for the training dataset and 70.28% for the test dataset.

It's worth noting that the confusion matrix, in the form of misclassification measures, provides insight into the model's performance. Model explanation, on the other hand, supports models by interpretability. To offer contexts for the prediction outcomes, this article used LIME, a recent IML technique. In this investigation, the open-source R package 'lime' was used. IML interprets a set of randomly chosen cases using probability and explanation fit as explanation parameters.

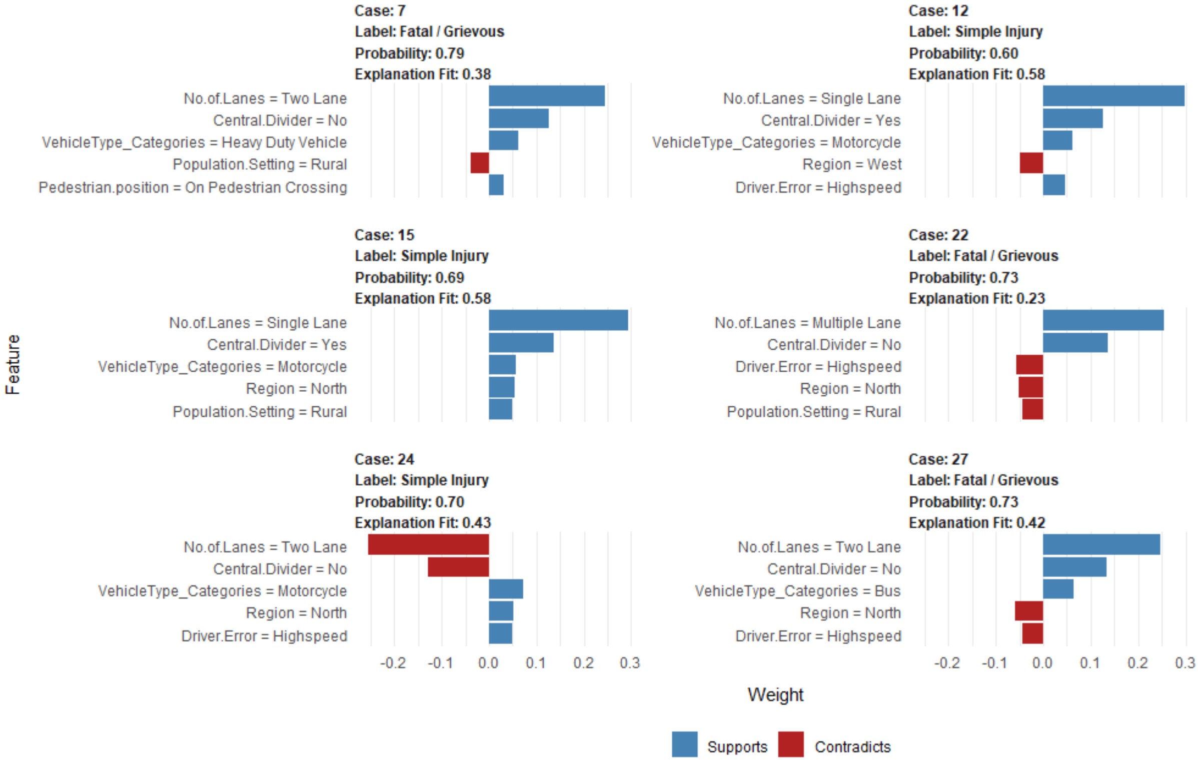

Figure 1

The explanation plots only show the top five contributory factors and their probability measures in bar plots. Fig. 1 shows few cases with fatal/serious injury and simple injuries from testing dataset. For example, Case 7 illustrates that the probability is 79% as fatal/serious injuries. The crash contributory factors for case 7 were identified as ‘two lane roads,’ ‘absence of central divider’ ‘heavy duty vehicle,’ and ‘pedestrian crossing locations.’

Conclusions:

IML frameworks can interpret algorithms that can assist road safety engineers in understanding the important parameters that are linked to pedestrian injury levels. The results highlight that design features of pedestrian facilities that exclusively support the safety of elderly pedestrians are required (For example, high visibility crosswalks, senior slow zone, safe routes for seniors). Local governments and transportation agencies must also refurbish the current road infrastructure, which is primarily designed for young, healthy road users and permits dominant driving attitudes to disregard the rights of elderly vulnerable pedestrians.

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Impact of phone use position on drivers' collision avoidance performance

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Abstract

Using mobile phones while driving is one of the most prevalent distraction activities, which causes safety concerns worldwide. Though hand-held phone use during driving has been forbidden in many countries, it is still commonly observed among drivers. This research aims to investigate whether and how different mobile phone use positions influence drivers' collision avoidance performance. Forty-six drivers (19 females and 28 males) took part in a driving simulator experiment. A car-following scenario was designed, where the leading vehicle decelerated abruptly to trigger a rear-end risk. All drivers drove the scenario three times: one in baseline without distraction, one holding the phone above the steering wheel, and one under the steering wheel. The results showed that drivers in both mobile phone use positions reduced speed in the car-following process. Using a mobile phone under the steering wheel significantly extended drivers' brake reaction time, and thus increased the rear-end collision likelihood.

Background

Mobile phone distraction has been a global road safety concern. It adds mental, audio, visual and/or manual workload to the drivers who are engaging in a complex task that requires substantial attentional resources (Li et al. 2018, 2019). Due to its serious concequences for road safety, hand-held mobile phone use has been forbidden in many countries (Rudisill et al. 2018). However, visual-manual interactions with a mobile phone, such as texting and browsing, are still commonly observed among drivers (Oviedo-Trespalacios et al. 2017, 2018; Young & Lenné, 2010). To avoid police enforcement, drivers tend to use the phone under the steering wheel, which may further degrade driving performance by impeding them from observing the road and traffic situations timely (Li et al. 2020). Understanding the demand of drivers using mobile phones and the capability of them handling multiple tasks during driving can help to develop strategies to reduce distracted driving risks. This study focuses on two mobile phone use positions (i.e. above vs. below the steering wheel) and aims to explore how the different positions influence drivers' collision avoidance performance.

Methods

A driving simulator experiment was conducted using the CARRS-Q high-fidelity driving simulator. To examine drivers' collision avoidance performance, a car-following scenario was designed, and the leading vehicle was triggered to stop suddenly at a deceleration of $-6m/s^2$ after 600 m of close car-following. A total of 46 participants who had a valid driver's license were recruited to drive the scenario three times in a counterbalanced order: no phone as the baseline, and using the phone above vs. below the steering wheel. The collision avoidance behaviours, including speed, brake reaction time and maximum brake force and collision result (0/1) were analysed. The Generalized Linear Mixed models were used to examine the effects of mobile phone use positions, drivers' age and gender on the collision avoidance behaviours. The Binary Logistic Regression model was developed to identify the significant predictors of the collision result.

Figure 1. CARRS-Q high-fidelity driving simulator

Results

The results show that drivers reduced their speeds at both mobile use positions compared to baseline, and as the age increased, drivers' speed decreased. Brake reaction time was significantly extended due to mobile phone use, especially when drivers used the phone below the steering wheel. The maximum brake force that drivers applied during collision avoidance was not affected by age, gender or mobile phone use. Drivers' speed, brake reaction time and maximum brake force were all significant factors of the collision result. The collision likelihood increased with the increase of speed and brake reaction time, and it also increased with the decrease of maximum brake force.

Conclusions

Using the mobile phone below the steering wheel was riskier than using it above the steering wheel. The study provides a better understanding of the direct and indirect effects of common mobile phone use positions on drivers' collision avoidance performance and collision risk.

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Trial of a method to capture cyclist's use of infrastructure

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Abstract

This project trialled a method of using video surveillance, augmented with machine learning, to automate the detection of cyclists. The augmented surveillance video was then used to analyse cyclists using various transport network infrastructure in the Australian Capital Territory (ACT). Video cameras were deployed to four locations in the ACT, selected based on feedback made by cycling safety stakeholders, for a period of seven days to capture footage of cyclists using on-road infrastructure. This enabled the examination of the ways cyclists utilise transport network infrastructure and their interactions with traffic (including the highlighting of conflict events). The project demonstrated that short term video surveillance, coupled with machine learning algorithms, can be employed as useful tool to obtain a better understanding of cyclist behaviour at specific locations and identify ways to improve road safety.

Background

The Centre for Automotive Safety Research (CASR) and the Australian Institute for Machine Learning (AIML) have developed specialised software that can process video files recorded from inexpensive cameras and isolate only the frames where cyclists are present.

There are many advantages to using cameras to capture footage of cyclist using on-road infrastructure. Traditional traffic counters often use pneumatic tubes to count traffic, but this cannot be deployed in mixed traffic. In-ground induction loops, designed to specifically count cyclists in bicycle lanes or paths, are also restricted in where they have been installed and cannot infer any details about the cyclists riding past (such as helmet use) or from where the cyclist has come. Video analysis overcomes all these issues and, additionally, enables the examination of cyclists at intersections, to determine (for example) potential conflicts during right turn manoeuvres (similar to Madsen & Lahrman, 2017; Olsen et al., 2017) or monitoring the usage and effectiveness of safety infrastructure treatments.

Method

Four long duration video cameras were acquired and tested to ensure they operated correctly, and that the recorded footage was able to be processed by the machine learning software. To determine suitable locations for the installation of the cyclist surveillance cameras, a group of ACT cyclist safety stakeholders were consulted. Their feedback identified 30 locations and a set of criteria were used to assist in selecting four sites that were most suitable for this project. The cameras were installed (see Figure 1) in early 2022 and recorded seven days of video footage between the hours 6:30am to 8:00pm each day.

A total of 94.5 hours at each location was recorded, resulting in 378 hours of total video of traffic recorded. This video was then processed through the machine learning software and reduced by around 95%.

The behaviours of cyclists using the on-road infrastructure of interest at each site were categorised by researchers viewing the shortened footage. In addition, any instances of conflicts with traffic were noted.

Results

The trialling of this video camera method has facilitated a greater understanding on how on-road infrastructure is being utilised (or miss-used) at each of the four sites where it was deployed. Furthermore, video examples of common behaviours (as well as extreme events) have been collated which can provide road authorities with the evidence they need to identify a safety issue or to adapt the way infrastructure is deployed at future sites.

Conclusions

This study has shown that short term video observation of specific sites, augmented with machine learning algorithms can be a quick and useful method of directly observing how cyclists utilise on-road safety infrastructure and to assist in determining where there may be safety issues that need addressing.

Figure 1. Camera placement (red arrow) and camera view at location where cyclists are given a designated crossing point where two lanes of traffic merge

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TRIAL OF A METHOD TO CAPTURE CYCLIST'S USE OF INFRASTRUCTURE

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INTRODUCTION

Provision of infrastructure for cyclists can have safety benefits. However, the infrastructure must be suitably relevant and correctly utilised. Monitoring of the way that cyclists use safety infrastructure and their interactions with other road users, such as vehicles, is therefore important.

Traditional traffic counters are able to count cyclists but do not provide any information about behaviours, are not suitable for use in all locations, and can be expensive to install.

Roadside observers can capture more information about cyclist behaviours, but this method can be error prone, costly, and cyclists may change their natural behaviour when they know they are being watched.

Using video to record cyclists in specific locations eliminates this observer effect but low resolution cameras do not facilitate easy recognition of cyclist characteristics such as gender or helmet use. Furthermore, the recorded video still needs to undergo the costly process of being manually viewed.

This project trialled a new method of capturing cyclist's use of infrastructure using an easily-deployable, high resolution recording system to capture footage that could then be processed with an with artificial intelligence (AI) software system to automatically trim the video to only the periods where a cyclist was present within the scene.

METHODS

1. Video camera systems, capable of recording 7-days of daylight traffic footage, were deployed at four locations in Canberra
2. The video footage was processed by an AI software system to extract only the periods when cyclists were present, as well as individual images of each detected cyclist
3. Various cyclist features, behaviours, and interactions of interest were then coded by a researcher to explore what outputs could be obtained

RESULTS

A total of 378 hours of footage was captured across the four monitored locations. After processing with the AI software, the footage was reduced by 94.2% to less than 22 hours and over 4,000 images of detected cyclists.

By viewing the generated images, which did require some manual filtering to remove a small number of false positives and duplicates, it was possible to rapidly obtain the following details:

- Number of cyclists detected at each site, per hour of the day and day of the week
- Proportion of cyclists wearing a helmet
- Proportion of cyclists who were perceived to be male, female, adult, or child
- Proportion of cyclists using various types of bicycles (e.g. road bike, mountain bike, e-bike)

Through viewing the summarised video footage, a qualitative and representative understanding of cyclist behaviour at each monitored site could be obtained.

A more quantitative audit of behaviour at each site was able to be obtained by examining the summarised footage and categorising cyclist behaviours of interest. This process was more time consuming, so deliberate thought should be put into what behaviours or interactions are being categorised. During this trial, it was demonstrated that the following behaviours were able to be successfully categorised or noted:

- Cyclist clothing type and conspicuity
- Cyclist use of rear light
- Routes taken by cyclists through location of interest
- Instances of conflicts between cyclists and vehicles
- Cyclists use of dedicated infrastructure such as:
    - Bicycle turn holding boxes
    - Crossing points
    - Bike lanes
    - T-intersections

Using modular camera units, augmented with AI software, is a cost effective and rapid method of reviewing cyclist's use of road safety infrastructure.

Agencies wishing to evaluate cyclist interactions with specific infrastructure, or behaviours at specific locations, can use this method to assist with data collection and analyses to inform or optimise their cycling safety strategies.

This project received ethics approval from the University of Adelaide's Human Research Ethics Committee (H-2018-102)

This project was made possible with assistance from the ACT Road Safety Fund

ACT Government

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Evaluation of Centreline ATLM along Curves in Mountainous Roads

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Abstract

Centreline Audio Tactile Line Marking (ATLM) was installed on a popular narrow road in the Adelaide foothills. A before-after evaluation was conducted to assess the ATLM potential for influencing lane position/crossing and speed along four trial curves. Vehicle lane position and speed at those curves, and between-site travel times were analysed. Post treatment, all vehicle types tended to safely shift towards the edge line along right-hand curves. However, variability along left-hand curves existed amongst the four sites. Generally, the treatment did not appear to reduce lane crossing frequency on curves, except at one site. Centreline ATLM did not appear to induce a speed decrease along curves. Nonetheless, a slight reduction of the average travel speed along the treated route may indicate a generalised speed calming effect. The study suggests merit for centreline ATLM along curves regarding lane positioning, but a limited effect on voluntary lane crossing and speed.

Background

Traditionally, Audio Tactile Line Marking (ATLM) is adopted as a countermeasure to prevent unintentional lane excursions (Austroads, 2008). However, some recent attempts have been made to adopt centreline ATLM also to prevent deliberate lane excursions, especially when negotiating curves (Mackie, 2009).

Centreline (ATLM) was installed on a 20km-long segment on Gorge Rd, a two-way narrow and semi-mountainous road located in the north-east Adelaide foothills, which is a popular motorcycle route characterised by curves with reduced visibility. An evaluation was conducted to assess the ATLM potential for improving lane position as well as reducing lane crossing and speed along curves.

Method

A before/after evaluation was conducted considering vehicle lane position and speed. Vehicle lane position and speed were measured at four selected curves along the route using a roadside lidar device positioned on the inner roadside of each bend. Additionally, traffic volume and travel times were collected along both the treated route and a nearby control road using pneumatic tubes and Bluetooth® signal tracking devices, respectively. The four trial sites and two control sites are shown in Figure 1.

Results

Lane Position - After installation of the centreline ATLM, all vehicle types showed a trend to shift towards the edge line (i.e. away from the curve apex) along right hand-side curves, which are notably those where drivers and riders tend to voluntary move towards/cross the centreline in order to 'cut through' the curve cord. However, along left hand-side results varied across the sites. The mean vehicle distance from the centreline and corresponding change before and after the ATLM installation are summarized in Table 1.

Site: Treatment 1 | Site: Treatment 2

Site: Treatment 3 | Site: Treatment 4

Site: Control 1 | Site: Control 2

Figure 1. Overview of trial sites (Treatment and Control)

Centreline Crossing - At one site, centreline crossing frequency reduced considerably along the right curve for all vehicle types (especially motorcycles) and along the left curve for HGVs. However, HGV crossing frequency locally increased along the left curve at another site. Generally, crossing frequency did not vary after the ATLM installation at the remaining three locations. In terms of excursion extent, mixed results indicated a marginal tendency to shift towards either small or large lane excursions after the ATLM installation, depending on the monitored sites.

Speed - Centreline ATLM do not appear to induce a decrease in travel speed on the monitored curves. Nonetheless, they seem to slightly reduce the average speed along the treated route thus inducing drivers to better monitor their travel speed along the route (based on a minor increase in the average travel time along the entire treated route).

Traffic Volume - The volume of light and heavy vehicles along both the treated and control roads marginally reduced after the ATLM installation. However, a localised increase in HGV volume occurred in the eastbound direction on one segment of the treated road and on the control road (likely associated to works on a nearby dam).

Table 1. Mean vehicle distance from centreline before and after ATLM installation and corresponding change by vehicle types/travel direction

		Left Curve (Near Side)				Right Curve (Far Side)			
		Distance from Centreline (cm)		Change after Treatment		Distance from Centreline (cm)		Change after Treatment	
	Site ID	*Before*	*After*	*Offset Direction*	*Shift Amount (cm)*	*Before*	*After*	*Offset Direction*	*Shift Amount (cm)*
All Vehicles	Treatment 1	-22.5	-47.8	Left Side	25.4	-8.7	-23.1	Left Side	14.4
	Treatment 2	-85.9	-51.1	Right Side	34.9	-48.1	-83.7	Left Side	35.5
	Treatment 3	30.2	27.1	Left Side	3.0	-58.8	-58.8	Right Side	0.0
	Treatment 4	-31.6	1.9	Right Side	33.5	-29.6	-41.6	Left Side	12.0
Motorcycle ONLY(1)	Treatment 1	-222.3	-251.9	Left Side	29.6	17.2	-40.1	Left Side	57.3
	Treatment 2	-268.2	-235.2	Right Side	33.0	-61.2	-92.2	Left Side	31.0
	Treatment 3	-169.3	-173.3	Left Side	4.1	-60.0	-61.7	Left Side	1.6
	Treatment 4	-225.6	-185.0	Right Side	40.6	-33.2	-32.8	Right Side	0.5
Passenger Vehicles ONLY(1)	Treatment 1	-83.2	-89.8	Left Side	6.6	-8.7	-23.0	Left Side	14.3
	Treatment 2	-81.4	-78.6	Right Side	2.8	-55.2	-97.6	Left Side	42.4
	Treatment 3	-33.2	-34.0	Left Side	0.9	-58.3	-55.6	Right Side	2.7
	Treatment 4	-84.1	-53.7	Right Side	30.4	-33.3	-44.8	Left Side	11.5
HGVs ONLY(2)	Treatment 1	-6.7	-34.9	Left Side	28.2	-9.9	-22.4	Left Side	12.5
	Treatment 2	-12.2	-12.5	Left Side	0.3	-39.7	-72.7	Left Side	33.0
	Treatment 3	38.4	35.0	Left Side	3.4	-58.9	-59.2	Left Side	0.3
	Treatment 4	-28.4	5.5	Right Side	33.9	-28.8	-41.5	Left Side	12.7

Values in green (negative) indicate a vehicle position to the left of the CL (within the correct travel lane)
Values in red (positive) indicate a vehicle position to the right of the CL (excursion on opposite lane)
(1) Potential underestimation of light vehicles detection by the Lidar device
(2) Potential overestimation of heavy vehicles detection by the Lidar device

Conclusions

Results indicate the following potential safety benefits of centreline ATLM along curves in a winding and hilly road environment:

- Overall shift of vehicle lane position towards the edge line along right-hand curves
- Reduction in frequency and extent of lane crossing (although localised at one site)
- Minor reduction in average travel speeds along the route (although not localised on curves)

The study suggests merit in centreline ATLM along curves regarding lane positioning, but a limited effect on voluntary lane crossing and speed. Additional research is needed to better investigate the marginal effects, especially considering the known limitations of this current investigation, which included short before/after periods (7 days), lack of a control on vehicle lane positioning, presence of work activities on a dam located along the route, and possible overestimation of HGVs detection by the measurement devices.

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Safe Around Schools – A collaborative approach to Road Safety

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City of Casey

Abstract

City of Casey is currently home to 96 primary and secondary schools. Traffic congestion, parking issues, unsafe driver behaviour and pedestrian risk-taking at school pick-up and drop-off times have a large impact on our community and our resources. Safe Around Schools is built around shared responsibility for road safety - Council, schools, parents and students working collaboratively - with the key message that "getting children to school safely is everyone's job". The program uses a mix of improvements – engineering, education, engagement, encouragement and enforcement – to improve road safety around schools and increase levels of active travel to school. By bringing together key departments within Council and working collaboratively with schools, we are able to trial, prototype, reflect and re-design throughout delivery, to meet the varying needs and environments of our different schools. Having worked intensively with 6 schools, there have been many lessons learned and some promising outcomes so far.

Background

City of Casey is the second largest growing LGA in Victoria, with more than 360,000 residents from 150 different cultures.

Casey is home to 96 schools - servicing more than 37,000 families, creating over 370,000 school trips on our roads each week - with plans for at least 18 more by 2032.

Whilst the challenges of traffic congestion, parking issues, unsafe driver behaviour and pedestrian risk-taking at school pick-up and drop-off times are neither new nor unique to Casey, the impacts draw heavily both on Council resources and our community.

Description of Project

Safe Around Schools is built around shared responsibility for road safety – Council and school communities working collaboratively to solve road safety concerns in their school precinct together.

A mix of treatments, being engineering, education, engagement, encouragement, and enforcement are used to improve road safety around schools. Our key message is "getting children to school safely is everyone's job".

Key elements:

- Building a school profile (existing data, current infrastructure, parking management, surveys, site-visits and mapping)
- Communication to parents (key messages via multiple & varied avenues, using Easy English and options for translations)
- Targeted enforcement activities (Council Parking Compliance and Victoria Police)
- Road Safety Education sessions for students
- Implementation of infrastructure changes

Lessons Learned

Anticipated outcomes:

1. Parents more aware of road & parking rules and making safer decisions
2. Children have increased awareness of being a safer pedestrian
3. Families have increased awareness of active travel options
4. Decrease in students being picked up in a vehicle each week
5. Decrease in number of parking & traffic complaints made

Achievements of these outcomes are varied, highlighting the need for both a more robust evaluation framework and review of objectives. For example, in areas 1, 2 & 3 we have observational and anecdotal evidence of success with the trial schools, but lack of quality data to strongly support. Longer term behaviour change impact is out of trial scope.

There are many ‘good news stories’ from this program, including improvements to traffic flows and additional infrastructure. Case studies are available to highlight program impacts. A broad range of communication resources have enabled distribution across the municipality, enabling access for all, inclusive of our CALD communities.

Next Steps

Safe Around Schools has been a successful trial. Alongside collaboration, the program’s agility in meeting the needs of varied school communities and operating within Covid-19 has been key. The program model is continuously improving for future delivery, coupled with two Innovation Bootcamps, resulting in new plans for 2022/2023 and beyond.

The next program iteration will see a tiered approach - Intensive, Selective and Universal offerings -catering to diverse needs of schools and engagement with more school precincts across the municipality. Program elements have been refined & improved. Exploration of a Road Safety Ambassador program has begun and will be co-designed with our trial schools.

Change is hard, taking time and innovation to shift behaviour and create new habits, however we are firmly committed to safer school precincts across the City of Casey.

Figure 1. Safe Around Schools characters & key message

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Evaluating RYDA's whole school approach to road safety education

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Road Safety Education Limited

Abstract

Road Safety Education Limited's (RSE) RYDA program for high school students has been operating since 2001. In 2020, after extensive review, RSE released RYDA 5.0 – the most significant update to date. RYDA 5.0 took the program from a one-day workshop, supported by additional learning materials to a true whole school approach to road safety learning. Embracing this approach, RSE developed an implementation guide for schools, a series of pre workshop discoveries, updated workshop materials which focused on inquiry learning and personal engagement and a suite of follow-up resources for teachers. A key to successfully implementing the whole school approach was the development and rollout of an ongoing communication plan and close relationships between RYDA program coordinators and school teachers. In 2021, extensive evaluation of RYDA 5.0 designed to measure knowledge retention, attitude shift and intended and practiced behaviour change across time highlighted positive trends relative to earlier iterations.

Background

RSE is the provider of RYDA, an evidence-led best practice program, delivered in Australia since 2001 and New Zealand since 2007. Typically, 45,000 15-17-year-old students from over 650 schools participate annually. RYDA is developed under the guidance of RSE's Advisory Council consisting of globally recognised road safety researchers, educators and psychologists and is evaluated for effectiveness.

Project

RSE works collaboratively with Governments across both countries to ensure RYDA meets best practice guidelines, enhances school-based learning and supports government initiatives. In 2018-2019, RSE worked side-by-side with Waka Kotahi (NZTA) in undertaking an extensive, full program evaluation, commissioning independent research company, New Zealand Council for Educational Research, to review the program documents, resources and delivery.

Project

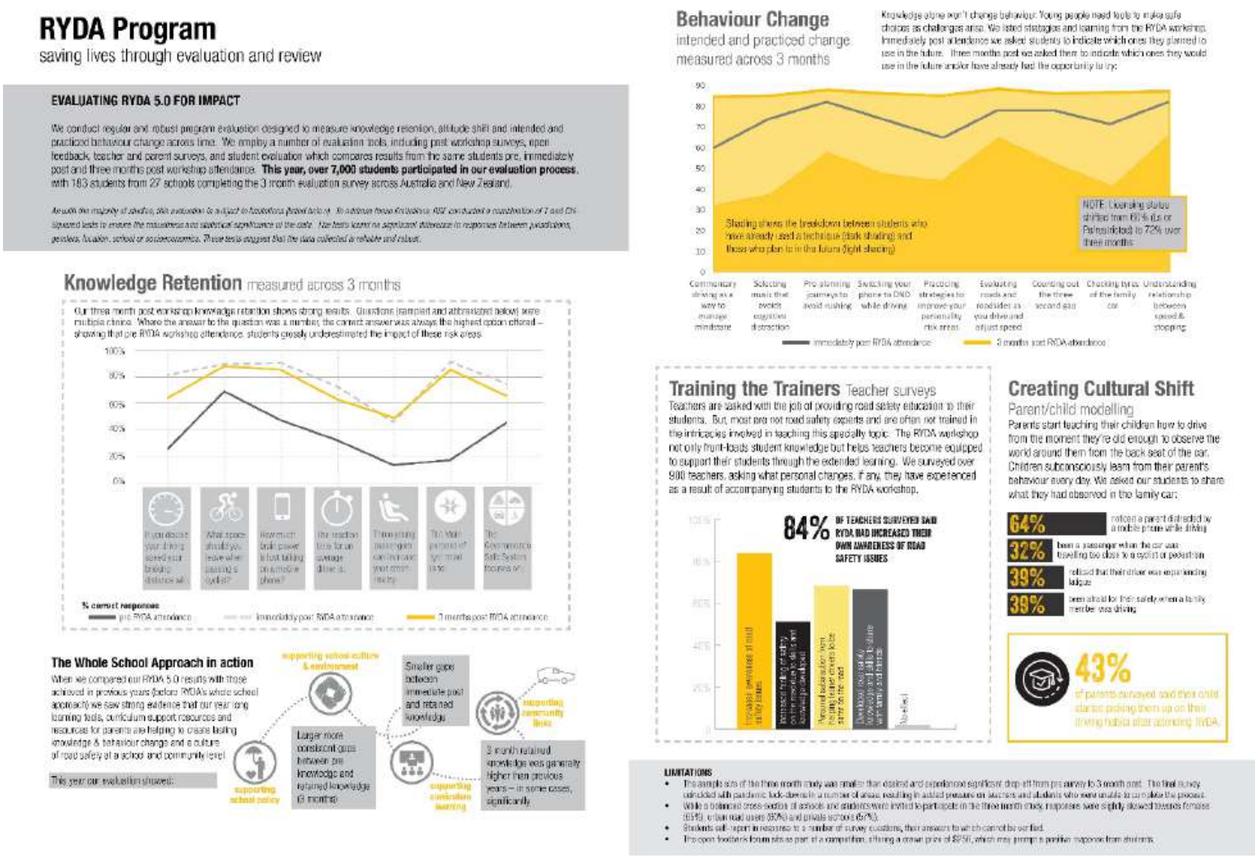
As a result, in 2020, RYDA 5.0, a whole school approach to learning (reflected in school policy, linked to the curriculum and embedded in the school community) was released. *A comprehensive whole school approach is widely recognised as best practice in working holistically to promote student health and wellbeing. By adopting this approach schools can increase engagement with the school community and are more likely to secure sustainable improvements* (Whole School Approach, n.d.).

RYDA 5.0 also supports youth development in social resilience and anticipating and managing risk. It features an engaging workshop with practical demonstrations, a student investigation set against the Safe Systems approach, quizzes and interactive role play. RYDA gives students a unique opportunity to set road safety goals and build personal strategies alongside the friends they will most likely be riding with, as drivers or passengers.

RYDA 5.0 takes teachers through the steps to successfully implement RYDA as a whole school approach – from communicating with other teachers and parents to pre workshop discoveries and follow-up lessons for students. With the use of a comprehensive CRM, RSE extended communications with schools to gather information on student learning, allowing us to adapt RYDA to meet student needs and co-design learning materials. The engagement system maintains regular contact and highlights learning support materials throughout the year.

Evaluation

A 3-stage evaluation showed strong retention of knowledge and uptake in strategies to reduce risk across time. Across all knowledge questions we saw a shift in correct responses from 37% (pre RYDA workshop) to 79% (immediately post workshop) and 72% 3 months later. When RSE compared evaluation results from RYDA 5.0 to those gathered for previous iterations, we saw larger more consistent gaps between pre knowledge and retained knowledge, smaller gaps between immediate post knowledge and retained knowledge and, in many cases, significant increases in retained knowledge. Looking at behaviour change, 81% of students reported they had used at least one of 19 listed strategies and 66% reported to having used more than half.



RYDA Program
saving lives through evaluation and review

EVALUATING RYDA 5.0 FOR IMPACT

We conduct regular and robust program evaluation designed to measure knowledge retention, attitude shift and intended and practiced behaviour change across time. We employ a number of evaluation tools including post workshop surveys, open feedback, teacher and parent surveys, and student evaluation which compares results from the same students pre, immediately post and three months post workshop attendance. **This year, over 7,000 students participated in our evaluation process**, with 183 students from 27 schools completing the 3 month evaluation survey across Australia and New Zealand.

As with the majority of studies, this evaluation is subject to limitations (listed below). To address these limitations, RSE conducted a combination of T and Chi Squared tests to ensure the robustness and statistical significance of the data. The tests found no significant difference in responses between jurisdictions, genders, location, school or socioeconomics. These tests suggest that the data collected is reliable and robust.

Knowledge Retention measured across 3 months

Our three month post workshop knowledge retention shows strong results. Questions (sampled and abbreviated below) were multiple choice. Where the answer to the question was a number, the correct answer was always the highest option offered – showing that pre RYDA workshop attendance, students grossly underestimated the impact of these risk areas.

Behaviour Change
intended and practiced change measured across 3 months

Knowledge alone won't change behaviour. Young people need tools to make safe choices as challenges arise. We listed strategies and learning from the RYDA workshop. Immediately post attendance we asked students to indicate which ones they planned to use in the future. Three months post we asked them to indicate which ones they would use in the future and/or have already had the opportunity to try:

Shading shows the breakdown between students who have already used a technique (dark shading) and those who plan to in the future (light shading)

NOTE: Licensing status shifted from 60% (Ls or Ps/restricted) to 72% over three months

Training the Trainers Teacher surveys

Teachers are tasked with the job of providing road safety education to their students. But, most are not road safety experts and are often not trained in the intricacies involved in teaching this specialty topic. The RYDA workshop not only front-loads student knowledge but helps teachers become equipped to support their students through the extended learning. We surveyed over 900 teachers, asking what personal changes, if any, they have experienced as a result of accompanying students to the RYDA workshop.

84% OF TEACHERS SURVEYED SAID RYDA HAD INCREASED THEIR OWN AWARENESS OF ROAD SAFETY ISSUES

Creating Cultural Shift
Parent/child modelling

Parents start teaching their children how to drive from the moment they're old enough to observe the world around them from the back seat of the car. Children subconsciously learn from their parent's behaviour every day. We asked our students to share what they had observed in the family car:

64%	noticed a parent distracted by a mobile phone while driving
32%	been a passenger when the car was travelling too close to a cyclist or pedestrian
39%	noticed that their driver was experiencing fatigue
39%	been afraid for their safety when a family member was driving

43% of parents surveyed said their child started picking them up on their driving habits after attending RYDA

The Whole School Approach in action

When we compared our RYDA 5.0 results with those achieved in previous years (before RYDA's whole school approach) we saw strong evidence that our year long learning tools, curriculum support resources and resources for parents are helping to create lasting knowledge & behaviour change and a culture of road safety at a school and community level.

This year our evaluation showed:

Larger more consistent gaps between pre knowledge and retained knowledge (3 months)

Smaller gaps between immediate post and retained knowledge

3 month retained knowledge was generally higher than previous years – in some cases, significantly

LIMITATIONS

- The sample size of the three month study was smaller than desired and experienced significant drop-off from pre survey to 3 month post. The final survey coincided with pandemic lock-downs in a number of areas, resulting in added pressure on teachers and students who were unable to complete the process.
- While a balanced cross-section of schools and students were invited to participate in the three month study, responses were slightly skewed towards females (65%), urban road users (80%) and private schools (57%).
- Students self-report in response to a number of survey questions, their answers to which cannot be verified.
- The open feedback forum sits as part of a competition, offering a drawn prize of $250, which may prompt a positive response from students.

Figure 1. RYDA 5.0 evaluation report (Concise Annual Report excerpt)

Conclusion

Our research shows that moving RYDA to a whole school approach to road safety education and prioritising, not only the young people who participate in RYDA but also those who support, teach and surround them has had a significant positive impact on gained and retained knowledge, attitude and behaviour change.

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Reducing Road Trauma in Slip Base Lighting Pole Crashes

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Abstract

Slip base steel lighting poles are used successfully in Australia and internationally to reduce the severity of vehicle/pole crashes. When a vehicle impacts the pole, the pole, which is held in place by three clamping bolts, slips on its base, moves with the vehicle in the direction of impact and also rotates about its centre of gravity, enabling the vehicle to pass under the pole's base. However, recent evidence indicates that there is inherent weakness in the design of the clamping system that has, in some instances, resulted in significant road trauma for people in the vicinity of the crash. This paper outlines Transport and Main Road's analysis of the phenomena and the development and evaluation of an effective counter measure to reduce serious injuries and fatalities.

Background

It is estimated that Transport and Main Roads has over 10,000 slip base lighting poles located on state-controlled roads and that 150 of these poles are knocked down by vehicles each year. Transport and Main Roads has received notification of an incident where a vehicle has impacted a pole causing a clamping bolt from the slip base lighting pole assembly to be ejected and flung through the windscreen of a second vehicle. The pole was located in the median of a four-lane arterial road. The clamping bolt has struck the second vehicle, which was travelling in the opposite direction to the vehicle that crashed into the pole. The bolt struck the driver of the second vehicle, causing significant facial injuries.

Description of Project

Transport and Main Roads has completed a project which analysed the cause and likelihood of clamping bolt incidents and has developed and evaluated an effective counter measure to reduce serious injuries and fatalities. An analysis of knocked down poles was undertaken since the reported incident. The results of the analysis confirm that some clamping bolts do not get recovered from the cash sites, indicating that some bolts at projected a significant distance from the crash sites. In order to eliminate the possibility of the clamping bolts becoming high speed projectiles, a tethering system has been designed to tether the clamping bolts to the impacted pole. The design provides a low-cost easy installation to existing poles without the need to unbolt or remove the poles.

Evaluation and Effectiveness

Evaluation of the tethering design was undertaken in two stages. Static load tests were undertaken at the University of Queensland to confirm tearing mechanism and material type. Crash tests of slip base poles were then undertaken at the Transport for NSW Crashlab with the tethering system in place to determine that poles continue to slip as intended and the clamping bolts are restrained. Tests were conducted in accordance with methodology specified in AS/NZS 3845.2[1] and detailed in the Manual for Assessing Safety Hardware Second Edition published by the American Association of State Highway and Transportation Officials (ASSHTO)[2] for breakaway utility poles. Three tests were undertaken:

- Passenger vehicle (1100C) 50 kph
- Passenger vehicle (1100C) 100 kph
- SUV vehicle (2270P) 100 kph

Figure 1. Crash testing

Conclusions and Next Steps

All three tests proved that the tethering system is effective in preventing the clamping bolts from becoming high speed projectiles and inflicting additional road trauma, while allowing the poles to slip as intended. Transport and Main Roads have developed a standard drawing for the tethering system and has commenced a program of installation of the system.

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Exploring the Relationship between Gender, Sensation Seeking and Traffic Offending

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Abstract

Males have higher rates of sensation seeking when compared with females and are also more likely to engage in traffic offending. This paper explores the relationship between these variables to identify if sensation seeking mediates the relationship between gender and traffic offending. Over 1,500 young drivers from Queensland and Victoria completed an online survey. The results indicate that sensation seeking fully mediates the relationship between gender and transient offending (e.g. speeding) and partially mediates the relationship between gender and fixed offending (e.g. drink driving). This suggests that, while gender is a contributing factor that can not be altered by road safety interventions, it may be possible to target interventions at sensation seeking in order to reduce road offending.

Background

Gender and sensation seeking are two factors which have repeatedly been associated with the higher crash rates of young drivers when compared with older drivers (Bates, Davey, Watson, King, & Armstrong, 2014). Sensation seeking, or the desire to experience new and intense experiences, is associated with traffic offending (Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd, & Kapardis, 2011) with males tending to have higher rates of sensation seeking behaviours when compared with females (Anderson, Bates, & Madon, 2021). Males are also more likely to engage in traffic offending when compared with females (McDonald, Berecki-Gisolf, Stephan, & Newstead, 2020). This paper examines whether sensation seeking mediates the relationship between gender and traffic offending.

Method

Participants in this study were young drivers aged 17 to 25 years who held a provisional (Queensland) or probationary (Victoria) licence. All participants from Victoria were at least 18 years old because this is the earliest that they are able to obtaina probationary licence. Participants completed an online survey that measured socio-demographic characteristics (age, gender, working status, education level and vehicle ownership), sensation seeking (Matthews, Desmond, Joyner, Carcary, & Gilliland, 1997) and offending behaviours. Both fixed offending, where the decision is made to offend before entering the vehicle (e.g. drink driving), and transient offending, where the decision is made to offend during the journey (e.g. speeding) were included.

Results

There were 1,672 participants within this study with 69 per cent being female and a mean age of 19.82 years (sd = 2.05). Most of the sample had completed high school (62.7 per cent) and worked part time (60.6 per cent).

Using the Baron and Kenny (1986) approach, a series of regression analyses were undertaken to identify if sensation seeking mediated the relationship between gender and traffic offending.

Separate sets of analysis were undertaken for transient and fixed offending. The analysis identified that sensation seeking fully mediated the effect of gender on transient offending and partially mediated the effect of gender on fixed offending.

Conclusions

This study makes several contributions; (a) it demonstrates that the link between offending on the road and gender is more nuanced than originally thought and (b) it highlights that there are different types of road offending affected by different factors. These findings have important implications for the development of road safety interventions. While gender is a fixed factor that can not be altered by road safety interventions, it may be possible to use interventions designed to reduce the influence of sensation seeking on road behaviours. For instance, a police-led program for high school students had a greater effect on the driving intentions of individuals with higher levels of sensation seeking (Anderson et al., 2021). Further research is needed to identify if sensation seeking also mediates the relationship between gender and crashes.

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What Vulnerable People? Drive My Life-a community mentoring driving programme.

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Abstract

Drive My Life empowers referral based vulnerable and/or at-risk participants by providing a supportive environment to gain the necessary knowledge and skills essential to obtaining a drivers' licence. There is a real opportunity to deliver a programme aimed at teaching those even with the most limited education, the necessary knowledge and skills to gain their correct licence. Participant goals include employment and educational opportunities, access to goods and services and the ability to connect with friends and family. The programme is not just about getting a licence, it is making safe drivers with a licence and the ripple effect is even more rewarding.

THE NEED FOR DRIVE MY LIFE

There are many reasons why there are members of our community who are unlicensed including (but not limited to):

- Financial costs
- No suitable vehicle to sit a test or learn in e.g.
    - no registration
    - no warrant
    - and/or the family doesn't own a vehicle
- No suitable person to teach them to drive
    - No one who holds a licence in the family
- Lack of education
- Learning difficulties
- Rural isolation with limited public transport options

Southern REAP (Rural Education) delivers the *Drive My Life* programme across Southland, Fiordland and Whakatipu. This fits well with Southern REAP's mission to facilitate opportunities for personal and community growth through life-long and life-wide learning. Southern REAP partners with Road Safety Southland, NZ Police and ACC.

The goal of *Drive My Life* is to empower vulnerable at-risk members of our community by providing a supportive environment for them to gain the necessary knowledge and skills essential to obtaining a drivers' licence through the graduated licence system.

By engaging at-risk participants will lead to greater social inclusion and participation within communities. Drive My Life opens many doors for these vulnerable at risk including:

- Gaining a qualification
- Increased job employment opportunities

- Increased connectivity within family and friends
- Support for those with learning difficulties
- Formal identification gained
- Increased confidence in their abilities which in turn has led to higher educational opportunities
- Positive community connections are developed through the mentoring component.
- Participants mental health and wellbeing improves, as does generational role modelling within families.
- Using a Safe System approach, participants are exposed and use best practice Road Safety tools and resources e.g. Drive Toolkit, 5 Star safety rated cars etc.

Volunteer mentors play a key role, as they are the part of the Drive My Life programme that enables the vulnerable at-risk participant the opportunity to get practical driving hours out on the roads. Mentors have the ability to support the drivers become safer, confident and drive ready for our roads. Mentors partner with participants 1-2 times a week forming strong, positive relationships with them. Mentors are able to encourage participants to develop life skills such as time management, effective communication, and encourage goal setting. All of these skills are transferable into the workforce and wider community.

Quantitative data is collated for all participants including their age, gender, ethnicity, and highest secondary school qualification. As well, statistics recording the number of participants on the programme, the stage they entered, the number that successfully pass, those that resit and those that fail to complete, or withdraw from the programme are recorded.

Qualitative data is also recorded. What does holding NZ Drivers Licence mean to the participant? How has it helped change their employment, education, relationships, mental health and well-being etc. Data is collected through surveys, questionnaires and anecdotally.

In 2021 alone Drive My Life received 736 referrals, 324 participants successfully obtained either a learner, restricted or full licence. 150 participants are still be worked with and 329 are on the waiting list.

Gold Coast Road Safety Plan 2021-2026

R. Wise, Sonny Suharto, Matthew Tilly

City of Gold Coast

Abstract

The Gold Coast Road Safety Plan 2021-2026 (Plan) 'defines the tomorrow' of road safety for the City of Gold Coast (City). The Plan recognises that road safety is everyone's responsibility and the Plan vision is to reduce crashes, save lives and prevent serious trauma on the Gold Coast transport network. The Plan builds on the successes of the Gold Coast Road Safety Plan 2015-2020. The localised Safe System framework of 'Our people', 'Our transport system', 'Our places' and 'Our shared responsibility' has fifty evidence-based actions delivered by the City's dedicated Road Safety team in collaboration with the Gold Coast Road Safety Partnership Advisory Group (PAG). The Plan was endorsed in September 2021(1) and a suite of first year initiatives are currently being delivered in conjunction with a program of 'business as usual' road safety activities.

Purpose of Gold Coast Road Safety Plan 2021-2026

The Plan addresses demographics, road user types, transport infrastructure and considers emerging road safety issues and technology. The Plan provides a brief commentary on how an issue specifically relates to the Gold Coast and identifies actions to address issues. The City's transport system caters for different types of network users with varying demands, experience, and knowledge of our road, active transport, public transport and freight networks. Providing a safe transport system and a positive road safety culture is important to maintaining the Gold Coast as a premier place to live and visit. The Plan contains actions specific to the emerging trend of personal mobility devices to determine how this mode can safely interact with pedestrians, cyclists and vehicles, as well as what measures can be applied to ensure everyone can safely utilise our off-road networks. This Plan supports the trial of a Gold Coast autonomous vehicle(2) to understand road safety perceptions and implications for other road users.

Localised Safe Systems approach and Gold Coast Road Safety Partnership Advisory Group

Vision Zero and Safe System principles inform the Plan to examine road safety improvements for demographics, road user types and transport infrastructure most impacted by fatal and serious injury crashes. Figure 1 describes the Policy framework and highlights intended outcomes. The seven-year collaboration of the PAG provides a professional network of road safety practitioners for information sharing and input into action implementation. The PAG formed during development of Gold Coast Road Safety Plan 2015-2020 and regular membership comprises of the City, the Queensland Department of Transport and Main Roads, Queensland Police Service (QPS), Centre for Accident Research and Road Safety-Queensland and the Royal Automobile Club of Queensland.

Implementation and evaluation

The City's Road Safety team delivers the Plan's actions and has blended skills in road safety engineering and traffic engineering as well as project administration. Current Year One fully funded initiatives include a Pathway Safety Study (and user-conflicts mitigations trial), state funded trial of a video analytics predictive crash analysis tool, a trial of the '50km/h in my street' speed limit awareness wheelie bin stickers, state funded review of speed limits within vulnerable road user activity centres, and youth road safety messaging. A program has been developed for the balance of the actions over the subsequent four years. These are complemented by 'business as usual' road safety activities that include delivery of a communications plan, Drive Safe Speed Awareness Initiative, road safety messaging on variable messaging signs, the Crash Investigation Alliance (in partnership with QPS) and quarterly meeting of the PAG. Monitoring and evaluation of crash data and initiative outcomes in conjunction with the PAG will determine if the City is progressing to meet the Plan's vision and objectives. This provides flexibility to adapt to emerging road safety issues or select more effective actions.

Conclusion

The Plan 'defines the tomorrow' of road safety for the City. Road safety is everyone's responsibility. As such, the City remains as committed as ever to playing its part to improve safety outcomes for all Gold Coast road users, its partners and stakeholders to implement a suite of effective solutions to reduce road trauma on the Gold Coast.

References

- City of Gold Coast. (2021). Gold Coast Road Safety Plan 2021-2026 Transport and Infrastructure Committee Meeting 808 Tuesday 7 September 2021 34-102

(1) City of Gold Coast. (2021). Autonomous Vehicle Trial Route Identification Transport and Infrastructure Committee Meeting 805 Tuesday 13 July 2021 138-152

OUR PEOPLE

Our city is recognised as one of Australia's most active cities, where people of all ages, gender and abilities safely walk, cycle and actively move for leisure, recreation and transport.

Our road users are caring, taking responsibility to understand the road rules and act in a safe, supportive manner.

Highlights

- Evidence based communication strategy: City road safety is everyone's responsibility, encouraging safer road use, safer people and safer speeds.
- Road safety messaging displayed on variable message signs.
- Support the City's Active Travel Program by providing evidence-based, localised road safety information and advice to encourage safe and responsible pedestrian, cyclist and driver behaviours.
- Identify Gold Coast freight, commercial and entertainment precincts that are serviced by alternative delivery modes such as bicycles, scooters, small electric vehicles and emerging alternatives, such as drones, and provide evidence-based road safety messaging to encourage safe riding, driving and operational practices.

OUR TRANSPORT SYSTEM

Our city is connected by an integrated and multi-modal transport system that safely and efficiently moves residents, visitors and commodities. Our transport modes seamlessly connect, making journeys safe, convenient and intuitive.

Highlights

- Move the Safe System approach from theory to practice and provide a sound basis for the future planning and design of road infrastructure appropriate to the relevant road environment.
- Implement road safety network screening tools to prioritise upgrades on our worst performing roads and intersections and emerging crash locations.
- Deliver a legible, safer and more forgiving roadside environment by reviewing existing signage and line marking installations with respect to compliance, proliferation and roadside hazards.
- Support the Accessible and Inclusive City Action Plan 2020–2025 in the provision of safe, convenient and accessible transport infrastructure.
- Continue the delivery of the Drive Safe community speed awareness initiative.
- Investigate how rideables and electric powered bicycles integrate with pedestrians, cyclists and vehicles in on and off-road environments. Implement treatments to improve safety by minimising user conflicts.

OUR PLACES

Our city and its neighbourhoods are purposefully designed considering the interactions of people with land use and transport.

Our streets are safe, comfortable and engaging, and our transport infrastructure is more forgiving of human error.

Highlights

- Undertake a safety focused review of Our Living City Gold Coast Planning Scheme policies and codes to provide improved consideration of safety.
- Investigate road safety challenges in vulnerable user areas on the Gold Coast to inform the Active School Travel programs.
- Review the rural road network to investigate changing road function and road user profile.
- Undertake a review of the City's current Traffic Calming Devices Policy to ensure it aligns with current best practice for local area traffic management (LATM) schemes.
- Advocate for the inclusion of road safety and proactive management of the City's transport network during planning and delivery of major City events.

OUR SHARED RESPONSIBILITY

Our city fosters a collaborative and inclusive approach to road safety.

Highlights

- Continue governance of road safety on the City's transport network with the Gold Coast Road Safety Partnership Advisory Group.
- Advocate that road safety is everyone's responsibility.
- Align the City's approach to road safety with state, national and global road safety strategies.
- Investigate funding opportunities to assist in the delivery of the Gold Coast Road Safety Plan 2021–2026 actions.

Figure 1 Localised Safe System Approach

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Personality, Perceptions and Driving Behaviour: a study of speeding

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Abstract

Traffic infringements are the primary means for responding to illegal driving behavior, with their aim being that of deterrence. Research evidence, however, suggests that there are other factors beyond legal sanctions that may have a deterring influence. To examine factors that may influence the performance of illegal driving behaviours, a conceptual model was developed to consider relationships between personality, perceptions and driving behaviour. The model was applied to low-level speeding behaviour. Using survey data collected between July-August 2019, from over 5000 drivers in Victoria, Australia, this study found that perceptions of enforcement, crash risk, social norms and disapproval and negative personal/emotional affect in many instances mediated the relationship between personality and expectations to speed. The results of this study have value in highlighting factors that may see drivers successfully or unsuccessfully deterred from speeding behaviour. Ultimately, this knowledge has the potential to enhance safety on the roads.

Background

Expanded models of deterrence began to emerge in research in the 1970s (Freeman & Watson, 2009), demonstrating that a multitude of factors may influence the process through which offending occurs, and these factors extend far beyond legal punishments (e.g. Akers, 1990; Nagin & Pogarsky, 2001; Piquero & Tibbetts, 1996). In road safety, expanded models of deterrence have included factors such as concern about crash involvement, social consequences and negative internal feelings. Personality has also been considered (e.g. Machin & Sankey, 2008; Ulleberg & Rundmo, 2003). Much of the using expanded models of deterrence has been undertaken outside Victoria, Australia. Given enforcement practices vary significantly at a jurisdictional level, examining individual jurisdictions can enhance understandings for that jurisdiction. Furthermore, irrespective of jurisdiction, perceptions change over time, and therefore continued research using expanded models of deterrence can provide understandings reflective of current attitudes and circumstances. The aim of this study was to examine the pathways in a newly developed expanded deterrence model, using data collected from drivers in Victoria, Australia.

Method

Figure 1 shows the conceptual model developed for this study. The model shows a series of pathways that may exist between personality, perceptions of enforcement, crash risk, social norms and disapproval and negative personal/emotional affect and behavioural expectations.

To examine the pathways in the model, an online survey, administered through *Qualtrics,* was used. Personality was measured using the Big Five Inventory (John, Donahue & Kentle, 1991; John, Naumann & Soto, 2008). Perceptions were measured using questions adapted from previous expanded models of deterrence research, phrased for the current study. Behavioural expectations were measured by asking respondents how likely they thought it was that they would speed at up to 10km/h above the speed limit in the following 12-months.

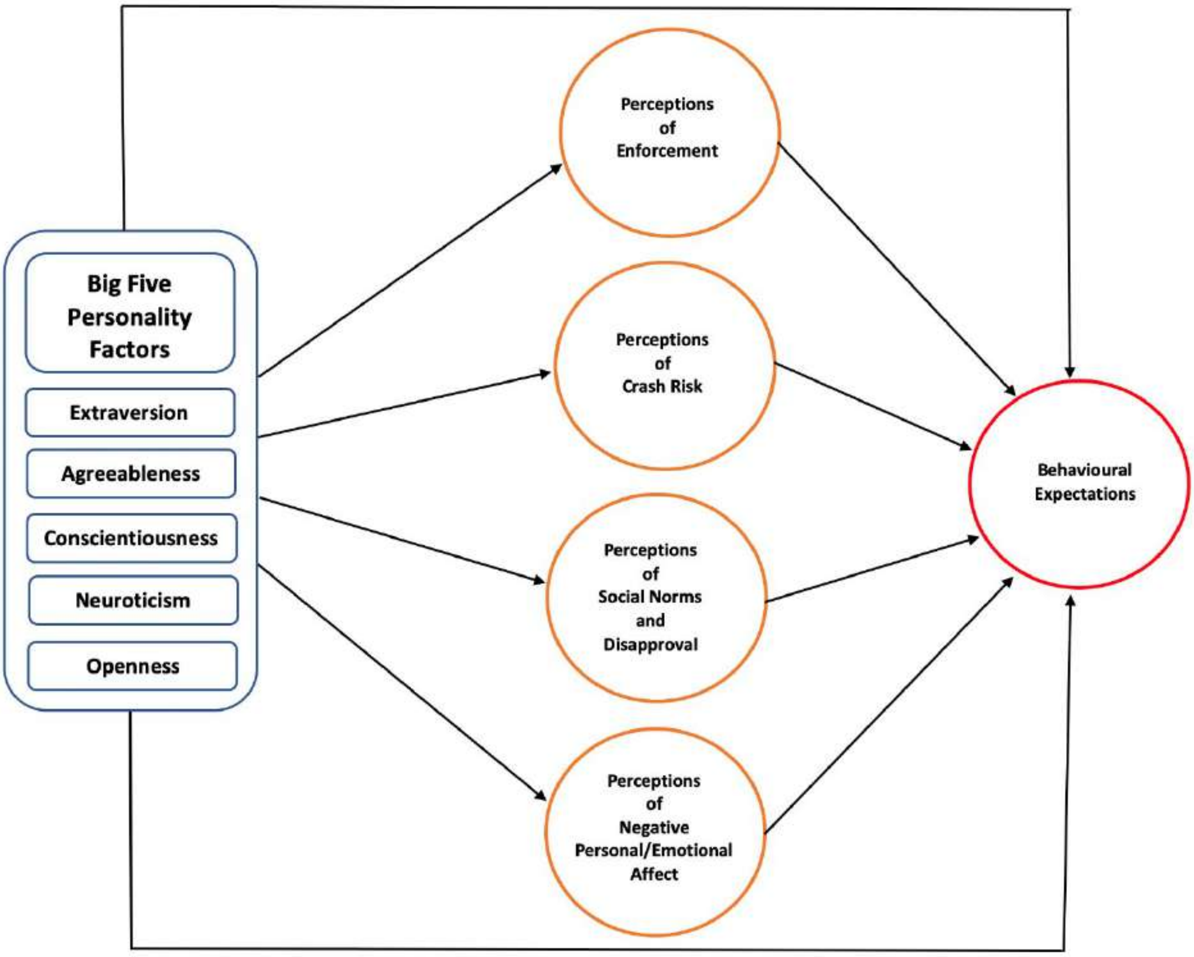

Figure 1. Conceptual model developed for use in this study, showing pathways between personality, perceptions of potential deterrents and behavioural expectations

To be eligible to participate, individuals had to hold a drivers licence in Victoria, Australia. Recruitment was conducted via the *Qualtrics* panel service. The survey was conducted between July-August, 2019. 5,108 responses were collected.

To examine pathways in the model, mediated regression was used (Hayes, 2013). Mediated regression models were run separately for each personality trait across each of the four perceptions factors. Given there are five personality traits and four perceptions constructs, 20 mediated models were run in total. Analyses were undertaken using MPlus Version 8.4 (Muthén & Muthén, 1998-2017).

Results

Table 1 shows the results for the 20 mediated regression models. The results show that perceptions of enforcement, crash risk, social norms and disapproval and negative personal/emotional affect in many instances mediated the relationship between personality and expectations to speed. Together, these results suggest that personality influences the perceptions drivers have towards potential deterrents, which in turn go on to influence expectations to speed. The results also show that there are factors beyond enforcement that may have a deterring influence.

Table 1. Direct, indirect and total effects for the relationship between personality and expectations to speed, mediated by perceptions of potential deterrents

	Expectations to drive at up to 10km/h above the speed limit			
Models where the mediating variable was perceptions of enforcement				
Personality Trait	**Direct Effect[a]**	**Indirect Effect[b]**	**Total Effect[c]**	**Mediation Effect[d]**
Models where the mediating variable was perceptions of enforcement				
Extraversion	-0.02	-0.05**	-0.07**	Complete
Agreeableness	-0.03*	-0.11**	-0.14**	Partial
Conscientiousness	-0.04*	-0.07**	-0.11**	Partial
Neuroticism	0.11**	-0.01	0.10**	Non-significant
Openness	0.03*	-0.06**	-0.03*	Partial
Models where the mediating variable was perceptions of crash risk				
Extraversion	-0.02	-0.05**	-0.07**	Complete
Agreeableness	-0.07**	-0.07**	-0.14**	Partial
Conscientiousness	-0.07**	-0.04**	-0.11**	Partial
Neuroticism	0.09**	0.02*	0.10**	Partial
Openness	-0.01	-0.03*	-0.03*	Complete
Models where the mediating variable was social norms and disapproval				
Extraversion	0.00	-0.07**	-0.07**	Complete
Agreeableness	0.11**	-0.25**	-0.14**	Partial
Conscientiousness	0.08**	-0.19**	-0.11**	Partial
Neuroticism	0.01	0.09**	0.10**	Complete
Openness	0.01	-0.04*	-0.03*	Complete
Models where the mediating variable was negative personal/emotional affect				
Extraversion	-0.02	-0.04**	-0.07**	Complete
Agreeableness	-0.05**	-0.09**	-0.14**	Partial
Conscientiousness	-0.05**	-0.07**	-0.11**	Partial
Neuroticism	0.08**	0.02*	0.10**	Partial
Openness	0.00	-0.03**	-0.03*	Complete

Note: All results presented in the table are standardized
*<0.05; **<.001
a The direct effect is the relationship between the predictor variable (personality traits) and outcome variable (expectations to speed), where the mediating variable (perceptions towards the potentially deterring factors) is held constant. Significant results mean the personality trait under examination has a relationship with expectations to speed.
b The indirect effect is the relationship between the predictor variable (personality traits) and outcome variable (expectations to speed), where values differ on the mediating variable (perceptions towards the potentially deterring factors). Significant results mean the perceptions variable included in the model had a significant effect in the relationship between the personality trait under examination and expectations to speed.
c The total effect is the sum of both the direct and indirect effects and provides an overall quantification of the relationship between the predictor variable (personality traits) and the outcome variable (expectations to speed)
d The effect of the mediating variable (perceptions towards the potentially deterring factors) in the model. Partial mediation means the mediating variable in the model significantly affects the relationship between the predictor and outcome variable, but the direct effect also remains statistically significant. Complete mediation is when the direct effect is not significant, but the indirect effect is, indicating the mediating variable in the model is responsible for the relationship between the predictor and outcome variables.

Conclusions

The results of this study have value in highlighting factors that may see drivers successfully or unsuccessfully deterred from speeding behaviour. This information has the potential to aid in the development of strategies to encourage safe driving, and in turn lead to safer road transportation.

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Estimating Crash Reductions at Signalised Intersections in Connected-Vehicle Environment

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Abstract

Crashes at signalised intersections caused by drivers disobeying red light signals increase the risk of serious injuries or fatalities. A Field Operational Test (FOT), known as the Ipswich Connected Vehicle Pilot (ICVP), sought to understand the capability and impact of connected vehicle technology including the estimated crash reductions of selected safety use cases. A methodology was proposed for estimating the crash reduction for the Advanced Red-Light Warning (ARLW) use case. The methodology was based on a well-known power model which assumes that changes in road trauma can be explained using the change in mean travel speed. This paper outlines the results of an application of this methodology to the FOT data collected over approximately 12 months. The results indicated potential reductions of 9.72%, 5.85% and 3.98% in fatal crashes, serious injury crashes, and slight injury crashes, respectively.

Background

The ICVP FOT introduced C-ITS technology to 350 drivers from 2020-2021 in Ipswich, Queensland. One of the main aims of the FOT was to determine if driver safety increased by enhancing their awareness through a set of safety use case warnings delivered via tailored in-vehicle Human Machine Interface (HMI). This paper focuses on the Advanced Red Light Warning (ARLW) use case.

Method

The treatment group (90% of participants) received audio and visual warnings (HMI-on). Some experienced a 3-month baseline period (data logging without warnings [HMI-off]) followed by 6-months of treatment while the order was reversed for the others. Control participants (10% of participants) never received HMI warnings (HMI-off) but safety event data was collected for analysis. This approach was taken to counterbalance any external influences.

Advanced Red Light Warning (ARLW) and analysis window

ARLW warnings were presented when the vehicle approached an intersection at a speed likely to enter the intersection on a red traffic signal. There were 29 intersections equipped with a roadside ITS station. The mean speed data was analysed within a window that started after the perception reaction time of the first approach warning (at least one second after presented start time) to the end of the Approach zone (see Figure 1).

Crash reduction ratio estimation

To estimate the crash reduction ratio, the mean speed for the HMI-on and HMI-off conditions for ARLW were first determined. Conventionally, Nilsson's power model (Cameron & Elvik, 2010) is applied to a road segment after a treatment is implemented to reduce driving speed. Speeds of all vehicles travelling on that segment, before and after the treatment, were compared to determine the potential crash reduction. In this study, the "treatment" (HMI-on) was applied to any road links within the pilot area when the safety warnings were warranted. To acknowledge the effects of different road environments on participants' driving, the ARLW scenarios were grouped by intersection approach before calculating the mean speeds for HMI-off and HMI-on conditions.

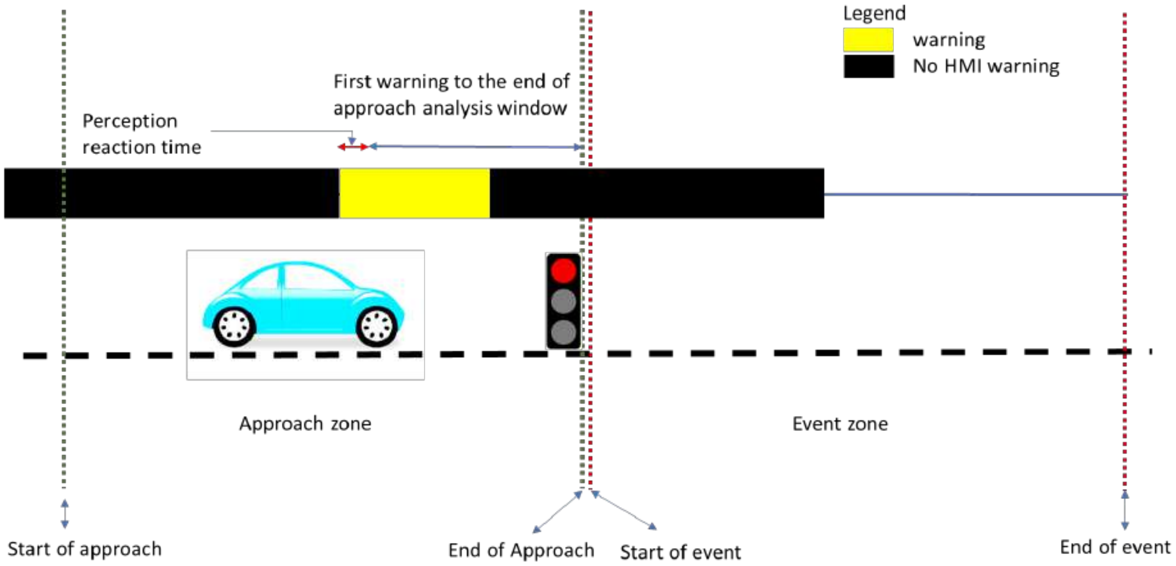

Figure 2. Analysis window for ARLW

A minimum of 30 sets of data were required for each approach speed calculation. For each approach, the mean speeds were bootstrapped and permuted a large number of times to generate crash ratio distributions for HMI-on/HMI-off and the null crash ratio distribution, respectively. Consequently, the two distributions were compared using Wilcoxon signed-rank test.

Results

The mean speeds for all scenarios in the analysis windows were used to estimate the crash reductions for ARLW. As the intersections were on urban roads, the exponents, C, applied in Nilsson's power model, were 2.6, 1.5 and 1.0 for fatal, serious injury and slight injury crashes, respectively. The expected crash reductions were all significant: 9.72%, 5.85% and 3.98% in fatal crashes, serious injury crashes, and slight injury crashes, respectively.

Conclusions

The study results support the potential safety benefits of ARLW. Delivered as part of connected vehicle technology, ARLW was estimated to significantly reduce injury-related crashes in the approach to intersections by 4-10%, based on 100% market penetration of the technology.

Acknowledgments

The Department of Transport and Main Roads (Queensland) provided the data for the current study. This research is funded by the Department of Transport and Main Roads, the Queensland University of Technology, iMOVE Australia, and supported by the Cooperative Research Centres program, an Australian Government initiative.

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The Role of Safe Mobility in the Creation of Liveability

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Abstract

The Safe System (SS) approach to road safety can not only reduce road trauma risk but also, if coordinated with other professional areas, support the design and operation of streets that create liveable communities. In Victoria, the Movement and Place Framework (M&PF) has been adopted to plan a network that considers multiple community needs (Victoria State Government - Department of Transport, 2019). The research project described in this document is a PhD study that analyses the connection between the SS principles and the M&PF, and its potential contribution to the creation of liveability and the achievement of the Sustainable Development Goals (SDGs). The need for a mechanism to facilitate communication between road safety experts and non-expert audiences was identified as one of the main challenges in the SS comprehension and adoption. To close this gap, a digital tool was developed for users to interact with street design and operation parameters, and learn about the impact these decision can have on the how streets are experienced.

Background

Streets are the largest network of public space in cities. Spaces where different types of activities and community needs converge. The need to create streets that make cities active, enjoyable and interesting while supporting their transport function, has resulted in the creation of different classification systems. In Victoria, the M&PF has been adopted to plan for a balance for these two competing functions (Victoria State Government - Department of Transport, 2019). In this context, the M&PF is combined with the SS approach to road safety, in which the main goal is to eliminate road trauma (Commonwealth of Australia, 2021), to create street design guidelines. Though they are expected to work together, a thorough integration is still undergoing. This project explores how the M&PF and the SS, can work in an integrated way, as well as collaborate in the creation of liveability and the achievement of the SDGs.

This PhD is a collaboration between the Monash University Faculty of Art, Design and Architecture (MADA), the Monash University Accident Research Centre (MUARC), and the Victoria Department of Transport (VIC DoT).

Methods and Results

The study began with a literature review that allowed for the identification of the alignment and shared attributes of the SS and the M&PF, with liveability and specific SDGs and targets. Afterwards, the first round of interviews was conducted. It aimed to collect information from road safety experts about the adoption of the SS in the urban context. After a qualitative analysis, it was found one of the main issues experts face is positioning road trauma in the broad agenda. With this information, a frame creation process was completed, resulting in the identification of the critical requirements to communicate the SS, especially its relevance at the personal level to non-expert audiences.

To facilitate the adoption of the SS, a digital tool was developed for users to interact with street design and operation parameters, and learn about the impact these decisions can have. First, the tool went through a calibration phase, consisting of a second round of interviews with street design and liveability experts. Second, it is currently undergoing a validation process including a workshop with potential users.

The calibration phase revealed the SS can set the foundations to the design and operation of a street network that creates liveable areas, especially green and public spaces. Nonetheless, for the process to achieve alignment and integration, different effects need to be considered, not only those related to the transport function of streets, but especially to the place one.

Conclusions

The SS has transformed road safety during the past decades around the world, yet its benefits could go beyond transport setting guidelines to create liveable urban areas. Taking the SS out of the transport silo and creating new connections, could benefit from a holistic strategy to make the M&PF and the SS principles more relatable to the general public. Such approach would not only accelerate their adoption, but also result in a broader understanding of the relevance of street design for life quality.

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The Art of Building Engaging Heavy Vehicle Tool Box Talks

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[a]Monash University Accident Research Centre & [b]National Roadd Safety Partnership Program

Abstract

Tool Box Talks (TBT) are a critical information tool in the transport industry, particularly in improving safety performance. TBT are typically kept to a small and manageable timeframe of 15- 20 minutes and are designed to convey important information and actively promote further discussion. A major issue though is many are developed internally resulting in them not being evidence based or engaging for the workers causing a 'tick and flick' approach. The NRSPP identified this issue and opted to develop 24 light vehicle focused topics. A leader in the heavy vehicle sector requested similar batches be developed for them. Recognising significant differences exist between the heavy and light sectors, the NRSPP took an industry collaboration and design approach to developing 22 topics for this sector. In particular, to resonate with truck drivers the TBT must be drivers talking with drivers, this paper explores the development process, industry buy-in and outputs.

Background

To provide a safe work environment, safety needs to be front of mind. One of the best methods to achieve it is through regular and engaging safety conversations with workers, such that talking about and being safe is standard practice. In many sectors it is good practice to include Work Health Safety on the agenda of every meeting with workers and then to have deeper discussions centred on topics relevant to their day-today work. These deeper facilitated conversations are what are known as Tool Box Talks (TBT) and provide an opportunity to workers and managers to explore key risks, understand them, why they matter and how to mitigate them.

A major issue is that many organisations have developed their own TBT, not all of which are evidence-based and some may be sending the wrong safety message or not occurring at all. Many do not engage or facilitate drivers, or draw on adult learning approaches to transferring knowledge. Recognising this the National Road Safety Partnership Program (NRSPP) established its own series of TBT and recently commenced a Heavy Vehicle Safety Initiaitive funded project to develop 22 Heavy Vehicle Tool Box Talks (HVTBT).

Method

The development of the HVTBT involved four stages including:

- Establishment of an industry working group and skills-based project team which:
    a. Established a Terms of Reference
    b. Agreed on the collaborative development process
    c. Selected 22 topics and industry working nominate to assist their development
2. Content development which consisted of:
    a. Topics aligned into developmental thematic batches
    b. Draft fact sheet led by NRSPP's Monash University Accident Research researcher
    c. Peer review of fact sheet
    d. Finalisation of fact sheet and package

   e. Graphic design by NRSPP's Swinburne University Strategic Communications Interns
   f. Drivers interviewed for video featuring truck driver insights
   g. Finalisation by working group
3. Promotion and release
   a. HVTBT branding and marketing strategy developed by Swinburne University Design Bureau
   b. HVTBT released monthly
4. Evaluation.

Results

The development of the HVTBT was separated into six thematic batches which includes:

1. Driver impairment - distraction, fatigue, complacency and fatigue/distraction
2. Operational – Pre-start checks, loading and fitness-for-duty
3. Mental and physical wellbeing – RUOK, mental health, diet and fitness
4. External factors – road conditions, third parties and environment
5. Driver support – anger, journey management and empowerment
6. Operational – maintenance, tyres, roller over and entry/exit

As part of the HVTBT packages the video is particularly powerful and features truck driver insights in relation to each topic interlinked with evidence-based statsics and research. Drivers enthusiastically embraced the opportunity as did their employers. What became clear was

- there is no stereotypical type of truck driver
- they all love and are passionate about their job
- they want to get home safe
- all of them are eager to learn, listen, share and be respected.

The development of marketing content is under development and will include a brand, promotional videos and 30s promotional marketing video for each TBT.

Further results and conclusion will be provided as part of the oral presentation

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Streets for Tomorrow…Today

Geoffrey Haines[a], Kathryn King[a], Michael Blewden[b], Ali Raja[b], Anna Nord[a] Greer Hawley[a], Matthew Barnes[a], Jena Western[a], Cameron Perkins[a]

[a]Waka Kotahi NZ Transport Agency, [b]Mackie Research

Abstract

The Innovating Streets programme aimed to make it easier and quicker for streets throughout Aotearoa to be made safer, more accessible and liveable. The 2020-21 Innovating Streets Fund supported the delivery of 62 projects across Aotearoa, including 89km of interim street treatments, such as temporary cycleways, safe crossings, parklets, and traffic calming. A mixed-method evaluation showed that Innovating Streets projects can accelerate a range of benefits, including safety outcomes. A focus on continuous improvement, sector capability, and overcoming system constraints is needed to maximise the potential of an Innovating Streets approach. The learning from Innovating Streets – organisational, practice based, and through the evaluation - has been methodically integrated into the 2021-24 Streets for People Programme. This programme is focusing on a smaller cohort of councils, enabling them to become leaders, in partnership with communities, in the use of adaptive practices that accelerate street changes that enhance safety, mode shift, and accessibility.

Background

A rapid transformation of urban environments is needed to create safe, healthy, and liveable towns and cities and meet our emission reduction goals. In response, the Innovating Streets for People programme was established by Waka Kotahi to make it easier and quicker for streets throughout Aotearoa to be made safer, more accessible, and more liveable. Concepts of tactical urbanism and codesign are central to the Innovating Streets approach – the key premise being that temporary solutions, shaped and adapted in partnership with communities, can demonstrate and build support for change, bring forward benefits, and enhance permanent solutions.

The 2020-2021 Innovating Streets Fund was open to Road Controlling and Territorial Authorities and aimed to 1) build sector capability through providing local opportunities to design and deliver Innovating Streets projects, and 2) advance understanding of system barriers to innovative street reform. Projects needed to be delivered within one financial year, and employ the principles of tactical urbanism and co-design (Barata & Fontes 2017; Dube 2009; Lydon and Garcia 2015; Waka Kotahi 2020). Project teams were supported by a Community of Practice, technical resources, and a team of Waka Kotahi advisors.

Innovating Streets Projects

Sixty-two projects installed interim street changes across 32 cities and towns. Project costs ranged from $40,000 to $1 million, with an average of $288,532 per project. Collectively, approximately 89 kms of interim street treatments were installed - temporary cycleways, one-way streets, safe crossings, parklets, traffic calming, and kerb buildouts. Projects ranged in size, from smaller installations, such as reclaiming car parking spaces for outdoor dining in town centres, to larger safe routes to school interventions and low traffic neighbourhoods.

Evaluation and lessons learned

The evaluation, a partnership between Waka Kotahi and Mackie Research, aimed to understand the short-term outcomes of the programme and identify key lessons learnt. The evaluation employed mixed-methods – programme monitoring data, sector surveys (2), in-depth interviews with project staff (15), project case study reports (44), and internal workshops (2).

Project outcomes

While each project had unique objectives, results suggest that Innovating Streets projects can realise a range of benefits in advance of permanent infrastructure, including a reduction in vehicle volumes, safer and more accessible environment for pedestrians, increase in the number of active modes users, and safer and more accessible environment for people on bikes, amongst other reported outcomes. Reductions in vehicle speeds were particularly evident - 29 project teams reported a reduction in vehicle speeds. For example, Tasman's Low-Traffic neighbourhood resulted in average speed reductions of 16km to 26km/hr (32% to 54%) (WSP, 2021). Auckland's Mangere East project resulted in speed reductions of 5-13km/h between treated locations (Auckland Transport, 2021).

Practice learning

The funded projects generated considerable learning about Innovating Streets practice. Key lessons were:

- the need for a clear project mandate and rationale for use of a tactical approach
- appropriate resourcing and a multi-perspective team
- clear communications, which are locally led where possible, and describe the bigger picture
- authentic partnerships with communities, including embracing local talent and services
- materials that align with the surrounding environment and fosters community acceptance
- a shared understanding of success and commitment to using evidence in decision-making

Conclusions, implications, and the 21-24 Streets for People Programme

This evaluation shows that the Innovating Streets approach can enhance design solutions, bring forward benefits, foster relationships with the community, and garner support for more permanent solutions. However, there have also been significant challenges, and significant learning has occurred. There is now a much better understanding, both nationally and locally, of what is required to ensure Innovating Streets projects are successful. The evaluation found that a focus on sector capability, national leadership, community partnership, and overcoming system constraints is needed to maximise the benefits of an Innovating Streets approach.

This learning has been methodically integrated into the new 2021-2024 Streets for People Programme. The new programme is focussing on supporting a smaller cohort of councils to become leaders in adaptive practices that accelerate street changes, in partnership with communities, for safety, mode shift, and accessibility. The 10-year vision is to catalyse a national movement and embed new ways of working so we can achieve streets for tomorrow… today.

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Developing Targeted Safety Performance Indicators for Rural Networks

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Abstract

To assist in the development of local road controlling authority (RCA) road safety strategies in NZ, interactive web maps have been developed to evaluate key road safety indicators for current and future years on the RCA's network. These tools provide a clear picture of existing and future safety performance of a network down to individual intersections and mid-blocks. It has been found that applying the same approach to say a predominantly higher volume urban network versus a lower volume rural network has resulted in lack of granularity in the results between the time periods for the more rural, remote networks. This paper will discuss the variability in the road safety metrics found and investigate how we can gain meaningful road safety outcomes for all RCA networks so they can can target deficient areas and reduce DSIs on their networks.

Background, Implications and Next Steps

With the adoption of NZ's Road to Zero road safety strategy, local road controlling authorities (RCAs) are either updating existing or preparing new road safety strategies for their transportation networks.

To complement road safety strategies, Stantec has developed interactive web map tools so the RCA can view their road network and the factors which have an influence on road safety. Additionally, the information can be provided via an interactive dashboard for simplified and targeted analysis/metrics of road safety performance for current and future years.

The interactive web maps use spatial data which is collected from various sources including RAMM™, together with the reported crash history extracted from Waka Kotahi's Crash Analysis System (CAS) database. Current and future modelled year network volumes for mid-blocks and intersections were extracted from transportation models together with crash prediction models, for the individual elements on the networks broken into urban and rural mid-blocks and intersections, were employed to evaluate key road safety indicators for current and future years.

These tools provide a clear picture of existing and future safety performance of a network down to individual intersections and mid-blocks and assists the RCAs to identify known and emerging areas where crash rates are increasing allowing them to programme their future safety projects in long term plans based upon this robust analysis. The evaluated key road safety indicators include:

- Deaths and Serious injuries (DSIs)
- Personal Risk
- Collective Risk
- Infrastructure Risk Rating (IRR)

These safety indicators when applied to an urban network with higher volumes, provide a clear understanding of where the future crash pressures will be in relation to key intersections and along certain corridors, when presented in the web map. The safety performance can be seen graphically and tracked over time intervals from the existing year to future modelled years.

However, when the same approach is applied to lower volume rural networks, this has resulted in lack of granularity in the results between the time periods modelled for the safety performance measures. This is due to the lower crash reporting rates in remote rural areas, the low volumes that these networks carry and the lower growth rates for the future years where there is minimal change in the land use.

With the expansion of peri-urban areas as a result of development growth, the tool will allow the identification of key routes that either currently perfom badly, or with the predicted growth, will result in an unacceptable level of road safety. In response to this, our team investigated modifying the tool to evaluate the networks using crash vehicle kilometres travelled (VKT) to provide that additional level of detail.

This paper will discuss the variability in the road safety indicator results found and investigate how we can gain meaningful outcomes for all RCAs to reduce DSIs on their networks. Examples will be provided together with a proposal to improve the granularity of the reporting for lower volume rural transportation networks and refine the interactive web map tool.

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Dragons Teeth – Useful perceptual countermeasure or distraction?

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Abstract

Dragons Teeth (DT) are painted markings intended to warn of an approaching speed limit change or crossing. A New Zealand wide DT trial is almost complete, with a focus on speed, driver compliance and awareness, and feasibility. For the interim findings, 85% speeds were 1-5 km/h slower following DT installation, with generally improved giving way behaviour by motorists, although compliance diminished at busier times when school patrols were present. There is also a possibility that DT diminish the conspicuity of the give way line at crossings. Road controlling authorities have provided a range of supporting feedback regarding design, maintenance, and performance. To date, results suggest there may need to be a nuanced approach to the possible use of DT, and the final evaluation will provide further evidence to inform guidance.

Background

In 2019, a trial of 'Dragon's Teeth' (DT) across New Zealand was initiated. Dragon's teeth are painted road markings used to indicate a change, in advance of a speed change and/or to increase awareness of pedestrians crossing. Previous research suggests that perceptual countermeasures such as DT can produce relatively modest speed reductions of 2-6 km/h but may provide important driver cues when used in association with other countermeasures (Elliot et al., 2003; Charlton & de Pont, 2007; Hirsch et al., 2018; Martindale & Urlich, 2010; Wei et al., 2013).

The aim of this study was to better understand the merit of DT in New Zealand through a nationwide trial, with particular focus on speed, driver compliance and awareness, and feasibility.

Method

This paper presents the interim findings (short-term speed, video based road user behaviour, and operational impacts). Later, medium-term speed and simulated road user testing will add to these interim findings and will inform final recommendations for use.

Dragons teeth applications are shown below in Figure 1. Installations in various contexts at 13 locations across New Zealand were completed during 2020-21.

A before/after study design was used, with project feasibility preventing matched control sites. Speed was measured at all sites, and video captured driver behaviour at four school pedestrian crossing sites, with a coding framework used to quantitatively assess any behavioural changes. Feedback from regional authorities provided maintenance, cost, and performance feedback.

Results

Overall, vehicle speeds were 1-5 km/h slower following DT installation. For motorist compliance, there were highly variable results which indicate that individual site characteristics are important, but also that existing video data alone may not adequately capture trends. DT increased giving way to pedestrians on or close to crossing, but possibly less so for pedestrians who were more peripheral to the crossing. Without crossing patrols there was an overall 8% increase in motorists slowing or stopping to give way to pedestrians following DT installation, but with crossing patrols

Figure 1. Dragons Teeth at speed thresholds (left) and school pedestrian crossing (right).

(during school commuting times) motorists were less likely (4-7%) to give way. Overall, drivers were more likely (+6%) to stop *beyond* the give way following DT installation, suggesting that that DT may diminish the conspicuity of the give way line at crossing.

Road controlling authority feedback has been generally favourable but suggest that at some higher speed locations DT may need to be more conspicuous, and long-life markings may be needed to avoid wear. Feedback also suggests that DT may be more appropriate in less busy environments/thresholds where other cues are missing.

Conclusions

A New Zealand wide Dragons Teeth trial has been implemented an interim results suggest overall positive outcomes. However, there may be contexts where Dragons Teeth *worsen* motorist compliance at crossings, suggesting a nuanced approach to their use. A full assessment of performance will be provided in the final analysis.

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Strengthening Speed and Child Restraint Enforcement Capacity in the Philippines

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[a]Global Road Safety Partnership

Abstract

Recent legislative developments in the Philipppines provided opportunities to strengthen existing speed enforcement capacity and build competence in relation to enforcing child restraint use for the first time in this country. The Global Road Safety Partnership's (GRSP) Road Policing Capacity Building programme team worked closely with government and non-government agencies in the Philippines to develop and deliver a series of classroom and roadside theoretical and operational training sessions that resulted in the establishment of a core group of trainers from within local enforcement agencies in the country. This group received initial training as well as ongoing coaching and mentoring support from GRSP to establish a sustainable model of enforcement capability development. Various training methods and curriculum topics are described, noting the importance of supporting in-country partners to determine relevant, context-specific issues according to local needs in the country.

Background

Evidence-based traffic laws are important, but alone, insufficient. Equally important is the need for appropriate implementation, including enforcement, to reduce crashes and trauma. Strengthening enforcement capacity is critical to deterring unsafe road use (WHO, 2017). GRSP collaborated with and supported government and non-government agencies in the Philippines to assist with implementing laws and regulations to combat speeding and non-use of child restraints (CRS).

In 2018, the Department of Transportation, Department of Public Works and Highways, and Department of Interior and Local Government issued Joint Memorandum Circular 2018-001 which clarified that Local Government Units (LGUs) are empowered to lower speed limits and mandated the LTO to develop and disseminate a speed enforcement training module. GRSP was also supporting in-country partners advocating for a child restraint law, culminating in the Philippines President signing the Child Safety in Motor Vehicles Act in February 2019. Through provision of technical assistance, GRSP continued supporting in-country partners to participate in the formal drafting process of Implementing Rules and Regulations and was also requested to build capacity to facilitate effective enforcement of the law.

Purpose of Project

These legislative changes presented opportunities for GRSP's Road Policing Capacity Building team to develop and deliver training to enforcement agencies in the Philippines.

Description of Project

Scoping was undertaken to assess knowledge, resources, and practices to guide curriculum development to address the lack of systematic, best practice speed enforcement training. GRSP worked with in-country partners to establish a core group of national police to receive training via a Train the Trainer method - 45 officers from LTO, Philippines National Police, Metropolitan Manila Development Authority, Pasig City, and Quezon City Traffic Management Offices received training on topics including: Safe System principles, risks of and countermeasures to address speeding, enforcement approaches, deterrence methods, correct evidential use of LIDAR devices, and practical recommendations to conduct effective speed enforcement operations, including development of a Standard Operating Procedure to promote highly visible, intelligence-led enforcement operations in a standardised manner. The core group then conducted district level training, supervised by GRSP, followed by roadside observation and coaching operatons to refine enforcement tactics. Videos of roadside coaching were produced as materials to support longer-term training.

GRSP also developed and delivered training for the LTO on implementation of CRS regulations, focusing on: practical enforcement aspects, safety belts and child restraint checks, preparation of targeted CRS operations (when and where CRS enforcement should be conducted), communication strategies with drivers/parents; and the role of media campaigns to support enforcement.

Outcomes and Conclusion

Short-term outcome: upskilling of a core police group to enable ongoing training. Longer-term outcomes: institutionalisation of best practice speed and child restraint enforcement operations and training in the Philippines. Provided that sufficiently resourced, ongoing training and operations are maintained, the country should be positioned to appropriately enforce child restraint use and monitor speeding and see reductions in free travel speeds, speed-related road crashes and associated trauma. An additional benefit is the provision of a successful case study for improving enforcement practices in a middle-income country context.

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Acknowledgements

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Road Transport Suicide Prevention – Transferable Learnings for Road Safety

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Abstract

The Road Transport Suicide Prevention (RTSP) project was collaboratively delivered by the National Road Safety Partnership Program and Austroads. Suicides on the road system are relatively rare but, like all road trauma, have significant impacts on the system and other road users. Road traffic suicides are particularly problematic for the heavy vehicle industry with drivers placed at risk of death, injury, and trauma. The distress impacts many people, including drivers of other vehicles, passengers, first responders, witnesses and bereaved family members. The purpose of RTSP was to investigate and understand the scope of suicide in road transport and seek to reduce its impact. The project was delivered in four streams and made multiple recommendations, with safe language as a foundational component. Due to the sensitivity of the topic, communications was identified as a crucial element. Whilst focused on suicide, what emerged could be applied to road trauma more generally.

Background

The project encompassed any suicide within the road system and those using it. It considered how suicides by road transport impact workers (including drivers and first responders) and family, and how incidents are measured, reported and communicated. Post-crash care for those affected is an important factor and was also explored.

The project followed an analysis of suicide data provided by Toll Group. This data included 19 incidents reported between 2008 and 2016, reflecting the pattern of Toll's operations and are not necessarily representative of other suicide data. Toll Group shared their research with the NRSPP Steering Committee (on which they sit) and following the presentation, a National Working Group was formed and Austroads committed to providing exploratory funding to identify a path forward to better understand the issue. The outcome of the exploratory research was the formation of the RTSP.

Project Delivery

Considering suicide's complexity and emotional impact on communities, an interdisciplinary approach to this issue was followed, four streams, each with a specific topic, were defined and completed by an expert group.

- Stream 1: Communications and Language – development of evidence-based guidelines.
- Stream 2: Data – identification and analysis of available data sources to understand the problem, trends and optimal identification, classification, collection and reporting.
- Stream 3: Interventions – reviewing past and current efforts, their effectiveness and transferability.
- Stream 4: Research:
  - impact of road transport suicide on third parties;
  - barriers to interventions in relation to road transport suicide; and

- funding for University of Melbourne National Health and Medical Research Council project exploring interventions to suicide in public places.

Results

It was found that suicide remains a significant issue in the transport system, as in the wider community. It is suggested that suicide be considered a type of road trauma, and transport and safety initiatives. This would involve collaboration between various sectors to develop strategies and processes to better inform identification and recognition of the issue, and system approaches to reduce road transport suicide. Strategies and initiatives identified within this project aim to reduce suicide at a broad level. Future directions could aim to adopt a more tailored approach to the transport sector.

It was also found that communication plays an important role in suicide prevention. Studies from a range of disciplines show evidence for various types of communication about suicide to have an impact on suicidal behaviours, such as suicidal ideation, attempts and deaths. While the effectiveness of specific communication types may be difficult to measure, each of these interventions has the potential to contribute to a reduction of road transport related suicidal behaviour. Equally, by creating what is known as ’safe language’ around communications, additional future benefits could apply to road trauma reporting.

Closing

Suicide runs counter to the philosophy of Safe System. As achieving a true vision zero approach requires understanding all fatalities and serious injuries that occur within the road transport system, it is also necessary to address those classified as suicides. To prepare for tomorrow, today’s problems must be understood and underpinned by appropriate data.

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Slower speeds for healthy, liveable and inclusive neighbourhoods

Peter Rodgers[a], Gemma Dioni[a], Charlotte French[b]

[a]Christchurch City Council, [b]GHD

Abstract

Improving safety on local roads in Christchurch is a priority for Council and is also a national priority of the Road to Zero - New Zealand’s road safety strategy for 2020-2030. Road to Zero sets an initial target to reduce deaths and serious injuries on New Zealand’s roads, streets, cycleways, and footpaths by 40 percent over the next 10 years. A significant difference can be made through having safe and appropriate speeds on Christchurch’s roads, particularly in our neighbourhoods. Slow speeds and safer streets is the centre piece of the puzzle to improve liveability and vibrancy in our neighbourhoods, increase transport options and accessibility, and decrease surface transport emissions by helping people to choose healthy lifestyle choices to walk, cycle, scoot and use the bus more. Changing travel behaviours today will lead to transformational changes in how we use our street space in our towns and cities in the future.

The why?

Neighbourhoods are areas where we can make the most difference with slower speeds. Improving safety for vulnerable road users, enables everyone to get where they’re going safely. Reducing vehicle speeds reduces both the likelihood of a crash and the severity of the outcome of a crash. If people feel unsafe, they may choose not to try an alternative mode to vehicles or sometimes they just don't make the trip.

For our elderly residents in particular this can subsequently reduce opportunities for exercise and socialisation. At the other end of the spectrum, children are also sensitive to changes in the urban environment. Most streets are not designed with them in mind, and can be unwelcoming and unsafe for them to travel due to the speed and volume of vehicle traffic.

The more people in the community that walk, cycle or scoot results in an overall reduction in travel by motor vehicles, and a reduction in surface transport emissions. This ultimately allows for re-allocation of space away from vehicles into positive community spaces where local kids can move around together, or even play games; where more connected neighbours can sit on a bench under a tree for a chat and encounter passers-by creating more vibrant places to live.

Research increasingly highlights how physical activity, play and spending time outdoors can push back against the effects of sedentary behaviour and screen time, enhance people’s sense of connectedness, improve physical and mental wellbeing and reduce obesity rates.

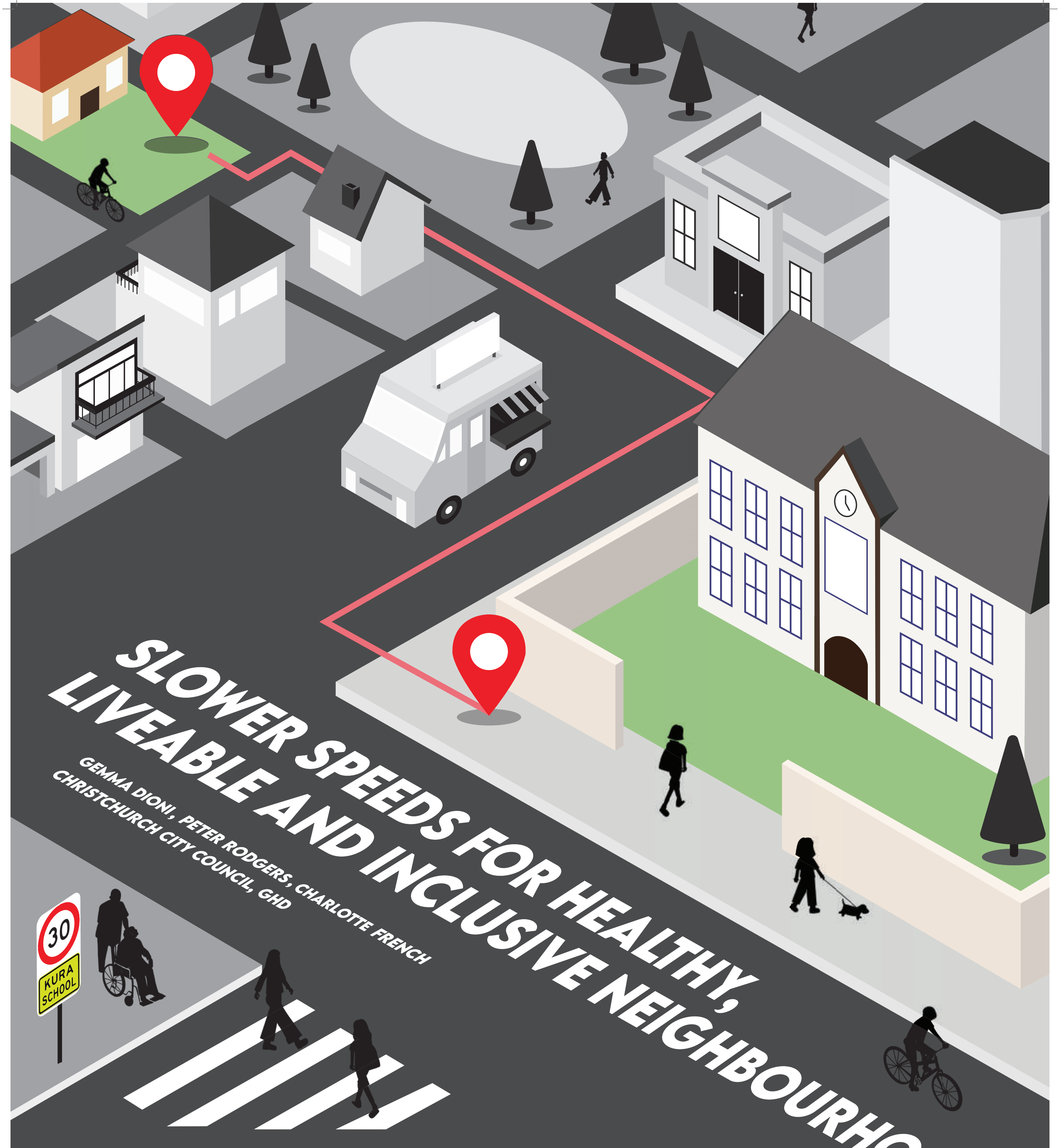
The how.

Five neighbourhoods are to be addressed each year initially over the a three year period. Due to the availability of limited funding, and the often negative public perception around speed changes within communities, it was important to appropriately prioritise the neighbourhoods for slow speed zone treatment. In the past, areas with historically a higher number of injury crashes or higher crash risk would be prioritised above all else, but these areas are also often the most contentious.

In order to create a balanced program, a tool was developed that assess not just safety risk, but also cost factors, and customer feedback elements through a weighted evaluation. The output of this tool is a ranked list of neighbourhoods, with the highest priorities being those that have safety but also take into account the human factors. As we have seen in the initial roll out of these neighbourhoods, using this process has allowed CCC to get the “easy wins” on the ground first and start the journey of slowing our neighbourhoods, paving the way for the wider Speed Management Programme.

The intent of the slow speed neighbourhood program is to reduce speeds on an area wide basis from 50 to 40 km/hr. Changing large areas helps to normalise lower than 50km/h speed limits in an urban environment. For changes to be effective, they need to be understood and supported by the community and a consistent approach will help to reinforce lower speeds across the network.

Initially signs and gateway treatments will be installed on the entry to the slow speed zones. Traffic calming measures such as speed humps are not specifically funded in Council’s Long Term Plan, however the need for these to support the reduction to 40km/h will increase as we move through the prioritised list.



SLOWER SPEEDS FOR HEALTHY, LIVEABLE AND INCLUSIVE NEIGHBOURHOODS

GEMMA DIONI, PETER RODGERS, CHARLOTTE FRENCH
CHRISTCHURCH CITY COUNCIL, GHD

What?

Improving safety on local roads is a priority for Christchurch City Council. Christchurch is taking a Vision Zero approach to road safety, in alignment with the Ministry of Transport's Te Ara ki te Ora Road to Zero Strategy. Everyone should be able to get where they're going safely whether they're walking, cycling, driving, motorcycling or using public transport.

Why?

Slow speeds and safer streets is the centre piece of the puzzle to improve liveability and vibrancy in our neighbourhoods, increase accessibility, and decrease surface transport emissions by helping people to make healthy lifestyle choices to walk, cycle or scoot.
Changing travel behaviours today has the potential to lead to transformational changes in how we use our street space in the future.

How?

In order to create an implementation program, a holistic matrix evaluation tool was created to allow us to prioritise neighbourhoods while considering community desire, wellbeing and liveability alongside safety and cost.
This also re-enforced our ability to deliver a consistent approach to setting speed limits which provides a clearer message to the community.

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Heavy vehicle/agricultural machinery stakeholder engagement road safety strategy

Greg Balind

Griffith City Council

Abstract

Local councils in New South Wales have the ability to form strong collaborative partnerships within their community which allows road safety strategies targeting road trauma reduction to be implemented. As a road authority, the Griffith City Council (GCC) sustains a legal and moral obligation to reduce crashes on roads under its management. An analysis of crash data in the GCC area from 2010 – 2014[1] showed heavy/agricultural vehicle crashes climbed exponentially as a consequence of the region's increased freight task. Council resolved that reducing crashes in this sector was not achievable on their own therefore ongoing engagement with primary production stakeholders and the general community commenced in 2015 to establish and address causal factors associated with heavy/agricultural vehicle related crashes. The outcomes of this new alliance saw the development of educational and long term engineering strategies which significantly contributed to the reduction of heavy/agricultural vehicle crashes across the district.

Background

The Griffith City Council (GCC) area is uniquely located in a large agricultural production district. Due to its relative remoteness, most of the harvesting and transportation of commodities and machinery is done via roads that, historically, were never designed to accommodate large heavy vehicles or oversize agricultural machinery. Due to the sudden growth of primary production commodities in the Griffith Local Government Area - the freight task associated with that growth meant the number of heavy/harvest vehicle related crashes on the road network similarly increased. As a strategy to reduce road trauma involving larger vehicles, a shared responsibility approach to road safety was developed that involved input from industry stakeholders, local government authorities and the general community that sought to reduce the incidents of heavy and harvest vehicle crashes.

Project Description

In an effort to reduce crashes and to address safety surrounding agricultural related vehicles, an engagement and education strategy was commenced that targeted drivers of farm related vehicles, and, non-industry related vehicles that sought to raise awareness of heavy vehicle dynamics and the need for all road users to take a shared responsibility for their safety and the safety of others. To do this, industry stakeholders were provided with statistical evidence that showed a need for a change in the approach to heavy/harvest vehicle road safety was needed. Feedback was therefore sought in relation to:

- what the industry needed/required to make their trips and the journeys for other road users safer
- what could GCC as the road authority do to achieve those requirements
- whether they would be prepared to include road safety into their into their general work culture moving forward?

Figure 1. Heavy vehicle carrying oversized agricultural machinery on a narrow rural road

Outcomes

As a result of the collaboration between stakeholders, other road users and the local government authority – a number of strategies were implemented that focussed on educating heavy/agricultural vehicle drivers and light vehicle drivers on safer conduct when interacting on the road, to have a heightened awareness of their environment that included other road users, and, to accept a greater understanding that all road users have rights when it comes to being on the road network. This was achieved by way of face to face conversations as well as via commercial radio advertising with a message that emphasises positive road user interaction. The project also provided GCC with valuable feedback that is constantly used to forward plan road design/upgrades that are more conducive for use by heavy/oversize agricultural vehicles light vehicles.

Evaluation

Feedback from many of the road users that are subject to this ongoing project confirmed there has been a significant improvement in the understanding by drivers of vehicles of all shapes and sizes on the need to share the road so the safety of users is not compromised. In addition, statistics[1] recorded during the 5 years commencing 2011 show 45 (8.5%) of crashes in the LGA involved heavy vehicles resulting in 3 fatalities and 43 injuries – 13 of which were serious. In comparison, statistics for the 5 years following the commencement of the project (2016-2020) showed 18 (4.7%) of crashes involved heavy vehicles resulting in 1 fatality and 14 injuries – 2 of which were serious therefore a significant reduction was evident.

Conclusions, Implications and Next Steps

The project continues to show that a multiagency approach to road safety has the ability to reduce road trauma - provided an individual person or organisation is prepared to take the lead. As a road authority, the GCC has an obligation to protect the safety of its community and prohibit harm being occasioned to those using the road network. Engagement with and education of primary production stakeholders and the community in general about interacting safely with heavy/harvest vehicles is just one area where positive road safety results are being achieved within the LGA – and beyond. The qualified lessons learned from this project by many road users proves that it is possible for drivers of all sized vehicles to share the road harmoniously. Moving forward, the GCC has (in part) relied on these learnings to review the existing Heavy Vehicle Strategy[2], to plan safer heavy/harvest vehicle transport corridors, and, to understand the needs of road users that will make their journeys more efficient and most importantly – safer.

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Modelling injury severity of bicyclists in bicycle-car crashes at intersections*

Sareh Bahrololoom[a], William Young[b], David Logan[c]

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Abstract

Although numerous studies have been conducted to understand the parameters contributed to bicyclist's injury severity, most of these studies focused on relationship of crash severity with road, environmental, vehicle and human demographic parameters rather than considering the dynamics of the crash. No study investigated the relationship of bicyclist's injury severity with speed and mass of both vehicles. This study developed a modelling framework to investigate the effect of crash dynamic variables such as speed, mass and crash angle on bicyclist's injury severity in bicycle-car crashes at intersections. A combination of Newtonian Mechanics and statistical analysis was utilised to develop this theory. Results of numerical models showed that, kinetic energy of the car before crash and kinetic energy of the bicycle after crash are important parameters affecting the injury severity of the cyclist in bicycle-vehicle crashes. Further, the analysis showed that older bicyclists were involved in higher severity crashes and wearing helmet reduced the injury severity of bicyclists.

Background

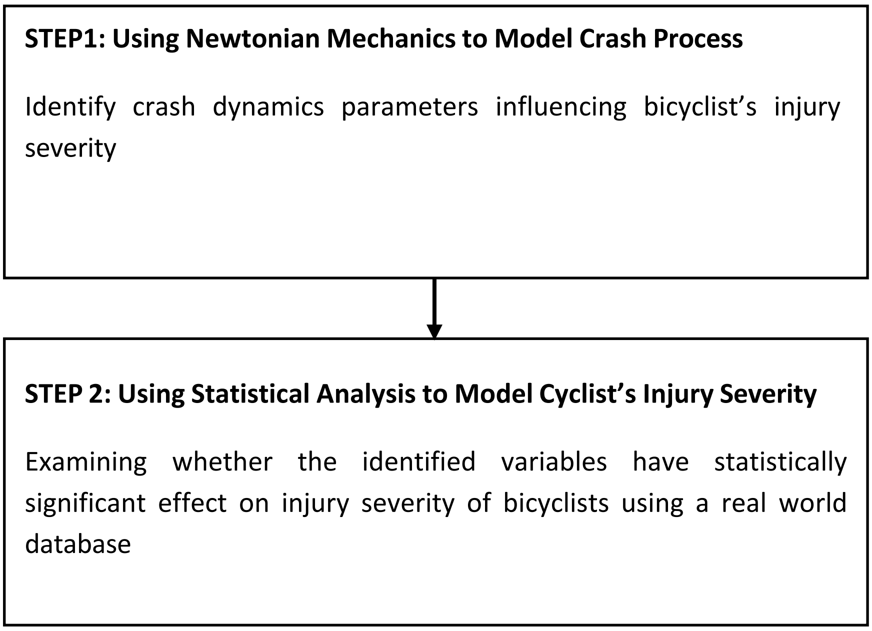
Bicyclists are vulnerable road users, as they are not protected during a road collision. In Australia, between 2014 and 2018, 179 bicyclists died in traffic crashes, which accounts for 3.0% of total traffic fatalities (BITRE, 2019). This figure is likely to increase in future due to the increased encouragement for active transport.

Many studies have been conducted investigating the factors influencing bicyclist's injury severity. Most of these studies investigated the relationship between crash severity and road, environmental, vehicle and human demographic characteristics. Limited number of studies explored the dynamics of the crash to understand how particular crash scenarios led to more severe injury outcome for bicyclist. More in-depth understanding of factors influencing cyclists' injury severity can be achieved through focusing on crash process and crash mechanism in bicycle-car crashes. Studies conducted on car-car crashes showed that crash delta-v and kinetic energy of the crash played an important role in injury severity of vehicle occupants. However, no study was found that explored how dynamics of the crash affect the severity a bicycle-car crash.

This study presented the development of a modelling framework to investigate the relationship of bicyclist's injury severity with mass, speed and crash angle in bicycle-vehicle crash at intersections.

Method

This modelling framework followed a two-step process (see Figure 1). In this process, a combination of Newtonian Mechanics and statistical analysis was utilised. In the first step, Newtonian Mechanics was used to model the crash process and understand the crash parameters influencing injury severity of bicyclist. In the second step, statistical analysis was utilised to model injury severity score (ISS) of bicyclists using the identified parameters, age of the bicyclist and whether the bicyclist wore helmet at the time of crash. The following sub-sections outlined the development of the modelling framework.



STEP1: Using Newtonian Mechanics to Model Crash Process

Identify crash dynamics parameters influencing bicyclist's injury severity

STEP 2: Using Statistical Analysis to Model Cyclist's Injury Severity

Examining whether the identified variables have statistically significant effect on injury severity of bicyclists using a real world database

Figure 1: Model development framework followed in this study

In the first step the crash process leading to injury severity is modelled for a typical bicyclist involved in a bicycle-car crash. It is hypothesised that two components contribute to bicyclist's injury severity (Logan et al. 2019). The primary component is the impact of the car with the bicycle/bicyclist. The secondary impact is the impact of the bicyclist to road surface or other object/s. The modelling process of these two impacts is explained below.

In the second step, a mixed binary logit model is developed to estimate injury severity of bicyclists using the variables identified in the first step. Transport Accident Commission (TAC) crash data was used to develop the model.

Results

Results showed that, higher speed and the mass of the car which was involved in the crash led to higher bicyclist's injury severity as kinetic energy of the crash had directly proportional effect on bicyclist's injury severity. Results further showed that wearing a helmet reduced crash severity outcome for bicyclists. Moreover, bicyclists aged more than 65 years old were associated with higher injury severity score.

Results of the mixed logit model further revealed that crash type variable representing high angle and low angle crashes is a promising way of categorizing crash type in comparison with the traditional crash type definition and crash type definition based on movement direction of the bicyclist and the car involved in the crash. The effect of this variable was found to be random which showed that not only higher angle crashes did not always lead to higher injury severity crashes, however, they were also associated with lower injury severity outcome most of the times.

Results of this study illustrated that the contribution of speed and mass of the car was more significant than the contribution of crash angle in estimating bicyclist's injury severity. However, the effect of crash angle on bicyclist's injury severity needs more investigation as number of crash types included in this study was not sufficient to come up with conclusive results. More studies are needed to better understand the role of crash angle in bicyclists' injury severity.

Conclusion

The developed modelling framework in this study improved the understanding of the factors influencing bicyclist's injury severity in a bicycle-car crash. This modelling framework is also very beneficial to be used as a part of an intersection safety assessment framework to enable conducting a proactive assessment of safety performance of intersections for bicyclists and propose appropriate remedial interventions to improve safety.

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Modelling injury severity of bicyclists in bicycle-car crashes at intersections

Sareh Bahrololoom, William Young and David Logan

Abstract

This study developed a modelling framework to investigate the effect of crash dynamic variables such as speed, mass and crash angle on bicyclist's injury severity in bicycle-car crashes at intersections.

Background

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This modelling framework followed a two-step process. In this process, a combination of Newtonian Mechanics and statistical analysis was utilised. In the first step, Newtonian Mechanics was used to model the crash process and understand the crash parameters influencing injury severity of bicyclist. In the second step, statistical analysis was utilised to model injury severity score (ISS) of bicyclists using the identified parameters, age of the bicyclist and whether the bicyclist wore a helmet at the time of crash.

In the first step the crash process leading to injury severity is modelled for a typical bicyclist involved in a bicycle-car crash. It is hypothesised that two components contribute to bicyclist's injury severity. The primary component is the impact of the car with the bicycle/bicyclist. The secondary impact is the impact of the bicyclist to road surface or other object/s.

Results

Results showed that, higher speed and the mass of the car which was involved in the crash led to higher bicyclist's injury severity as kinetic energy of the crash had directly proportional effect on bicyclist's injury severity. Results further showed that wearing a helmet reduced crash severity outcome for the bicyclist.

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Comprehensive approach on road safety assessment

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Abstract

This paper presents the methodology used in three case studies within the Safe System approach. The main objective of the three studies was to provide technical support in road safety by assessing the safety of selected road sections (in Vietnam, Ecuador and Mongolia), defining and applying a comprehensive approach. In particular, the consultancies provided capacity building, training and advisory services to improve the safety of road users, paying special attention to the safety of vulnerable road users (especially pedestrians). Road safety audits and inspections have been carried out in conjunction with the implementation of the International Road Assessment Programme (iRAP). The main novelty is that, alongside these studies, field surveys have been conducted in order to take into account the views of all road users. Finally, communication and awareness campaigns have been organized, taking into account the participation of the traffic police.

Background

The safe system proposes 5 pillars to achieve the reduction of road accidents and thus the elimination of fatalities and serious injuries. With this approach we present 3 international case studies where road safety has been improved through joint actions on 2 pillars: safe roads and safe road users.

The objective in all cases is common, to improve road safety on selected road sections: on a 150 km stretch of National Road 19 in Vietnam, on urban roads around 15 metro stations in Quito (Ecuador), and on the 5 km semi-urban corridor in Ulan-Bator (Mongolia).

A similar and novel methodology was used in all 3 cases: the International Road Assessment Programme (iRAP) was used in conjunction with Road Safety Audits (RSA) and Road Safety Inspections (RSI) in the different phases of a road's life cycle (current state, design, construction, and commissioning) and communication and awareness campaigns were designed in accordance with the risks identified.

Description of Project

iRAP is an objective evaluation of the safety of a road infrastructure based on certain characteristics of the infrastructure, which rates its level of safety by means of stars (from 1 to 5). Firstly, the physical condition of the infrastructure is assessed through technical activities comprising iRAP baseline assessments and, secondly, star ratings for designs (SR4D), which allows the level of road safety to be improved by incorporating proposed improvements into the design before they are made. SR4D was applied twice: firstly, to evaluate the Star Rating of the design and secondly, to assess the effect of the implementation of the recommended measures following the audit.

The RSA and RSI require a preliminary study based on a review of the plans and surveyed road data. The RSA team then conducted a site visit to gain a clear understanding of the project. Field surveys were conducted to be able to consider the point of view of the different users. This allows the RSA team to understand the context of the plans, the interaction of the scheme with the surrounding and nearby roads, the use of the current facilities, the level of traffic, the type of main road users, etc.

The combination of iRAP and road safety audits and inspections has made it possible to assess the initial safety level of roads, as well as the improvement in road safety resulting from the incorporation in the design of the proposed improvements both before and after they were implemented.

Conclusions

Awareness and communication campaigns were prepared on the risks identified in the road safety audits and inspections, with a special focus on vulnerable road users. In Mongolia, this was complemented by a traffic control campaign. Capacity building on best practices on Safe System infrastructure and traffic management during road works, as well as the findings and recommendations of the RSA, RSI and iRAP assessments have been disseminated and presented through specific pragmatic workshops combining theory and practice.

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Suicide resilience and Auckland's State highway network

Andrew Stevens

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Abstract

As road practitioners we rarely consider suicide risk or need to deal with its consequences as part of our typical roles in managing and designing our transport networks. Suicide is a taboo topic; but it has a very real impact on our transport networks and those who operate them – not to mention the wider social impacts. This topic will explore our experiences of the past decade on Auckland's State highway network as we have worked to protect our most vulnerable people. Waka Kotahi's Auckland Systems Management team does not profess to be the experts in this field, but we look forward to sharing our learnings and open discussion in the hope that one day suicide risk on our transport networks can also have a Vison Zero target in NZ with respect to road trauma.

Raising Awareness of Suicide Trauma on our Transport Network

Vision Zero was first developed in Sweden in the 1990s, promoting that no death or serious injury is acceptable, and places responsibility on road designers to provide a safe system including consideration for human errors. Debated in the 1990's it was not until 2008 that the Swedish parliament adopted "Vision Zero for Suicide".

Although New Zealand has since adopted the Vision Zero philosophy for road trauma, it has yet to take a similar approach for suicides with respect to the transport network despite the annual death toll from suicides being roughly double that of road trauma.

While the magnitude of road related suicide cannot be accurately gauged within NZ it is a part of the picture. But as suicide is unfortunately one of those taboo topics only spoken about in quiet whispers, the part it plays within the transport network is largely ignored.

The Auckland Systems Management Alliance was created by Waka Kotahi to not only operate and maintain the Auckland motorway network but to also to be leaders for the industry.

It was in this capacity over a decade ago that we recognised that suicides and suicide attempts on the network outweighed the number of DSI incidents threefold! This has a significant social impact, yet this challenging social ill is not something we have typically been prepared for as part of our training as engineers. It is unlikely that we will have had any formal training on suicide risk and prevention or had any real exposure to the consequences of our design decisions, so it is unlikely to feature in our design processes as it is barely recognised in our design standards.

While we acknowledge that we are not experts in the field of suicide prevention on our transport networks, we would like to share our experiences and learnings to raise awareness so that you have the opportunity to play a part in making a positive difference in either your next transport design project or in the operation and maintenance of your network.

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Safe System awareness and knowledge – A Victorian practitioners' perspective

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Abstract

Safe System is the approach used to guide road safety in Victoria. Implementation of any road safety approach requires understanding and buy-in from all road safety actors. However, the degree to which practitioners are aware of Safe System has been under-researched. A survey was developed to better understand practitioners' awareness and self-rated knowledge of Safe System. The findings of the survey indicate that whilst 76.2% of respondents reported awareness of Safe System, and rated their knowledge highly, 23.8% of the cohort was unaware of Safe System. The survey results also found that respondents who held a greater knowledge of Safe System were more likely to have applied it within their most recent work. Further, male respondents and those achieving higher education levels were more likely to report awareness of Safe System. The findings of this study will be of interest to policymakers and researchers who are examining the role and application of Safe System.

Background

Safe System is the principal approach to road safety in Victoria (Howard, 2004). Existing research has focused on road users' level of agreement with Safe System concepts (Road Safety Advisory Council - Tasmania, 2016) and more generally examined community attitudes towards road safety (Transport Accident Commission, 2020), but there has not been a systematic investigation of practitioners' awareness or knowledge. The application of Safe System requires buy-in from all road safety actors, and therefore requires all practitioners to be aware of the approach.

The aim of this study is to determine the degree of Safe System awareness and self-rated knowledge among Victoria's road transport practitioners.

Method

A 40-item survey was developed to determine Victorian road safety practitioners' attitudes and perceptions towards Safe System. The survey was comprised of four domains that focused on practitioners' demographic information, practitioner awareness of Safe System, knowledge and perceptions of Safe System and practitioners' experience of implementing Safe System.

Participants were recruited through a combination of industry newsletters, email lists and authors contacts.

Results

The survey was distributed to people who self-identified as being a Victorian road safety practitioner using the Qualtrics platform. In total, 417 completed surveys were recorded.

Of the survey respondents, 50.8% identified as Victorian Government employees, 63.8% were male, with a median age of 45, and a median of 12 years of road transport experience. Over three quarters (76.2%) of respondents reported awareness of the Safe System approach, and 75.1% of practitioners rated their knowledge of Safe System as high to very high (see Table 1).

There was an 8% difference in awareness between government and non-government employees, with 80.2% of government employees having heard of Safe System, compared to 72.4% of non-government employees. A higher proportion of males were aware of Safe System compared with females (66.9%) and higher proportions of respondents achieving post-graduate and undergraduate degrees (79.5% & 83.0%) reported awareness of Safe System, compared with those achieving lower education levels (High school: 55.6%; TAFE/Tech cert: 71.4%; Diploma: 57.1%). There was no difference between practitioners' self-rated knowledge of Safe System and whether the respondents worked for the government (see Table 2).

Age (X^2=52.271, p=0.580), work location (X^2=10.840, p=0.055) and organisational size (X^2=3.277, p=0.513) were not associated with the level of self-rated knowledge of respondents.

However, there was a significant relationship between Safe System knowledge and whether Safe System was applied within the respondent's most recent project/program (X^2=62.229, p<0.000). A greater proportion of respondents rated their knowledge of Safe System as high to very high applied Safe System within their previous project/program compared to those with lower self-rated knowledge.

Conclusions

The findings from this study highlight that almost one quarter of practitioners who responded to the survey were not aware of Safe System. Practitioners were more likely to apply Safe System if they rate their knowledge highly, and thus focusing on improving awareness of Safe System, and providing opportunities for increasing knowledge and understanding among practitioners is important for long-term implementation.

Table 1. Self-rated knowledge level of Safe System compared against employment status

	Very Low and Low n, (%)	**Neutral** n, (%)	**Very High and High** n, (%)
Government	11 (6.6)	32 (19.3)	123 (74.1)
Non-government	9 (6.0)	27 (17.8)	116 (76.4)
Total	20 (6.3)	59 (18.5)	239 (75.2)

Table 2. Awareness of Safe System

	Aware of Safe System (n=318, 76.3%)	**Not aware of Safe System (n=99, 23.7%)**	**X^2**
Work location, n (%)			X^2 (5, N = 417) = 10.840, *p* < 0.055. Cramer's V = 0.055
Urban	64 (82.1)	14 (17.9)	
Inner metro	41 (68.3)	19 (31.7)	
Outer metro	36 (81.8)	8 (18.2)	
Inner regional	23 (69.7)	10 (30.3)	
Outer regional	23 (95.8)	1 (4.2)	
Statewide	131 (73.6)	47 (26.4)	
Organisational size, n (%)			X^2 (4, N = 417) = 3.277, *p* = 0.513. Cramer's V = 0.513
Sole practitioner	15 (71.4)	6 (28.6)	
Small (2-19 employees)	28 (77.8)	8 (22.2)	
Medium (20-199 employees)	33 (70.2)	14 (29.8)	
Large (200-500 employees)	27 (87.1)	4 (12.9)	
Very large (500+ employees)	215 (76.2)	67 (23.8)	
Gender, n (%)			X^2 (2, N = 417) = 11.118, *p* <0.004. Cramer's V = 0.163
Male	213 (80.1)	53 (19.9)	
Female	91 (66.9)	44 (32.4)	
Prefer not to say	14 (93.3)	1 (6.7)	
Highest education level, n (%)			X^2 (7, N = 417) = 28.332, *p* <0.000. Cramer's V = 0.261
No formal education	0 (0.0)	1 (100)	
High school	10 (55.6)	8 (44.4)	
Tafe/apprenticeship	0 (0.0)	2 (100)	
Other TAFE/technical cert	15 (71.4)	6 (28.6)	
Diploma	24 (57.1)	18 (42.9)	
Bachelor degree	137 (83.0)	28 (17.0)	
Post-graduate degree	124 (79.5)	32 (20.5)	
Other	8 (66.7)	4 (33.3)	
Age, n (%)			X^2 (5, N = 417) = 8.553, *p* =0.128. Cramer's V = 0.128
18-25	9 (60.0)	6 (40.0)	
26-35	74 (79.6)	19 (20.4)	
36-45	86 (77.5)	25 (22.5)	
46-55	76 (70.4)	32 (29.6)	
56-65	55 (77.5)	16 (22.5)	
66+	18 (94.7)	1 (5.3)	
Road safety experience (years), n (%)			X^2 (4, N = 417) = 3.693, *p* = 0.449. Cramer's V = 0.449
<1	3 (60.0)	2 (40.0)	
1-5	92 (71.3)	37 (28.7)	
6-10	52 (77.6)	15 (22.4)	
11-15	48 (77.4)	14 (22.6)	
16+	123 (79.9)	31 (20.1)	

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Safer Driver app trial – reducing phone use behind the wheel

Anita McCracken[a], Nikki Palmbachs[a], Brad Chalder[a], Sarah Macaulay[a], Peter DeLuca[b], Bertrand Fontaine[b], Christine van Vliet[b], Patricija Bautrenaute[b], Max Luykx[b], Milad Yavari[b], Prakash Raman[b]

[a]Royal Automobile Club of Western Australia (RAC), [b]Sentiance NV

Abstract

Inattention is a significant cause of road trauma - it was reported as being the primary contributing factor in 17 per cent of road fatalities in Western Australia in 2021 (Road Safety Commission, 2022). RAC, in partnership with Sentiance, an intelligence-driven data science and behaviour change company, developed and tested a Safer Driver mobile phone app. The Safer Driver app used evidence- based research and scientifically validated behavioural change techniques to coach participants to reduce their mobile phone use while driving. Evaluation of the trial showed that the Safer Driver app was an effective behavioural change tool, with users who received coaching demonstrating a statistically significant decrease in mobile phone use when compared to participants given a control version of the app. This trial demonstrates the potential for digital coaching apps to encourage safer driving habits, to help save lives and prevent serious injuries on our roads.

Background

Research has shown a driver who uses a mobile phone is approximately four times more likely to be involved in a crash resulting in hospitalisation (McEvoy et al., 2005). Despite the risks, an RAC survey found that four in five Western Australians admit to using their mobile phone while driving at least sometimes (RAC, 2019).

The Safer Driver app

The Safer Driver app used evidence-based research and scientifically validated behavioural change techniques to coach people to reduce their mobile phone use while driving. The app collected data on three types of phone use: no call handling (manually using a phone and/or touching the screen); hand-held calling (manual handling); and handsfree calling (no physical handling and/or touching the screen after answering).

Based on these insights, the app provided feedback on a user's phone use while driving, and shared facts and tips about the risks of distracted driving. The app set and asked participants to accept personalised driving challenges of increasing difficulty to continually motivate them to reduce their phone use. A control app was developed to enable comparison against the Safer Driver app; the control app only showed a participant's journey (origin-destination) and did not provide any other feedback or coaching.

The trial

In 2021, 814 Western Australians were recruited for a 30-day trial. Through randomisation, 70 per cent were assigned to the Safer Driver app and 30 per cent to the control app.

A 'relative distraction score' was used to measure the change in distraction. This was calculated as the total distraction duration (all occurrences of phone use) over the course of a trip, divided by the overall trip duration.

To evaluate the effectiveness of the app, reductions in phone use for the Safer Driver group were compared to the control group at weeks one and four for each participant included in the full behavioural change analysis. To be included in this analysis, participants had to meet minimum levels of: distraction at the commencement of the trial; number of car trips during weeks one and four; and engagement with the app. After these criteria were applied, 182 Safer Driver app and 86 control app users were included in this analysis.

Results

A statistically significant decrease in the relative distraction score was achieved for the Safer Driver group compared to the control group. While users in both groups had similar levels of phone use at the beginning of the trial, users in the Safer Driver group had a markedly lower score at the end of the trial compared to the control group. In fact, among users who received coaching through the Safer Driver app, distraction reduced by a median of 57 per cent.

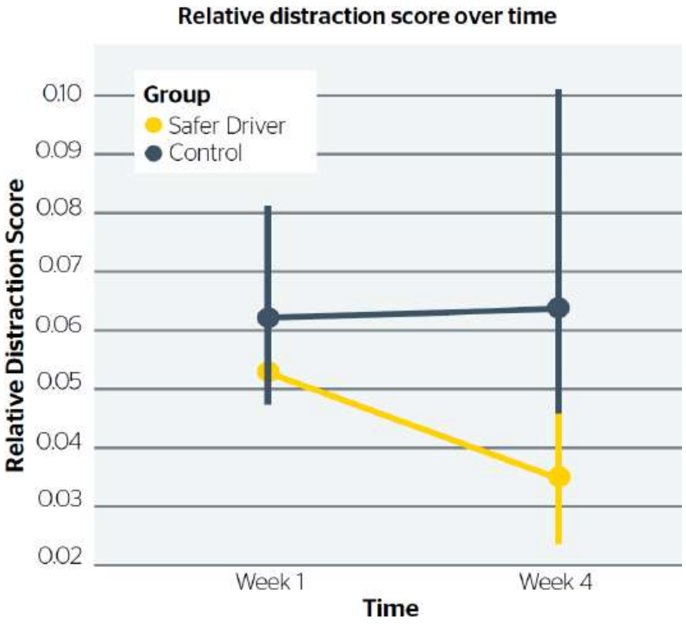

Figure 1. The median relative distraction score for each group at weeks one and four.

Conclusion

Evaluation of the trial showed that the Safer Driver app was an effective behaviour change tool, demonstrating potential for digital coaching apps to help people develop safer driving habits. RAC is exploring potential ways to build on the learnings from this trial to help inform, educate and support positive behaviour change and encourage safer road use.

References

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REDUCING PHONE USE BEHIND THE WHEEL

A driver who uses a mobile phone is approximately four times more likely to be involved in a crash resulting in hospitalisation.

The Safer Driver app used evidence-based research and behavioural change techniques to coach people to reduce their phone use while driving.

One in two users who received coaching reduced their distraction by 57 per cent or more.

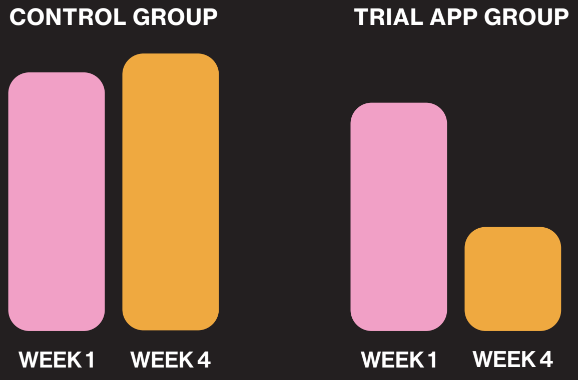
Four in five Western Australians admit to using their phone while driving at least sometimes.

Users who received coaching demonstrated a statistically significant decrease in phone use when compared to users of the control app.

814 Western Australians were recruited for a 30 day trial and assigned to either the coaching app or a control app. 268 participants met the criteria to be included in the analysis.

Inattention is a significant cause of road trauma — it was reported as being the primary contributing factor in 17% of road fatalities in Western Australia in 2021 (Road Safety Commission, 2022). RAC, in partnership with Sentiance, an intelligence-driven data science and behaviour change company, developed and tested a Safer Driver mobile phone app. The Safer Driver app used evidence-based research and scientifically validated behavioural change techniques to coach participants to reduce their mobile phone use while driving. Evaluation of the trial showed that the Safer Driver app was an effective behavioural change tool, with users who received coaching demonstrating a statistically significant decrease in mobile phone use when compared to participants given a control version of the app. This trial demonstrates the potential for digital coaching apps to encourage safer driving habits, to help save lives and prevent serious injuries on our roads.

RELATIVE DISTRACTION SCORE



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Use of Automated Video Surveys on Shared Paths

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Abstract

Shared paths are commonly used to facilitate pedestrian and bicycle movements. Although they are generally safer than roads, crashes and near misses still happen. Different types of interventions have been applied to address conflicts between different path users but remains a lack of evidence regarding their effectiveness. Meanwhile, collecting pedestrian and cyclist data is technically challenging. While pneumatic tubes can measure the speeds and volumes of cyclists reliably, they pose a potential trip hazard to some path users and are not capable of accurately sensing pedestrians. Nor can they identify close interactions between path users. Our project is an attempt to address this by using automated video surveys. To achieve this, 14 videos (24hr each) from six sites were collected and analysed. The extracted data provides insights into areas such as volumes, OD matrices, spatial and temporal patterns, bicycle speeds, give-way compliance, conflict areas. Manual validation has shown that the program's accuracy is above 90%, with some exceptions.

Background

Perth's Principal Shared Path (PSP) network is a series of high standard paths shared between pedestrians and cyclists. They are maintained by the State government and form the backbone of the active transport network within the metropolitan area. Although PSPs are generally safer than roads, crashes and near misses still happen. The most common concerns include cyclists travelling at a high speed and not giving way to pedestrians, especially around train stations. Different types of interventions have been applied to various locations but there is a lack of evidence on their effectiveness. Meanwhile, collecting pedestrian and cyclist data has been technically challenging. While pneumatic tubes can measure the speeds and volumes of cyclists reliably, this technology poses a potential trip hazard to some path users and is not capable of accurately sensing pedestrians. Additionally, they only provide point measurements with no ability to identify spatial interaction between road users.

Purpose of Project

Our project is an attempt to address these problems by applying Video Analytics (VA) to automate the analysis of video surveys for pedestrians and cyclists. VA involves the automatic extraction of data from videos using modern machine learning techniques, especially deep learning. It has only recently become practical because of rapid advances in algorithms and computer hardware. Its non-invasive nature and the richness of extracted information make it an attractive technology for pedestrian and cyclist surveys.

Project Scope

As a pilot, 14 videos (24hr each) from six sites were collected. The UWA VA Pipeline was used for the analysis. It consists of open-source packages and custom-made algorithms.

Results and evaluation

The software was employed to automatically identify and track objects of interest such as pedestrians, cyclists, and vehicles (in the case of level crossings) across each site. The extracted data provided various insights surrounding path user movements, volumes, speeds, give-compliance and conflicts.. Figure 1 shows a sample heatmap produced by overlaying trajectories of pedestrians and cyclists. It provides a visual representation of their movement patterns and highlights areas with the most opposing movements, which are denoted by a bright white light. The software also automatically generates summaries of moments with potential safety concerns. To address possible privacy concerns and meet the human research ethics requirements, the research team has also developed algorithms to blur people's faces.

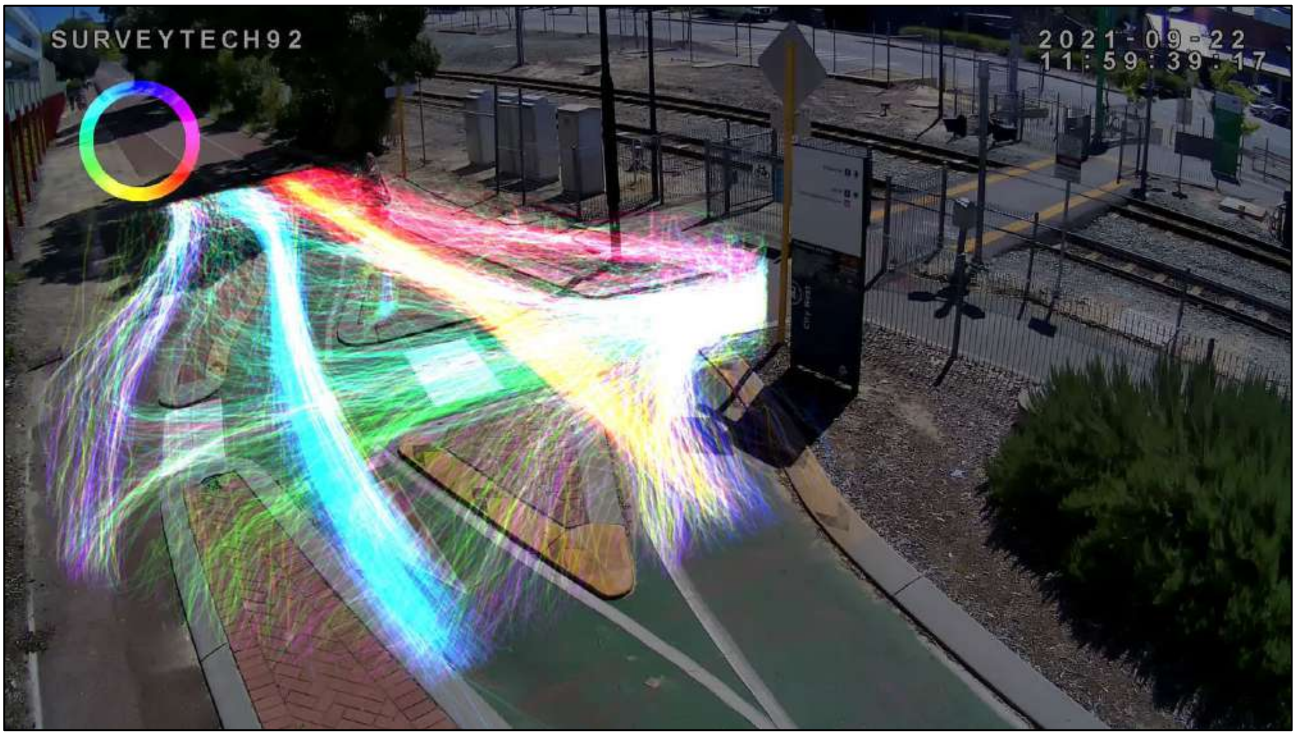

Figure 3 Heatmap of cyclist and pedestrian movements for City West Station Precinct

The team identified a range of safety issues based on the data and suggested possible interventions. Manual validation has shown that the program's accuracy is mostly above 90%, with some exceptions.

Conclusions and Next Steps

Our results have demonstrated that VA is a promising technology for undertaking pedestrian and cyclist surveys and should be used more broadly. Moving forward, there a several challenges for the development team to work on, including resolving detection issues resulting from occlusion and strong shadows.

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CREP Ease of Use Rating: Field Study Comparing Real-World Misuse

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Abstract

Incorrect use of child restraints is a widespread and longstanding problem. Since its inception, the Australian Child Restraint Evaluation Program (CREP) has incorporated an 'ease of use' assessment (Suratno, Brown, & Job, 2008), assuming that child restraints that are easier to use are more likely to be correctly used. However, it remains unknown if CREP 'ease of use' ratings correlate with real-world correct/incorrect use. To examine this, data on correct and incorrect use of child restraints of known make and model from a New South Wales observational study were coupled with published CREP scores. Mean CREP ease of use scores were examined between restraints with and without errors, using independent sample T-tests. There was no significant difference in mean ease of use scores between restraints used correctly or incorrectly. The findings suggest an evidence-based approach is required to identify restraint features with a low propensity for misuse.

Background

Suboptimal child restraint use, particularly the incorrect use of restraints, is a significant and widespread problem that increases the risk of death and injury to child occupants (Du et al., 2010). In Australia, the Child Restraint Evaluation Program (CREP) provides consumers with information about the dynamic performance of restraints available on the market, as well as an ease of use rating (Leavy, Brown, Paine, & Griffiths, 2010). There is a broad long-standing assumption that ease of use is linked to propensity for errors given that an easier to use restraint might be more likely to be used correctly. Ease of use is assessed in CREP based on the packaging, labelling, instructions, restraint installation/removal and securing/release of the child. Although this measure provides a mechanism to compare restraints, it is unknown whether there is any relationship between CREP ease of use ratings and misuse observed in the real world. Therefore, this study aimed to examine CREP ease of use ratings between restraints used correctly and incorrectly in the real world.

Method

This study used data collected from a field-based observation study. Restraint practices of randomly recruited children aged 0 – 12 years were assessed as they arrived at schools, preschools/childcare centres and long daycares across New South Wales, Australia. Observations conducted by trained researchers determined the presence of any error and any serious error in child restraint use and recorded the child restraint make and model. Published CREP ease of use scores (Child Restraint Evaluation Program, 2022) including overall and subcomponent scores were matched to identified restraints observed in the field. Independent samples t-test was used to determine if the CREP ease of use scores significantly differed between child restraints used correctly and incorrectly.

Results

A total of 190 child restraints were identified by their make and model. Four restraints had missing restraint use data and were subsequently excluded. Therefore, 186 child restraints were included in the analysis. Seventy-one restraints were being used rearward facing, 102 were being used forward-facing, and 17 were being used as booster seats.

No significant difference was observed in the five ease of use measures or overall mean CREP score between restraints used correctly or with any error, see Figure 1 below.

Table 1. Mean overall and component CREP Ease of Use Scores for restraints used correctly and those observed with an error. The maximum Ease of Use Score is 5.

	Mean No Error	Standard Deviation No Error	Mean Any Error	Standard Deviation Any Error	t	df	p-value
Overall CREP Score	2.89	0.58	3.03	0.58	-1.18	184	0.24
Instructions	2.70	1.02	2.94	0.86	-1.37	184	0.17
Labels	2.5	1.11	2.78	1.03	-1.32	184	0.19
Packaging	2.47	1.14	2.64	1.06	-0.82	184	0.42
Securing Child in Restraint	2.47	0.94	2.76	1.01	-1.45	184	0.15
Securing Restraint into Vehicle	1.87	0.68	1.65	0.74	1.5	184	0.14

Similarly, no significant difference was observed in the five ease of use measures or overall mean CREP score between restraints used correctly or with any serious error, see Figure 2 below.

Table 2. Mean overall and component CREP Ease of Use Scores for restraints used correctly and those observed with a serious error. The maximum Ease of Use Score is 5.

	Mean No Error	Standard Deviation No Error	Mean Serious Error	Standard Deviation Serious Error	t	df	p-value
Overall CREP Score	2.99	0.57	3.03	0.59	-0.43	184	0.67
Instructions	2.83	0.91	2.95	0.88	-0.91	184	0.37
Labels	2.71	1.02	2.74	1.07	-0.21	184	0.83
Packaging	2.68	1.13	2.57	1.04	0.67	184	0.51
Securing Child in Restraint	2.67	0.97	2.74	1.03	-0.45	184	0.66
Securing Restraint into Vehicle	1.67	0.68	1.69	0.77	-0.23	184	0.82

Conclusions

The results of this study indicate that the ease of use protocol used in CREP may not differentiate child restraints by their propensity for misuse. Further work is required to identify evidenced-based features of child restraints with a low propensity for error to drive the development of effective ease of use protocols.

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Road environment factors associated with motorcycle crashes in Victoria, Australia

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Abstract

This purpose of this study was to investigate motorcycle crash risk factors associated with the road environment on urban and rural public roads in Victoria (Australia). The study used a case-crossover design to investigate environmental risk factors conducted in conjunction with a population-based case-control study which investigated rider, vehicle and trip risk factors. Case sites were crash locations where a motorcycle rider was injured (hospital admission). Control sites were locations on the route of the motorcyclist prior to the crash, matched for the presence of an intersection (or midblock) and a curve (or straight). A detailed set of site characteristics was assessed and recorded at all sites. A number of road environment factors were significantly associated with injury crash risk, including those related to the road surface and curve geometry.

Background

Motorcyclists are over-represented in road trauma statistics; less than 1% of all distance travelled on Victorian roads is by motorcycle or scooter (ABS, 2016; Allen, 2016), yet about 20% of those seriously injured in 2018-19 were motorcyclists or pillions (Source: TAC). While traditional crash investigation methods can highlight possible causes, a case-crossover study can identify risk factors controlling for exposure characteristics of the road environment or infrastructure. We are not aware of any previous case-crossover study that investigated road environment related risk factors for motorcyclist crashes in Australia. We therefore aimed to investigate risk factors associated with the road environment for non-fatal motorcycle injury crashes in Victoria. An investigation of rider, motorcycle and trip-related risk factors from this study has been reported previously (Allen et al. 2019).

Method

Selection of case and control sites

This study used a case-crossover design conducted in conjuntion with a population based case-control study (Day et al., 2013). Cases were 191 sites of a recent motorcycle (or scooter) injury crash on a public road within 150km of Melbourne where an adult rider was admitted to one of 14 study hospitals. One or two control sites per crash site were selected from the rider's route. Control sites were matched to the case site by the presence of an intersection (or midblock) and curve (or straight road). In total, 188 crash sites (47 straight midblocks, 34 curved midblocks, 107 straight intersections) were included in the analysis. Only 3 crashes occurred at curved intersections; these were excluded due to low numbers.

Data collection and analysis

Each case and control site was inspected by a trained crash investigator. Detailed road and environment characteristics were measured at all sites, including intersection type, road and shoulder surface characteristics, traffic management devices, speed limit, advisory signs, roadside kerb and barrier types, and curve geometry. Three separate conditional logistic regression analyses were conducted to identify crash risk factors for intersection, midblock straight and midblock curve locations.

Results

Table 1 shows the road/environment characteristics associated with crash risk, by location.

Table 1. Road/environment characteristics associated with crash risk, by location type

Location	**Road/environment characteristic**		**Odds ratio (95% confidence interval)**
Straight Midblocks	Sudden change in road surface	No Yes	Reference **16.05 (1.38-185.98)**
	Buildings present	No Yes	Reference **14.03 (1.07-184.24)**
Curved Midblocks	Curve radius	Smallest radius of curve	**0.97 (0.95-0.99)**
Straight Intersections	Pavement integrity	Intact Cracked	Reference **3.62 (1.50-8.75)**
	Type of carriageway separator	None Physical barrier Paint, grass, paved, gravel, low level landscape	Reference 0.69 (0.32-1.48) **2.67 (1.05-6.82)**

Crash risk factors differed by crash location. Road surface characteristics were associated with crash risk on straight midblocks and at straight intersections. The presence of buildings increased risk on straight midblocks, while sharper curves were associated with increased risk on curved midblocks. Crash risk was highest at straight intersections with paint, grass, paved, gravel or low-level landscape medians compared to no medians or physical barriers.

Conclusions

This is one of the first reported applications of a case-crossover design to investigate road environment risk factors for motorcyclist crashes. Several road environment factors were found to be associated with increased crash risk, including characteristics of the road surface, road geometry and the built environment. Many characteristics were not associated with crash risk; these will be identified in the presentation. Findings from this research will ultimately be useful for road safety stakeholders to improve the safety of the road environment for motorcyclists through new countermeasures or highlighting areas where more research or evaluation is needed.

Acknowledgements

The case-control study from which this data was sourced was funded by the Australian Research Council (LP110100057), VicRoads, the Transport Accident Commission of Victoria, and the Victorian Government Department of Justice, with in-kind support from Victoria Police, Victorian Automobile Chamber of Commerce. Ambulance Victoria provided daily crash notification and location information. We thank the MICIMS full-time project team (Geoff Rayner, Josie Boyle, Rob Jackel) as well as all field-based researchers, project research nurses and research assistants.

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Survey of off-road motorcycle riders in Victoria, Australia

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Abstract

A significant proportion of serious injury motorcycle crashes in Victoria occur in off-road areas. To help inform future research and safety strategies, an online survey of adult off-road motorcyclists was conducted. The most prevalent age groups were in the range 40-54 years, and 70 percent reported at least 10 years off-road riding experience. The most popular riding areas were single track or natural terrain, followed by double track or unsealed roads. While 70 percent of riders agreed that off-road riding is a risky activity, 85% agreed that "I put safety first". Wearing rates of helmets, gloves, goggles/visor and boots were all high, but rates were lower for other types of protective gear and lower overall for riders aged under 20. Eight percent of riders reported a serious injury crash in the past 3 years, with half of these occurring on a double track or unsealed road.

Background

Motorcyclists are among the most vulnerable road users in Australia and internationally. While fewer motorcyclist fatalities occur in off-road than on-road areas in Victoria, it has been estimated that between one third and one half of all motorcycle serious injuries occur in off-road areas (VAGO 2011, VISU 2020). However, very little is known about the characteristics of off-road riders, their riding exposure, patterns and factors that contribute to serious injury crashes. To this end, a survey of off-road riders in Victoria was undertaken to improve our understanding of these factors.

Method

Over 1,500 Victorian motorcyclists aged 16 years or over who had ridden off-road in the past 3 years completed an online survey during 2021. Survey questions included rider demographics, off-road riding experience and patterns, safety related attitudes, injury crashes, and use of protective clothing.

Results

Rider demographics

Over three quarters of participating riders were aged 30 years or older (Figure 1), and 95 percent were male. Over 80 percent had a full motorcycle license and about half indicated at least 20 years off-road experience. Over half of riders resided in a major city (Table 1).

Location and types of riding

The most prevalent areas ridden (at least most of the time) were single track or natural terrain in state forests or parks (55%), followed by double track or unsealed roads in state forests or parks (50%), farms (11%), private property (8%), motocross tracks or dedicated venues (7%), and public land in residential areas (5%). Over 80% indicated most of their off-road riding was in a group.

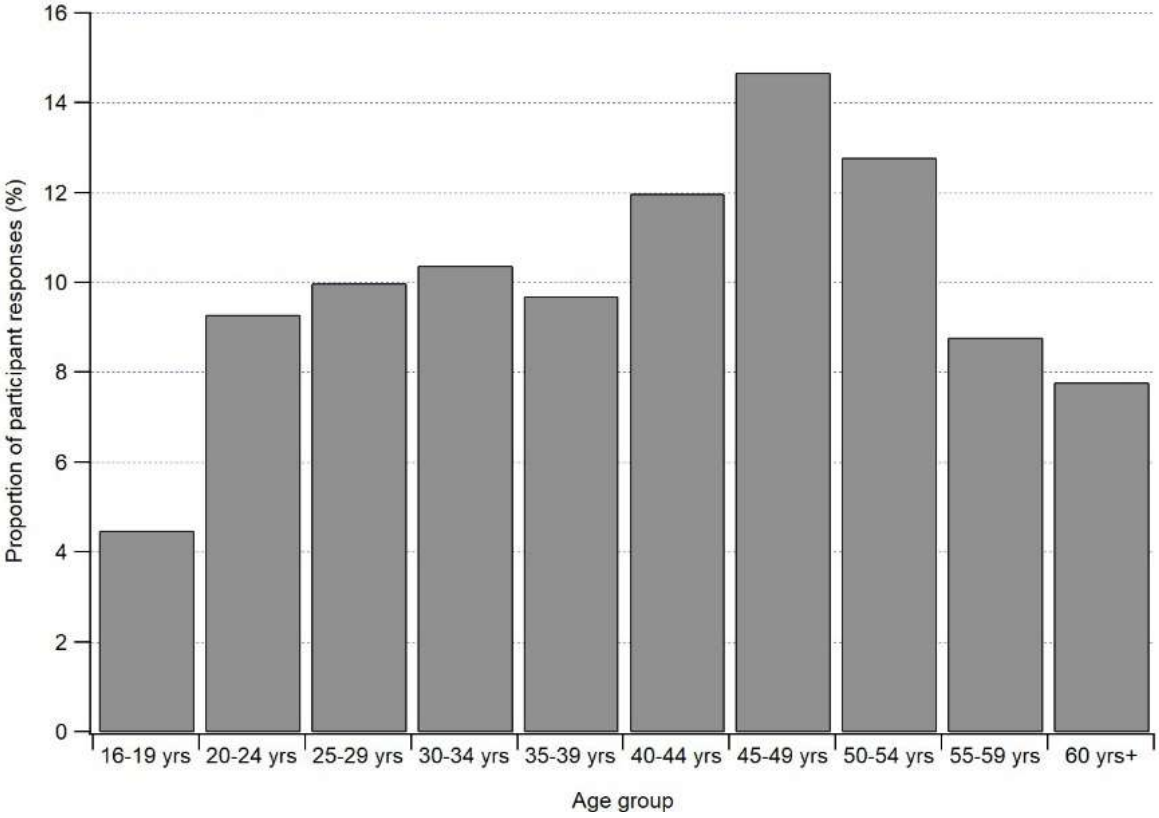

Figure 1. Age distribution of off-road rider participants

Table 1. Characteristics of off-road rider participants

Characteristic	n (%)
Residential remoteness (ARIA)	
Major city	852 (56)
Inner regional	546 (36)
Outer regional / remote	120 (7)
Riding location	
Within 10km of home	131 (8)
Within 50km of home	677 (39)
>50km from home	918 (53)
Off-road riding experience	
0-5 years	224 (18)
5 to 9 years	173 (11)
10 to 14 years	219 (14)
15 to 19 years	144 (10)
20 years or more	763 (50)
Motorcycle type used (primary)	
Enduro or trail	1054 (69)
Adventure or touring	222 (15)
Motocross	175 (12)
All other	40 (4)

Protective clothing use

Wearing rates were high for helmets (99%), gloves (95%), boots (92%) and goggles/visor (86%). Other protective clothing had lower wearing rates of between 43% (roost guards) and 57% (shoulder/elbow armour). Riders aged 16-19 had the lowest rates of protective clothing use.

Attitudes to risk and safety

While over 70 percent of riders agreed that "off-road motorcycling is a risky activity", over 85 percent agreed with the statement "I put safety first".

Injury crashes

Sixty percent of participants were injured while riding off-road in the past 3 years. Eight percent indicated at least one serious injury (attended hospital for up to 1 day), of which half occurred while riding on a double track or unsealed road in a state forest or park, and less than 20% while riding on a single track or natural terrain.

Conclusions

There is a paucity of research regarding off-road motorcyclist exposure, risk and safety. Survey findings showed that off-road riders were generally older, male, very experienced, rode in groups, and that protective clothing use was less amongst younger riders. A high proportion had sustained an injury while riding, and the most prevalent riding area for those seriously injured was on a double track or unsealed road in a state forest or park. This is the first survey of its kind in Victoria and represents and important, early step to developing injury prevention countermeasures for off-road riders.

Acknowledgments

The survey was part of a Department of Health and Human Services (DHHS, Victoria) funded project aimed at developing a new off-road motorcycle safety campaign, following a request from the Coroners Court of Victoria. We are grateful for input provided by the DHHS off-road motorcycle reference group members during survey development, and all off-road rider participants.

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Smart Routine Real-Time Monitoring of Wire Rope Barriers

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Abstract

Wire rope safety barriers reduce the risk of death and injury from road accidents, but require regular visual and physical inspections to ensure the correct tension is maintained. To reduce inspection costs and provide quicker information, Viotel has developed a Smart barrier monitoring system. Monitoring units can be installed in under 5 minutes using a rolling lane closure, and provide hourly measurements of wire rope tension as well as real-time information about significant impacts on the barrier. Solar panels and batteries are used to power the units. Trials of this system in Australia/New Zealand have demonstrated the effects of ambient temperature on barrier tension with diurnal and seasonal variations. Impacts have been detected using vibration monitoring and in some cases the resulting tension drop due to impact damage has been quantified. The real-time data of flexible barrier condition can be used to prioritise and schedule maintenance.

Background

Wire rope safety barriers reduce the risk of death and injury from road accidents. However, these barriers should be maintained as per manufacturer specifications in order for them to provide maximum safety benefits. Specifically, any damage/degradation resulting in low tension must be rectified so that subsequent impacts are managed according to design. Currently, this requires frequent visual inspections for damage and annual/bi-annual physical tension checks with traffic management, which impose a significant cost.

Method

To reduce inspection costs and provide real time information on barrier status, Viotel has used the latest IoT technology to develop an automated asset condition monitoring system to make wire rope and other road barriers SMART. The stations are small, inexpensive and the patented design allows rapid easy installation with a rolling lane closure. Barrier vibrations are continuously measured to detect impacts, which are reported within a minute. In normal operation (no impacts), the combined tension of two wire ropes is reported hourly. A small integrated solar panel and internal rechargeable battery provides power. Low-power Cat-M1 protocol is used for communications within the mobile phone network, and a LoRa/satellite approach may be used in remote areas. GPS is used to determine location daily, providing additional inventory information for asset owners.

Only a single monitoring unit is required for each barrier. The modern types of flexible barriers have parallel ropes that do not cross each other. This design means that tension is evenly distributed along the barrier, allowing a reliable measurement of tension at any single point along the barrier. Furthermore, vibrations from impacts propagate efficiently along the wire rope; a vehicle impact at one side of a barrier may be easily detected at the other side of the barrier, even if the barrier is 700m long.

Hundreds of units have been installed on flexible barriers in four major jurisdictions of the ANZ region in order to gather real-world data on barrier performance and practicality of this IoT monitoring approach.

Results

Australian trials of the wire rope monitoring units over the period Sept 2021 – March 2022 have demonstrated:

- the effects of temperature on the wire rope tension: the hotter the temperature, the more the rope expands between fixed end-points and drops tension. These effects are observed as a diurnal tension variation with a seasonal change.
- GPS and vibration data is effective at detecting any tampering or theft of the devices in an unannounced test by the maintenance contractor
- vehicle impacts, and in some cases the resulting tension drop, are clearly detected, with minimal false alarms
- the small 0.9W solar panel, mounted vertically, is sufficient to power the monitor even for hourly communications

Conclusions

IoT technology appears to have lowered costs and power consumption to the level where wide-scale monitoring of every wire rope barrier is possible. This type of monitoring is useful to gain real-time information about the tension of flexible barriers in order to schedule and prioritise maintenance, and has also been adapted to hard barrier and crash cushion monitoring.

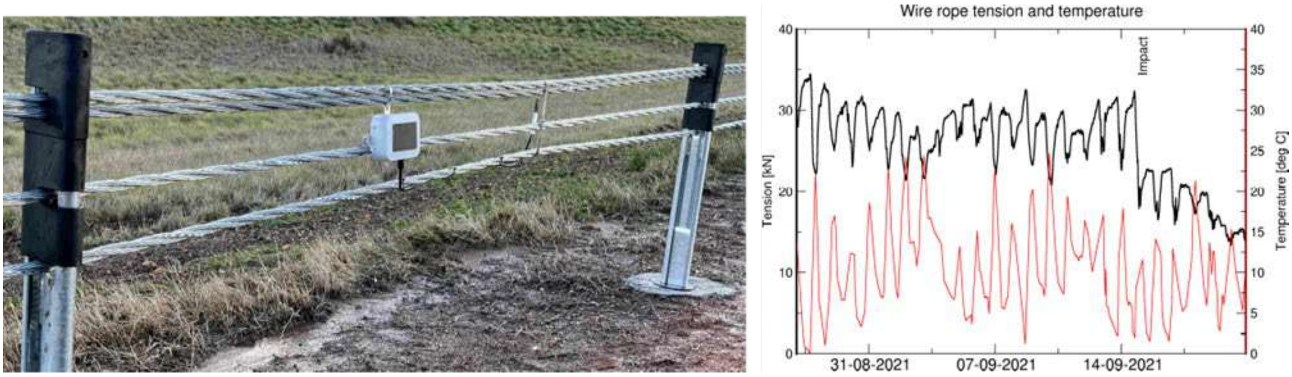

Figure 1. Photograph of an installed wire rope monitoring unit (left) and some wire rope tension data (right) showing the variations of tension (thick black line) with temperature (thin red line) and the drop in tension after an impact.

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4 out of 5 child car restraints fitted incorrectly?

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Kidsafe Qld Inc

Abstract

If you think a child car restraint does not need to be professionally fitted, think again. Figures from Kidsafe Queensland show that 80% of car seats checked in the past year were incorrectly installed, which can prove deadly for children in the event of a crash. In 2020 more than 1100 people tragically lost their lives on Australian roads, including 55 children. Research by NeuRA shows that a correctly fitted child restraint, which is appropriate for the child's age and size, can reduce the risk of serious injury or death in road crashes by up to 70 per cent.

Purpose

Toll road operator Transurban partnered with Kidsafe to provide free professional car seat fittings for parents in Brisbane and Logan thereby removing cost as a potential barrier of to checking or fitting the child car restraint. This provided Kidsafe staff with the opportunity to identify and record fitting errors and rectify any issues, as well as to instruct the parents / carers regarding the correct use and fitting of their child car restraint to prevent future issues.

Evaluation / Effectiveness:

Professional fitters from Kidsafe fitted and/or checked 2639 seats from 1 July 2020 to 29 Feb 2021 at three locations across Brisbane . Of 1187 seats already installed by customers that were checked, fitting faults were detected in four out of every five. Nearly half of these seats had more than 1 fitting fault (Table 1). The most common mistake was not using the tether strap correctly, with more than 50% of all seats checked having issues such as straps not attached, incorrectly attached, too tight, twisted or broken. Other common mistakes, which could result in injury or even death in a crash, include incorrect use of harnesses, seatbelts or Isofix connectors disconnected or improperly connected, and rear facing babies and toddlers with seats and capsules incorrectly reclined or angled. There were slight site differences in restraint error types (Table 1).

Alarmingly, of the seats checked, 8% (n=95) were not safe to be used. Of these unsafe seats, one in three were more than 10 years old; one in four seats had broken components, and an additional one in four could not be installed forward facing due to the baby not reaching the height marker (backwards-facing seats are legally required in these cases). Again, there were slight differences in error type by site.

Conclusion / Implications / Next Steps

The opportunity provided by Transurban allowed Kidsafe to identify, record and amend common car restraint errors at three sites across Brisbane. The data collected are compelling and indicate a high proportion (eight out of ten) of incorrectly fitted car restraints, with approximately one in twelve restraints being unusable as fitted. How do we change people's behaviours and knowledge? Despite manufacturer videos on how to fit child car restraints, education campaigns by various organisations and a myriad of easy-to-use and easy-to-fit child car restraints being sold, child car restraints continue to be misused, thus endangering kids lives. Why? Are the easy to use restraints more expensive? Is cost a barrier to choosing a professional to fit the child car restraint? Is this particularly true in areas of social disadvantage? Is it a lack of accessibility to professional child car restraint fitters? Or is it a symptom of the Australian 'she'll be right' attitude? Further research into knowledge and attitudes of parents/carers, and how these translate into behaviours regarding fitting of child car restraints is imperative, in order to address this issue and ensure the safety of our children. Clarity is urgently needed regarding what we need to change and how. Currently, NSW is the only Australian state where child car restraint fitters are regulated. Eura research shows that professionally fitted child car restraints decrease incorrect restraint use. In other states anyone can fit a child restraint for a fee without any training. Providing parents/carers with access to professionals to fit and/or check car restraints may be a better, and safer, option. Transurban have continued the free restraint checks and fitting in Queensland to ensure our most vulnerable passengers travel safely.

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Most Common Fitting Faults (% of all seats checked)				
	Total	**Site 1**	**Site 2**	**Site 3**
	Tether issues (56%)	Tether Issues (40%)	Tether issues (44%)	Tether issues (64%)
	Harness issues (37%)	Harness Issues (22%)	Harness issues (40%)	Harness issues (40%)
	Seatbelt / Isofix not securely fitted (31%)	Seatbelt / Isofix not securely fitted (14%)	Seatbelt / Isofix not securely fitted (26%)	Seatbelt / Isofix not securely fitted (38%)
	Rear facing issues (17%)	Incorrect use of accessories (10%)	Rear facing issues (19%)	Rear facing issues (19%)
	Incorrect use of accessories (8%)	Rear facing issues (8%)	Incorrect use of accessories (2%)	Incorrect use of accessories (9%)

Most Common Reasons Checked Seats were Unusable (% of Unusable Seats)				
	Total	**Site 1**	**Site 2**	**Site 3**
Expired seat	**31%**	41%	22%	29%
Broken seat or component of seat	**23%**	22%	26%	22%
Baby/child not reaching height marker	**23%**	15%	30%	24%
Missing top tether	**11%**	4%	17%	11%
Seat not compatible with car	**4%**	11%	-	2%
Over seas non-compliant seat	**4%**	4%	4%	4%
inflatable seat belt	**1%**	4%	-	-
Mouldly seat	**1%**	-	-	2%

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Comparison of the Pandemic Effect on Traffic Safety in Iran

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Abstract

This paper investigates the impact of the COVID-19 pandemic on road safety factors including traffic volume, fatalities, speed and injuries in Iran at national and provincial level. The results reveal that while the correlation between the average hourly traffic and number of traffic fatalities at national level is normally stronger than the provincial level, however, after the outbreak, the correlation at both levels was increased. Additionally, at provincial level the average reduction in the number of deaths to traffic volume indicator was higher than the national level. Overall, it can be concluded that the average speed on the road network has been smoothly increased with no significant correlation found on casualties. The post-COVID 'new normal' reduction in traffic volume and increase in the number of people who work from home needs to be investigated accurately in the future studies to help us being more prepared to cope with similar disasters.

Background

Since the World Health Organization (WHO)'s declaration of the COVID-19 pandemic in March 2020, there has been a considerable decrease in traffic volumes on roads network worldwide. It is hypothesized that the decrease in traffic volume was conducive to an increase in speeding drivers. The emergence of COVID-19 has fundamentally changed human behavior. Wagner et al. (2020) suggests that decreased traffic volume and congestion, coupled with the reduction in law enforcement, produced an environment with more opportunities for speeding.

From March 2020 to November 2021, five waves of Covid-19 occurred in Iran. Although no complete lockdown was imposed in any period, in the first wave in March and April 2020, there were severe restrictions on city trips and intercity travel.

Method

To achieve the study's aim, rural roads' traffic volume and speed violations data were gathered from the Road Ministry, and fatalities and injuries data were derived from the Iran Legal Medicine Organization both covering a 5-year period (from April 2016 to November 2021). Correlation coefficients were used to compare national and provincial datasets for both periods before and after the onset of the COVID-19 pandemic.

Results and Conclusions

Figure 1 shows the monthly road deaths and average hourly traffic flow from Apr-2016 to Nov2021. Although the correlation coefficient of the two factors in the period studied at the national level is higher than the province (0.78 compared to 0.60), the important point is the significant increase in this coefficient in the period after the pandemic compared to before. The correlation coefficient of the studied indices at the provincial level increased from 0.55 in the period of 44 months before the outbreak to 0.67 in the period of 22 months after the outbreak of Covid-19. At the national level, the correlation coefficient increased from 0.81 to 0.90.

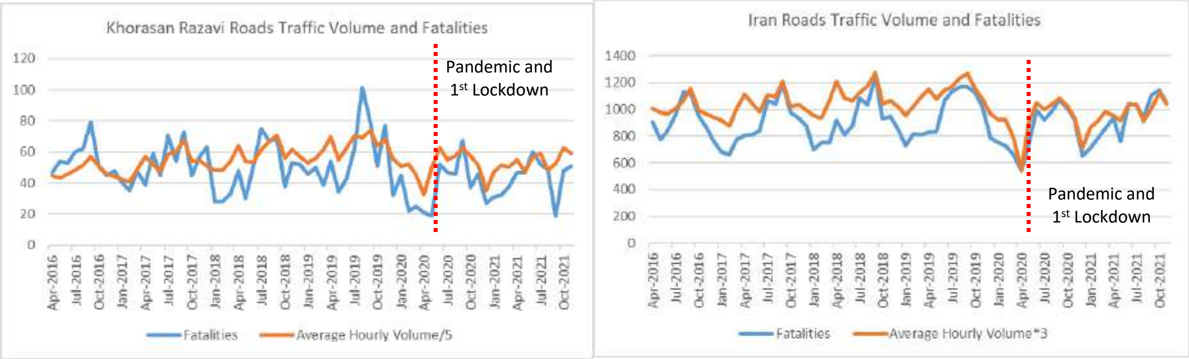


Figure 4 Iran v.s Khorasan Razavi's Road Fatalities and Average Hourly Traffic Volume.

One of the reasons for this difference at the national and provincial level is the reduction of extra-provincial travel to Khorasan Razavi due to the closure of the religious attractions in Mashhad. According to Figure 2, the average percentage of cars with non-provincial license plates fell from 28 percent (in the 12 months ending February 2020) to 23 percent in the 12 months following the outbreak of COVID-19 pandemic. The study of the same index in the provinces that feature tourist destinations did not show such a decrease.

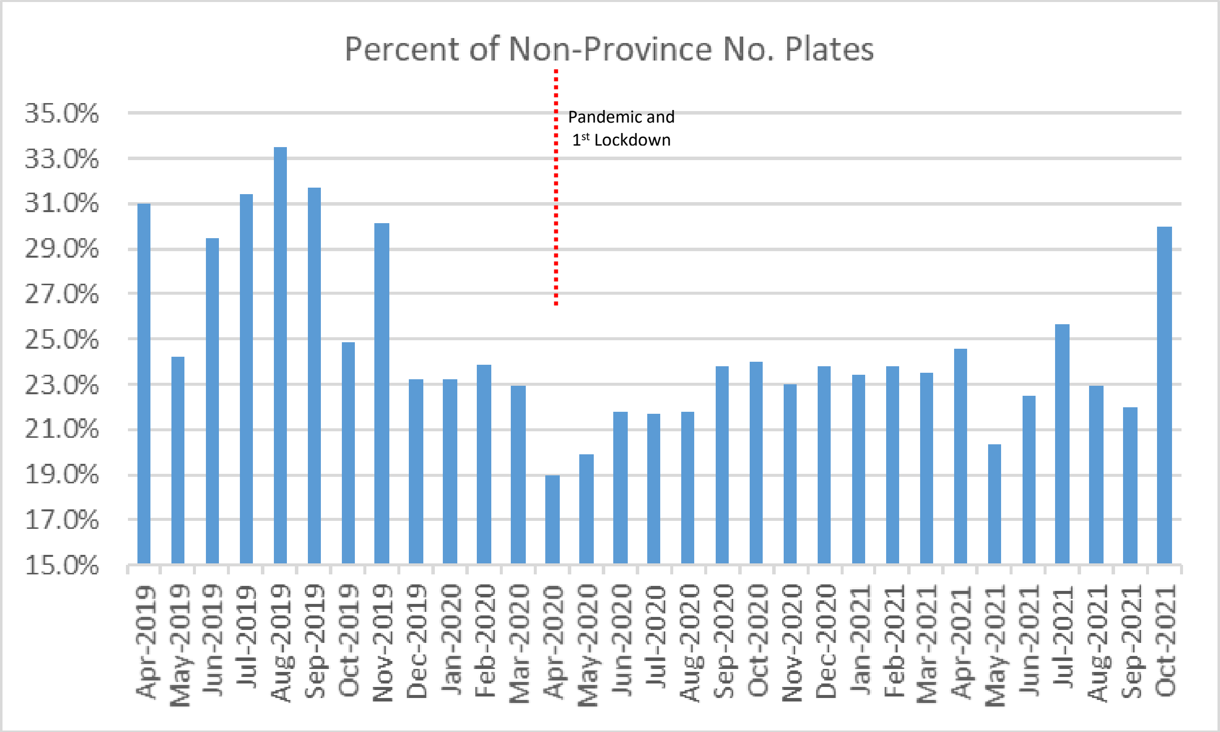
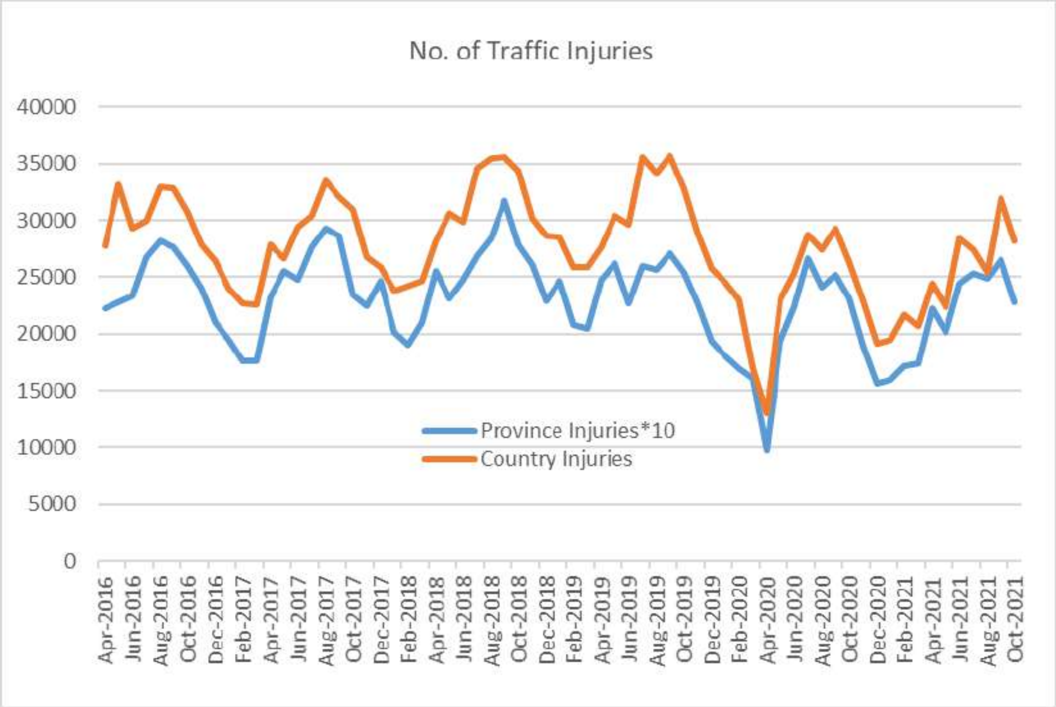


Figure 5 Percent of non-provincial licence plates (assessed as unfamiliar drivers) on Khorasan Razavi Roads

Figure 3 shows the monthly number of road deaths and injuries back-to-back at national and provincial level and in general shows a higher level of correlation for injuries than fatalities. The correlation coefficient of the fatalities in the whole period at the national level was 0.70 compared to 0.90 for the injuries. Based on data, the fatalities' coefficient of the correlation decreased from 0.76 before the COVID outbreak to 0.64 after Feb 2020. As for the injuries, the correlation coefficient showed an increase from 0.86 to 0.96.

Overall, it can be concluded that while the average speed on road network has been smoothly increased at both national and provincial level after the pandemic, no significant correlation was found to impact on traffic casualties. In this study the traffic volume was the main factor explaining the variation in road traffic deaths and injuries. These findings provide an insight to road safety management of cause and effect in the future.



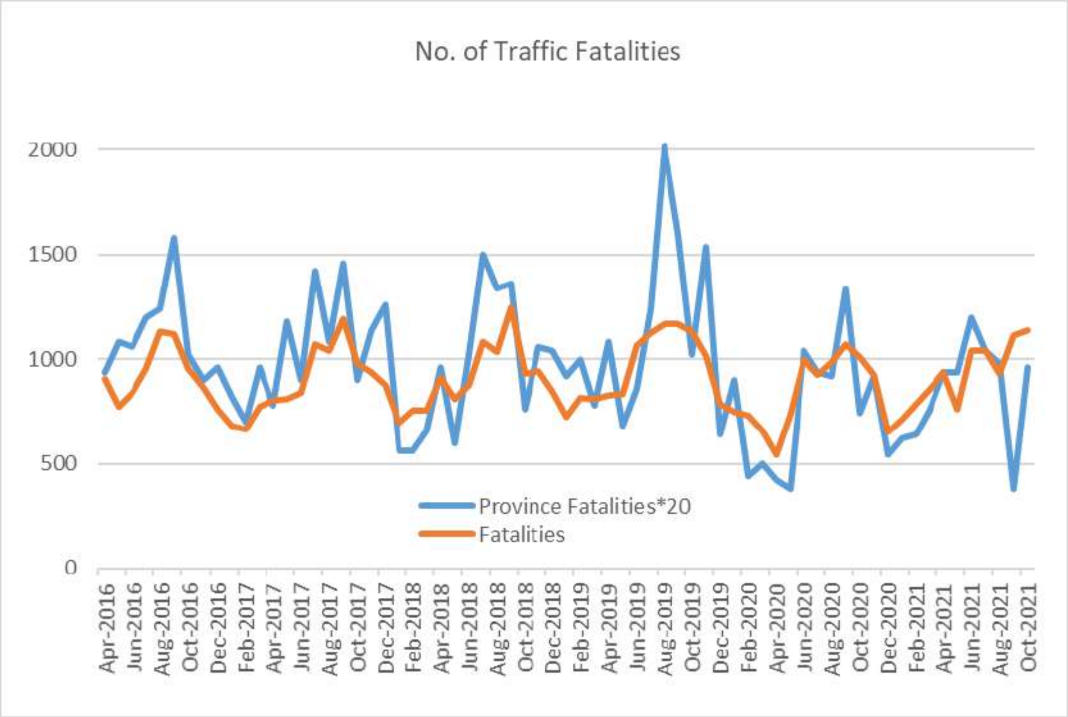


Figure 6 No. of Injuries and Fatalities

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Child restraint practices in Sydney: Misuse is still a problem

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Abstract

Prior to the introduction of legislation requiring mandatory use of age-appropriate restraint by children up to age 7, only about half of children in NSW used the most appropriate restraint type. Observational studies also reported errors in the way restraints were used were widespread with one in two children affected. In this study, we used the same methods to examine restraint use in the Greater Sydney metropolitan area approximately 10 years after the introduction of the 2009 legislative change. Most children (97.8%, 95%CI 96.3-99.4) were observed to be using a legally appropriate restraint. However, less than half were in correctly used restraints (Any error = 40.4% (95% CI 32.6-48.3; Any serious error= 43.8% (95% CI 35.0-52.7). The results indicate a substantial increase in appropriate restraint use, at least in the Sydney region but no improvement in correct restraint use.

Background

In 2009, legislation was introduced in Australia mandating appropriate and correct use of dedicated child restraints for children up to 7 years of age. Prior to this, population-level observations conducted in NSW reported only 16% of children optimally restrained with 32% inappropriately restrained, 32% incorrectly restrained and a further 19% both inappropriately and incorrectly restrained (Brown et al, 2010). In this study, we use the same observational methods to examine restraint practices among children in the Greater Sydney region approximately 10 years after the introduction of the 2009 legislative change.

Method

We used a cross-sectional design with a multi-stage stratified cluster sample constructed in the same way as our earlier sample (Brown et al, 2010). Due to Covid-19 impacts, the study was limited to the Greater Sydney region. Data was collected from 6 randomly selected local government areas (4 metropolitan & 2 outer metropolitan areas).

Participants were recruited as they arrived at randomly selected data collection sites (schools, preschools, and long daycare centres). Observations of how the restraint was being used were made with the child in the vehicle, and a more detailed inspection of restraint installation was made once the child left the vehicle. The age of the child was reported by the parent during a survey, and height and weight were measured.

‘Appropriate’ restraint use (coded as Yes/No) was defined using the current age-based legal definition of appropriate restraint (NSW Government, 2014). Correct use was defined as the restraint being used as intended by the manufacturer. Errors were categorised as ’minor’ or ’serious’ depending on their likely impact on crash protection and aligned with previous categorisations (Brown et al, 2010) to produce two further dichotomous outcomes; ”Any error’ Yes/No, ”Serious Error” Yes/No.

Sample weights and post-stratification weighting for age distribution and sample size variations were calculated using standard techniques. Population weighted estimates of the proportion of children in each outcome category were generated using the SURVEYFREQ procedure.

Results

Across the Greater Sydney region, 97.8% (95%CI 96.3-99.4) of children were observed to be using appropriate restraints according to the current legal definition. However, less than half were correctly restrained (No error = 40.4%, 95%CI 32.6-48.3; No serious error = 43.8%, 95%CI 35.0-52.7). Correctness of restraint use varied by restraint type.

Conclusion

Substantially more children are using appropriate restraint types now than were observed prior to the introduction of age-appropriate restraint laws in NSW in 2009. However, rates of incorrect use remain similar to those reported pre-2009. Child occupant safety is of great concern with serious errors present in more than half of all children aged 0-12 in the greater Sydney region.

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Advocating for a Child Restraint Systems Law in the Philippines

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Abstract

Advocating for a law mandating child restraint systems (CRS) was challenging in the Philippines. Legislators thought that (1) the law was unnecessary since majority of children use public transportation or motorcycles, and (2) CRS are expensive. Both the public and enforcers were not familiar with CRS. To build our case during legislation, advocates (1) briefed policymakers that CRS is one of many interventions to protect children through a safe systems approach and (2) referenced a commissioned study on the availability, affordability, and acceptability of CRS in the country.

Background

To implement the law, advocates:

- Donated CRS to enforcers so they could be familiar with the device;
- Developed guidelines and organized training for enforcement;
- Established a network of fitting stations where fitters can assist parents to install CRS and use CRS properly; and
- Supported government to inform, educate, and raise awareness among the public about the law.

A. Context

In advocating for a law mandating child restraint systems (CRS) to protect children in motor vehicles in the Philippines, advocates encountered challenges on key issues raised by legislators, such as:

1. That a CRS law is not needed because majority of children use public transportation or motorcycles; and
2. That mandating CRS use is anti-poor because CRS are expensive.

Since CRS involved new technology, there was very low familiarity with these devices among law enforcement officers; thus, enforcers did not know how to enforce the law. The public was also unfamiliar with CRS and the new law. Lastly, implementation of the law was suspended due to COVID-19.

B. Strategies to Advocate for Enactment of a Law Requiring CRS

To respond to legislators, advocates:

1. Clarified that CRS is just one among many interventions to protect children, and highlighted existing protections for children using other means of transportation (e.g., laws on speeding); and
2. Referred to a study commissioned by partners at the World Health Organization showing the availability, affordability, and acceptability of CRS in the Philippines.

These helped build the case for a CRS law and in 2019, Republic Act No. 11229 or the Child Safety in Motor Vehicles Act was enacted. The new law requires drivers of private motor vehicles to properly secure children aged 12 years old and below with a height below 150 centimeters or 59 inches in a CRS that is appropriate to their age, height, and weight.

C. Strategies to Address Challenges in Implementing the CRS Law

i. Low Familiarity with CRS Devices

Civil society organization ImagineLaw donated different types of CRS to enforcers in the lead enforcement agency, Land Transportation Office (LTO), so that they could familiarize themselves with these devices.

ii. Low Familiarity with CRS Enforcement Strategies

ImagineLaw supported the LTO in developing enforcement guidelines and provided a training of trainers for enforcement, with support from the Global Road Safety Partnership. Enforcers are also required to be trained as fitters who could assist drivers and parents on installation and proper use of CRS.

iii. Low Familiarity with CRS Among the Public

The implementing rules of the new law required the LTO to establish a network of fitting stations in the country. ImagineLaw, with support from Global Health Advocacy Incubator and Kidsafe WA, organized a series of fitters' trainings for LTO regional representatives, which culminated in a train-the-trainer session that allows trained fitters to train more fitters.

iv. Low Familiarity with the CRS Law Among the Public

ImagineLaw supported LTO media officers in planning their information, education, and awareness (IEC) campaigns to help the public understand and prepare to comply with the new law. LTO media officers were trained to develop key messages that emphasize the law's objective of protecting children, and monitor and evaluate IEC efforts.

D. Outcomes

We successfully advocated for the enactment of a law requiring CRS. While full implementation of the CRS law remains suspended, advocates focused on supporting government partners to build their capacity for full enforcement.

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Insights into parental decision making about transition to adult belt

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Abstract

Correct restraint of children is critical to reducing the severity of injury in the event of road related trauma. However, in Australia, the premature transition of a child from booster seat to adult seat with lap and sash belt is common. There is limited research on how parents make transition decisions and to date, no single metric for assessing child readiness to transition. Using 'talk aloud' methods, this research examined parent decision-making in the assessment of a safe seatbelt fit for their child. This information has been used to identify primary parent behaviours and drivers to support parents in making safe transition decisions when children move from booster seats to the adult seat with lap and sash belt.

Background

Road trauma is a leading cause of child mortality and morbidity worldwide (Peden et al., 2008) and in Australia (Australian Institute of Health and Welfare [AIHW], 2020; AIHW, 2014). While laws outline legal requirements for child restraint use, these do not always align with recommended best practice for safety (Neuroscience Research Australia [Neura] & Kidsafe, 2020). As a result, many children in Australia are moved from the booster seat too quickly (Royal Children's Hospital , 2019) increasing the risk of serious injury (Brown, McCaskill, Henderson & Bilston, 2006). To date, there has been no study examining how parents make the transition decision. The aim of this study was to identify the drivers of behavior associated with transition decisions

Method

This random design observation study will recruit 36 participants (parent and child aged 7-12 dyads), across intervention (current resource to support parents in their transition decision, the 5-step test (Neura & Kidsafe, 2020) and control groups (legal advice only). All parents will observe their child in three different seating conditions (good, poor, and partial fit), using a purpose-built rig adjusted for the child's anthropomorphic measurements. Using 'talk aloud' methods, parents will be asked to assess if the seating condition and seatbelt fit is appropriate for their child. Transcripts were produced and a draft schema with tasks and correlation to COM-B was created. Data were analysed qualitatively using the Behaviour Change Wheel (BCW) and COM-B framework (Michie, Stralen, & West, 2011).

Results

Preliminary qualitative results found that the task analysis was a sufficient technique to identify target behaviours and behavioural drivers. The target behaviour identified was for the parent to self-check the correct fit of the child in the adult seat with the lap and sash belt of each vehicle that the child travels. Aligning with the COM-B approach, parents must have 1) the *psychological capability (C)* to assess the proper fit, have sufficient attention to systematically check the fit, 2) the *physical opportunity (O)* of access to the car and the child , 3) the *social opportunity (O)* from seeing other families check their child in the seat for correct fit, 4) the *automatic motivation (M)* where target behaviours are habitualised and 5) the *reflective motivation (M)* of believing that following the target behaviour is important for the child's safety. Reflective motivation was evident through a strong desire to ensure their child was safe and comfortable in the seat when using lap and sash belt.

Conclusions

Mapping parent decision-making during assessment of their child's readiness to be transitioned from booster seat to adult seat with lap and sash belt gave insight into identifying specific primary parent behavioural components and drivers to support parents in making safe transition decisions. This knowledge can be used to develop user-centered, innovative mechanisms to aid parents. Future interventions should include the mapped behaviour drivers linked to the Behaviour Change Technique Taxonomy (BCTTv1) (Michie, Atkins & West, 2014), as well as input from parents and carers when creating improved resources to support parents making transition decisions.

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Learner Driver Mentoring Programs: Positive Outcomes for Disadvantaged Novice Drivers

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Abstract

Learner driver mentoring programs (LDMPs) help disadvantaged novice drivers achieve the compulsory driving experience required by Australian graduated driver licensing systems (GDLS), however, beyond licensing support, LDMPs have the potential to foster other safety benefits. The aim of this research is to identify the positive benefits that LDMPs offer disadvantaged participants, during their learner and early provisional driving stages. A preliminary systematic literature review, focusing on Australian LDMPs, was conducted in 2020, and is being expanded in 2022 to critically explore new Australian and wider international literature on associations between LDMPs and participants' road safety behaviours, perceptions of procedural justice and social inclusion outcomes. The 2020 study found LDMP participants to be safer drivers than matched equivalent drivers without LDMP experience, and the 2022 study will expand on these findings to provide a greater understanding of the positive changes that LDMPs can offer the young, disadvantaged drivers of tomorrow.

Background

LDMPs in Australia help disadvantaged novice drivers achieve learner driving hours stipulated by GDLS. LDMPs differ from usual driver education by providing voluntary driving supervisors, and suitable vehicles, to teach driving skills, traffic laws and road safety messages, whilst helping learners feel socially supported in local communities. This is anticipated to provide a safe driving culture to counter the higher crash risk typically found in low socioeconomic communities. However, beyond licensing support, potential safety outcomes of LDMPs are unclear. The aim of this research was to systematically assess peer reviewed information about the impact of LDMPs in Australian communities.

Method

Database searches were conducted between April and May 2020, with a secondary independent review conducted between August and September 2020. Databases searched were EBSCOhost Megafile Unlimited, Wiley, Taylor and Francis, Informit, Science Direct, QUT ePrints and Google Scholar. The search strings were: ("learner driver" OR "learning to drive" OR "beginner driver" OR LDMP) AND (mentor* OR mentee OR coach*) AND (Australia OR "New South Wales" OR Victoria OR Queensland OR "Northern Territory" OR Tasmania) (with preliminary searches returning no literature about LDMPs in the Australian Captial Territory, South Australia or Western Australia) and, for grey literature, Trove, QUT ePrints, USQ ePrints, and ProQuest Dissertations and Theses Global, as well as Australasian College of Road Safety publications. Google Advanced Search was used to search pertinent organisation websites (e.g., motoring groups and research centres) and domains (i.e. .gov.au, .org.au, .com.au and .edu.au). Inclusion criteria were (a) reports on intervention involving a LDMP in Australia, (b) includes quantitative or qualitative data, and (c) a full text PDF is available in English, whereas exclusion criteria included not meeting thise requirements or an opinion piece or low quality evidence (e.g., newspaper report).

Results

Database searches in 2020 returned 2,533 relevant articles and two additional articles were used with organisational permission = 2535; 2353 were removed after title/abstract searches; 182 full texts were scanned, and nine retained. Impartial road safety data found LDMP participants were safer drivers than matched equivalent drivers without LDMP experience and participants' self-reported data showed reductions in risky driving. Participants self-reported increases in feelings of connectedness and positive community engagement.

Conclusions

The 2020 study found nine reliable articles containing data about LDMPs in Australia. They reported indicative but limited information about the benefits of LDMPs on participants' road safety and other outcomes. These findings highlight the need for further research into LDMPs. This study is currently being expanded, including renewed search strings and inclusion criteria for articles from 1980-2022, including those relating to like programs in international jurisdictions. Selection criteria focuses on articles reporting information about LDMPs and the road safety, procedural justice and social inclusion benefits they offer disadvantaged novice drivers.

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How Do We Measure Harm in Land Transport?

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Abstract

How we measure the level of harm in our land transport system may influence how we manage our safety goals. Traditional road safety measures of harm are the numbers of deaths and injuries suffered in crashes. The potential for these to be under-reported is well known but also overlooks other examples of casualties within the transport environment. Recent safety investigations of people walking, biking, motorcycling and using other transport devices in Auckland found that considerably more people are suffering serious injuries on roads and paths from incidents not involving other vehicles. Research into road crashes nationally found similarly large social costs from non-motorised user incidents. These findings may help inform funding decisions for maintenance of paths, vegetation and kerb-crossings, where many incidents occur. Targeting reduced casualties on our transport network can also be at odds with other targets to increase modes like walking and cycling (due to personal health benefits).

Background

For all its benefits to society, land transport also brings with it a number of potential harms. Obvious ones include road crash casualties and environmental effects to people and ecosystems; less apparent harms include worsening personal health and community severance of some people. Overall, there are some challenges in how we measure the level of safety harm in our land transport system, and these may guide conversations on how we manage our strategic safety goals.

A traditional measure of harm in road safety is to count the number of deaths and injuries suffered in road crashes across the various transport modes. The potential for this data to be under-reported (due to Police not recording every incident) has long been well known and is typically accounted for when evaluating safety improvement projects. However, even then, it overlooks other examples of casualties within the transport environment. The growing number of "transport devices" (skateboards, scooters, etc) in our user mix also creates data categorisation problems.

Recent NZ Studies

Auckland Transport commissioned an in-depth review into recent deaths and serious injuries for "vulnerable transport users" (VTUs) outside of motor vehicles (i.e. people walking, biking, motorcycling and using wheeled transport devices like skateboards and e-scooters) (ViaStrada 2021a), to provide insight into the extent, nature and causes of serious harm to VTUs in Auckland.

The study found considerable under-reporting across all VTU modes compared with police-reported (CAS) numbers, with typically 6-8 times as many serious injuries being recorded in hospitals (MoH) versus recorded by CAS. By far most of these incidents were user-only ones that did *not* involve a motor vehicle or other party (thus not reported in CAS). Most of these users suffered some kind of fall, typically due to loose, wet, uneven or stepped surfaces.

These findings mirror a similar study commissioned by NZ Ministry of Transport to investigate domestic transport costs. The road safety analysis estimated that the social costs of accidents not involving motor vehicles by non-motorised users was $830 million yearly, more than double the costs for those involving motor vehicles (ViaStrada 2022). This has profound implications for investment in good path and crossing standards and maintenance to reduce this burden.

Discussion and Implications

The above investigations highlight how non-motorised travel modes can be systemically underplayed using traditional road safety harm metrics, with the appearance given of a greater problem with motor vehicle road safety (and thus a greater share of the funding).

Targets for reducing deaths and injuries on our transport network can also be at odds with other public agency targets to increase numbers using low-use modes like walking and cycling. While this growth in sustainable transport modes should be welcomed, there is a real likelihood that it will be accompanied by a growth in casualty numbers for these modes, even if efforts are made to improve the environment for travelling using these means. Roading authorities may need to consider performance metrics that reflect “life mortality costs” (including public health benefits), or use exposure-based metrics.

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Estimating injury risk reduction associated with speed limit changes in WA

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Abstract

When selecting life-saving road safety countermeasures to be implemented, practitioners routinely are faced with the challenge of having to rely on potential injury reduction estimates that might not consider local context and/or specific crash problems. Injury risk reduction ratios associated with speed limit change scenarios for pedestrian, side-impact and head-on crash types were estimated taking into consideration Western Australia's (WA) traffic speed data, projected mean speed reduction, perception-reaction time and breaking to estimate more realistic reduced impact speeds, the probability of a crash occurring along the vehicle stopping distance trajectory, and recent peer-reviewed studies on the relationship between impact speed and injury risk. The presented results provide guidance to WA practitioners when considering speed limit changes; however, the method can be applied to any location where traffic speed data is available. Further required refinements of the method are highlighted.

Background

Current methodologies to estimate injury reduction associated with speed limit changes have relevant limitations. Reliable estimates such as before-and-after evaluations of speed limit change are location and speed environment specific. Such results cannot be generalized to other locations and often lack estimates of injury reduction for specific crash types (pedestrian, right-angle, head-on etc.). Although theoretical estimations such as provided by the Power and Exponential Models (Cameron & Elvik, 2010; Elvik, Vadeby, Hels & van Shagen, 2019) can be tailored to an area of interest for any speed zones using local speed data, they are also not specific to crash types.

This study builds on three research components to overcome these limitations:

- projected mean speed reduction from speed limit changes given by Elvik (2009);
- well-established kinematics and mathematical functions to account for deceleration in the event of a crash to obtain reduced impact speeds and the the probability of the distance to hazard being anywhere within point of initial hazard perception and stopping distance (Corben, D'Elia & Healy, 2006); and,
- recent meta-analyses of studies using vehicle event data recorders that have established injury risk functions of impact speed for different crash types (Hussain, Feng, Grzebieta, Brijs & Olivier, 2019; Doecke, Baldock, Kloeden & Dutschke, 2020).

Methodology

Scenarios of interest for speed limit changes were defined for rural and urban environment ranging between 30km/h and 110km/h with a maximum reduction of 30km/h (e.g. from 110km/h to 80km/h; see Table 1). WA mean speeds were used for each 'from' speed zone of the proposed speed limit changes scenarios. A conservative expected mean speed reduction of less than 50% of the speed limit reduction given by Elvik (2009) was adopted, making up the 'to' mean speeds. Following the method presented by Corben et al. (2006), the impact speed (*v*) function of distance travelled (*s*) was obtained using Eq.1 for each initial mean travel speed (*u*), 'from' and 'to'.

Distance travelled is composed of distance travelled prior to breaking and breaking distance (using perception-reaction time = 1.2sec, $\mu = 0.7$, $g=9.8\text{m/sec}^2$). The S-shaped curve of pedestrian fatality risk by impact speed estimated by Hussain et al. (2019) was combined to the previously obtained function, resulting in a pedestrian fatality risk function of distance travelled. By integrating the ensuing function for each initial mean speed, 'from' and 'to', and calculating a ratio with the pair of results, it was possible to estimate pedestrian fatality risk reduction for the proposed speed limit change scenarios. Similarly, using the S-shaped curves provided by Doecke et al. (2020), head-on and side-impact serious injury risk reduction were also estimated.

$v^2 = u^2 + 2\mu gs$ (Eq.1), where:
v = final speed (here the impact speed)
u = initial speed (here the mean travel speed)
μ = coefficient of friction between the tyre and the road
g = gravitational constant
s = distance travelled.

Table 1. Pedestrian, side-impact and head-on estimated injury risk reduction for associated speed limit change scenarios

	Speed limit change scenarios (km/h)		Mean traffic speed (km/h)		Pedestrian Fatality Risk Reduction	Side Impact Serious Injury Risk Reduction	Head-on Serious Injury Risk Reduction
	From	**To**	**From**	**To**			
Rural	110	100	102	97	10%	23%	14%
	110	90	102	92	20%	44%	28%
	110	80	102	87	30%	62%	42%
	100	90	95.5	90.5	11%	29%	17%
	100	80	95.5	85.5	23%	53%	34%
	100	70	95.5	80.5	34%	72%	49%
	90	80	85.4	80.4	14%	40%	23%
	90	70	85.4	75.4	29%	66%	44%
	90	60	85.4	70.4	42%	82%	60%
	80	70	74.5	69.5	19%	46%	31%
	80	60	74.5	64.5	39%	77%	56%
	80	50	74.5	59.5	56%	91%	74%
	70	60	65.7	60.7	27%	63%	40%
Urban	70	50	67.4	57.4	47%	82%	64%
	70	40	67.4	52.4	62%	89%	79%
	60	50	58.3	53.3	29%	37%	42%
	60	40	58.3	50.3	43%	56%	59%
	60	30	58.3	46.3	60%	76%	74%
	50	40	49	46	24%	40%	26%
	50	30	49	41	57%	92%	60%
	40	30	42	37	53%	99%	35%

Discussion

The presented results provide guidance to WA practitioners regarding pedestrian, side-impact and head-on injury risk reduction when considering speed limit changes, taking into account local data, conservative mean speed reduction, deceleration in the event of a crash and latest estimates of impact speed and associated injury risk. Furthermore, the method can be applied to any location where traffic speed data is available. Remarkably, a before-and-after evaluation of a change in speed limit from 50km/h to 40km/h in WA's CBDs found a 24% reduction in serious injury (Radalj, 2019), supporting the results for the same speed limit change scenario presented here. Comparisons with estimates from other methodologies (not shown) can further validate the presented results.

However, the proposed methodology assumes that a crash has an equal probability to occur at any point in the trajectory of the stopping distance. This is not necessarily the case, being a limitation of the method that requires further refinement. Moreover, Elvik's (2009) studies were derived from implementations that did not involve changes in infrastructure; therefore, the expected mean speed changes are dependent on signage and enforcement. Nevertheless, self-explaining roads, where environment and road design provide immediate cues to drivers for appropriate vehicle speed, are a leading design principle (Theeuwes, 2021) and recommended where possible.

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Macroscopic Road Safety Modelling: How non-road related features influence crashes

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Abstract

Road safety engineers and planners are mostly interested in how road and roadside features influence road traffic crashes. However, there are other non-road and roadside features that also affect road crashes. This study investigates these non-road and roadside features in the Perth metropolitan area. Socio-economic, land-use, traffic, transport and crash data were sourced from various state and federal government agencies and were aggregated into ABS statistical area level 2. The relationship between crashes and these non-road and roadside features were established using the geographically weighted Poisson regression. The result suggests that, as the number of non-road and roadside features such as schools and % of population cycling to work increases, crashes are likely to increase. On the other hand, an increase in the % of population under 17 years, % of population working from home and % of households with no vehicles have the potential of reducing crashes. This study provides further knowledge to safety engineers and planners to be proactive in addressing road safety issues.

Background

Road safety engineers and planners are mostly interested in how road and roadside features influence road traffic crashes on specific sections of the network. Countermeasures are then proposed to treat these sections of the network to improve safety, an approach that is mostly at the microlevel, relying heavily on historic crash data and a bias towards road and roadside related features. Although this approach is useful, there is a need to supplement it with a more proactive approach; where safety issues are investigated at a regional or macro level with interest in other non-road and roadside related features. Macroscopic modelling offers insight into how other features (apart from road related features) influence crashes. This study aims to investigates how non-road and roadside characteristics influences crashes in Perth metropolitan area and how the result from the study can also be useful in the development of other predictive models.

Methodology

Data Collection and Aggregation

Data was sourced from various State and Federal agencies. Data on socio-economic and demographic characteristics were obtained from the 2016 ABS population census. Land use data and network/ transport data were sourced from Main Roads WA and Data WA (https://data.wa.gov.au/). Crash data for 2014-2018 was also obtained from Main Roads WA. All the data were collected for Perth Metropolitan area only and subsequently aggregated at ABS Statistical Area Level 2 spatial unit. The final database used in the study contained over 30 different variables.

Modelling

The study explored the relationship between crashes (casualty, KSI and fatal) and socio-economic, land use and network/transport characteristics. A base model was built using the Negative Binomial regression model. To explore the possibility of accounting for spatial autocorrelation and heterogeneity, two other models were tested: Random parameter negative binomial (RPNB); and the Semi-Parametric geographically weighted Poisson regression model (S-GWPR). Both models produced similar estimated parameters in terms of direction and statistical significance. The S-GWPR was selected as it has an added advantage of producing a more appealing visualization output, making its output easier for interpretation.

Results

The result presented here only relates to casualty crashes. Table 1 shows that of more than 30 variables tested in the analysis and modelling, only 10 were found to significantly influence casualty crashes in Perth Metropolitan area. Features from Table 1 that have a positive relationship indicate that casualty crashes are likely to increase with an increase in such factors in Perth Metro. The negative relationship shows the likelihood of decreasing casualty crashes.

Table 1. Factors that influences casualty crashes in Perth Metro

Feature	Relationship with crashes
Population (log)	Positive
% of pop. < 17 years	Negative
% of pop. unemployed	Negative
% of pop. working from home	Negative
% of pop. cycling to work	Positive
No. of public transport stops	Positive
No. of traffic signals	Positive
No. of schools	Positive
% of land use for industrial purposes	Positive
% of households with no vehicles	Negative

Notes: Pop. is population and No. is number

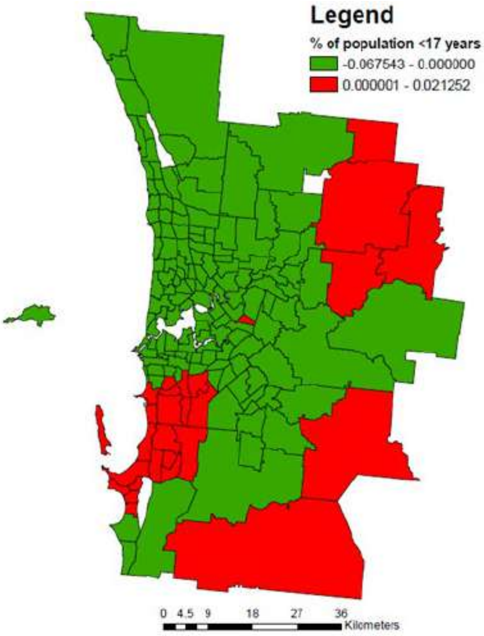

Figure 1: Local parameter estimates for % of Pop < 17 years variable (casualty crashes)

The S-GWPR provides global results, presented in Table 1, as well as local results. Since the local results considers each feature per zone, the best presentation of this result is through visualization. Figure 1 shows the visualization of the local estimated parameter for the % of population >17 years variable.

Although from Table 1, the global result indicates a negative relationship between the % of population older than17 years and casualty crashes, the local parameters result indicate there are some zones within Perth Metro where there exists a positive relationship between the % of population >17 years and casualty crashes (Figure 1: red zones). Therefore, measures should be focused in the red coloured zones when the proportion of population greater than17 years in these zones begins to increase or is expected to increase.

Application of Study

The study had two main applications:

- The study provides planners/engineers knowledge of the other factors apart from road and roadside features that should be taken into the decision-making process as we plan and develop our cities/towns. Knowing the variables that have the potential of influencing road traffic crashes can help road safety practitioners to put in place proactive measures to reduce road traffic crashes.

- The result from this study is also serving as inputs in ongoing developments in predictive modelling, being used in tandem with infrastructure and traffic variables to generate further insight into high risk midblock and intersection locations on the road network.

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Crash investigation capacity building in Samoa, Solomon Islands and Vanuatu

Brett Harman and Mark Stables

Global Road Safety Partnership

Abstract

In 2021, the Global Road Safety Partnership (GRSP) worked closely with the World Bank to deliver enhanced road crash investigation and reporting training to police officers from the Pacific Island countries of Samoa, Solomon Islands and Vanuatu. The programme was delivered via `distance learning` due to travel limitations resulting from the COVID-19 global pandemic. Training was made possible through the development of a series of paper-based crash investigation and reporting modules that were supplemented with a series of weekly interactive webinars and written tests to assess participant understanding of critical concepts. GRSP also developed a Crash Investigation and Reporting guide to supplement modules and webinar content. This case study presentation will demonstrate the learnings identified, and that continue to emerge, which will provide an ongoing evidence-based guide to the crash investigation and reporting capacity building improvements in Samoa, the Solomon Islands and Vanuatu.

Background

In 2021, the Global Road Safety Partnership (GRSP), hosted by the International Federation of Red Cross and Red Crescent Societies, worked closely with the World Bank to deliver enhanced crash investigation and reporting training to police officers from the Pacific Island countries of Samoa, Solomon Islands and Vanuatu. The programme was supported by UK Aid, through the World Bank`s Global Road Safety Facility (GRSF) and implemented by GRSP.

The programme was originally planned to be delivered in-person however, due to travel limitations as a result of the COVID-19 global pandemic, and to practically advance the program, a 'distance learning' approach was undertaken. This involved the development of a series of paper-based road crash investigation and reporting modules that were supplemented with a series of weekly interactive webinars. At the conclusion of each webinar session, participants were given the opportunity to ask questions and clarify module content. Additionally, written knowledge tests were conducted to assess participant understanding of critical concepts. GRSP also developed a Crash Investigation and Reporting guide to supplement the modules and webinar content.

Scoping of Project

To build a programme that met the needs of each country, a scoping exercise was completed to confirm essential information such as current practices, procedures and crash reporting documentation. This was a critical requirement to ensure that key information about how serious crashes were attended, investigated, reported and managed so that the course content could be designed and adjusted to meet local conditions. Essential information obtained included;

- Road crash investigation policy, practice manuals and explanation of the process and timeliness of reporting.
- Road crash investigation training syllabus and qualifications system.
- Attendance procedures by police officers at serious crashes.
- Copy of existing road crash reporting template(s) and explanation of the reporting process(es), coding system and data entry methods.
- Crash audit system (e.g., method to determine accuracy and timeliness of repeorting).

Outcome

Short term outcome: upskilling of a core policing group within the Samoa Police Service, the Royal Solomon Islands Police Force and Vanuatu Police Force to enable the implementation of specialist crash investigations and improved investigation standards. Longer term outcomes: Standardisation of best practise crash investigation and reporting processes, including implementation of effective policy and crash investigation procedures. Provided that sufficiently resourced and sustained training and investigation practises are maintained, each agency should be positioned to improve the standard of road crash investigation as well as the quality of crash reporting. Over time, this process will assist each country to better determine the factors that contribute to road crashes and to use this data to implement evidence-based countermeasures to help address them.

Conclusion

This case study presentation will demonstrate the learnings identified, and that continue to emerge, which will provide an ongoing evidence-based guide to the crash investigation and reporting capacity building improvements in Samoa, the Solomon Islands and Vanuatu.

Acknowledgements

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Youth Participation in School Safety Zones Assessment (Case Study: Indonesia)

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Abstract

The impacts of Manahan flyover development in front of Junior High School 1 in Surakarta City, Indonesia increase the road safety risks to the students due to its poorly urban mobility planning. Since its establishment in 2017, there have already been 12 crashes that occurred around the flyover which resulted in two deaths in two years after the opening. This research aims to assess the school safety zones using the Star Rating for Schools from the International Road Assessment Programme (iRAP) and to propose recommendations for safer road infrastructure by empowering youth participation to identify the problems as road users. Advocacy to the Government of Surakarta City is important to raise awareness and improve road safety in school zones surrounding the Manahan flyover area. The SR4S results is an evidence-based to influence the government as the decision-makers to provide safety environment into the area impacted from the Manahan flyover development.

Background

The growing trends to prioritize the development of new infrastructures for motorized vehicles such as flyover to mitigate traffic congestion in many cities in Indonesia has resulted in inequalities for non-motorized users. It is often to neglect safer facilities for the non-motorized user thus posing increasing road safety risks for them. Youth well-being, as non-motorized users, is related closely with the provision of non-motorized facilities because youth aged below 17 years old may not ride motorized vehicles.

The crashes are not the only road safety problems that occurred around Manahan flyover area. There are underlying road safety risks that impact Junior High School 1 in Surakarta City which is located beside the north side leg of the flyover. The increasing risks came from the flyover design that put the climbing area to the flyover in front of the gate of the school and the lack of safer facilities for the pedestrian as the development of flyover did not provide sidewalks and pedestrian crossings which may harm their safety.

Purpose of Project

This study used iRAP SR4S as a road safety inspection tool to assess school safety zones surrounding the Junior High School 1 Surakarta City and engage youth from the school to participate along the assessment and discuss the improvement. iRAP SR4S is chosen because it could be used as an analysis tool and communication tool to communicate the safety risks. These characteristics are beneficial for road safety advocacy to propose the improvement of road safety conditions to the government.

The specific objectives of this study are as follows: (1) to assess school safety zones using iRAP SR4S; (2) to identify the improvement needed to increase the school zone safety; and (3) to assess the safety conditions after applying the identified improvement. The results from the study would be presented to the government and used as a basis for road safety improvements.

Conclusions

The main problems surrounding the Manahan flyover and school that mapping by the students as youth consists of the lack of safer infrastructures, street obstacles for pedestrian, lack of safety awareness, poor infrastructure design and management, and lack of services. The school safety zones assessment was carried out through the Star Rating for School application which resulted the Star Rating Scores and Star Rating. A Star Rating is determined by assigning Star Rating Scores (SRS) and calculated at spot locations, where 1-star is the least safe and 5-star is the safest. From the calculation, it was found that 6 (six) of them were rated as 1-star and 2-star and only 1 (one) location was rated as 3-star.

Table 1. The Summary of Star Rating in Manahan Flyover Area

No	Locations	SRS		Star Rating		Estimated % Risks Reduction
		Before	After	Before	After	
1	In front of Main Gate of JHS 1	68.7	0.21	1	4	99.69
2	Opposite of JHS 1	119.61	4.62	1	5	96.14
3	In front of Women's Building	40.67	3.01	2	5	92.60
4	3-leg intersections at WB	182.17	13.47	1	4	92.61
5	3-leg intersections at Tax Office	23.91	1.77	3	5	92.60
6	4-leg intersections at MT. Haryono	87.76	7.22	2	4	91.77
7	In front of Church at MT. Haryono	79.74	3.3	2	5	95.86

With the minimum intervention in each location such as improving signs and marks, providing pedestrian crossing, putting the speed limit at 30 km/h, operating speed at its speed limit, and applying the speed management, the estimated percentage reduction of risks will be higher up to more than 90 percent and all the locations will be rated as 4-star and 5-star that indicates the highest safe location for students.

Figure 1. Before and After Intervention of Star Rating in Manahan flyover Area

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Understanding and improving temporary road signage stability

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Abstract

Temporary road signage is used to regulate traffic and advise road users, however wind and passing heavy vehicles have been known to cause collapse. This project aimed to gain an understanding of sign stability in the presence of passing road trains and investigate the possibility of improving stability through design modifications. ANSYS *Fluent* simulations and field trials were carried out to assess stability. The findings from the simulation showed that the current design is unstable and highly prone to wind induced failure. The simulations suggested that road train passage at 100 km/h is capable of inducing a ~8 m/s velocity in the sign's proximity, which is greater than that permissible for a rigid sign with no leg mobility. Field trials showed that the modified sign remained stable at 1.2 m from the edge line however it was still prone to collapse at closer distances.

Background

Temporary traffic signage are installed at roadworks sites in regional areas across Western Australia to warn drivers of the dangers ahead. Although an efficient communication means, temporary road signage is only effective if it remains standing. In the past few years, communities have raised concerns that temporary road signs frequently fall over and fail to warn drivers of hazards on the regional road network. As a major industry player, Main Roads Western Australia (MRWA) in collaboration with the University of Western Australia investigated how the stability of temporary road signage can be improved. Currently, temporary road signs are designed with leg mobility so that when the sign collapses the legs rotate and flatten and do not present a hazard to road users. A previous study by MRWA mostly focused on how high-speed movement of large road trains are the main reason that induce the sign to collapse. In addition to high-speeds, this study investigates how the weight of the signboard, the surface area, centre of pressure, wind loading and aerodynamics influence the stability of temporary traffic signs and proposes possible solution to improve stability.

Materials and Methods

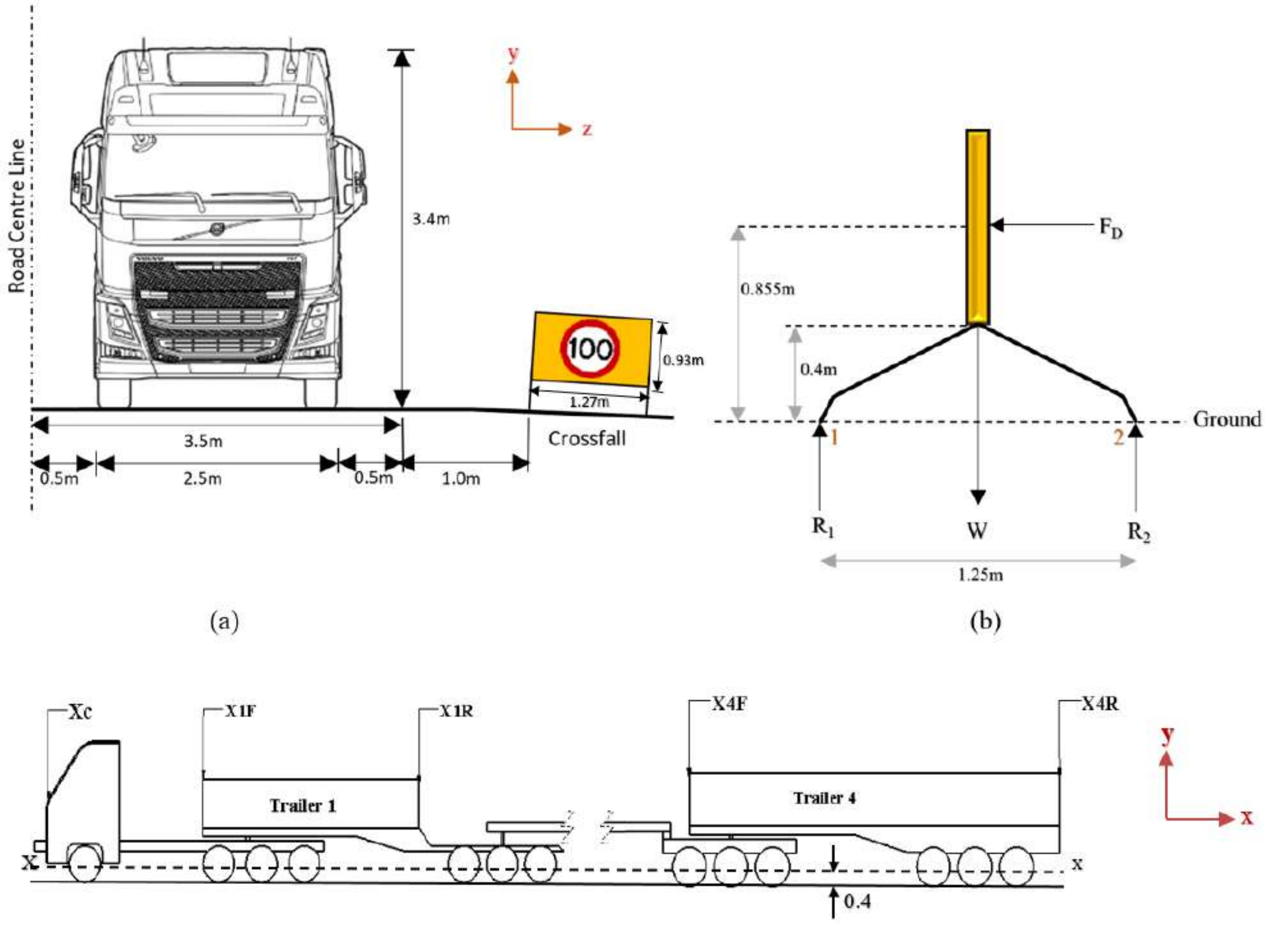
Analytical methods

A previous study by MRWA (2019) found bi-pod round legs, multi message signs and sand bags to be more effective in stabilizing temporary road signs on rural road network. This study therefore used samples of multi message sign, bi-pod round leg and sand bags obtained from MRWA for analysis. To understand the stability of road signs an analysis is performed by assuming the road sign as a rigid body on a horizontal road surface. In addition, it is assumed that a uniform wind velocity at standard atmospheric conditions acts on the sign.

Simulation and modelling

Computational fluid dynamics (CFD) is performed in a closed domain with a blockage ratio less than 3%. This value of blockage ratio leaves no error in the determined magnitude of drag coefficient (Altinisik, Kutukceken, & Umur, 2015). The signboard is simulated in the software without legs. This is done as the legs contribute negligible drag, however, warrant a much finer mesh. The boundary conditions of the domain include velocity inlet, pressure outlet, walls, ground and symmetry. Within the domain, the road sign is placed closed to the inlet boundary. A perpendicular uniform wind velocity of 10m/s was supplied at the inlet of the computational domain to determine the drag coefficient and drag force. A road train was then simulated to identify the magnitude and effect of wind induced from the road train along the sign. A 60 m heavy haulage truck, which resembles a real road train is designed in Solidworks, ignoring certain geometric features which likely have negligible influence on road sign stability. ANSYS *Fluent* was used to investigate the wind generated. To simplify the simulation, the road train is assumed stationary and walls are made to move with a velocity similar to the inlet velocity. A uniform inlet velocity of 100km/h was used.

Temporary road sign, road and road train geometry is depitcted in Figure 1. The results of the analytical and simulation experimental were used to undertake a wind tunnel test at UWA research facility. Finally, an onsite field trails were conducted on a modified bi-pod round leg at Perth and Pilbara regions.



(a) (b)

(c)

Figure 1. (a) Road geometry (b) Side view of road sign (c) Side view of road train

Results

The result of the simulations suggest that the rigid road sign remains stable until an induced velocity of ~8 m/s acts on it due to the passing vehicle induced loading. From CFD, the maximum vehicle generated wind from the truck was ~9 m/s, which is greater than the maximum permissible velocity that the sign can withstand. It was evident from the simulation that the sign with four sandbags (~60 kg) used to weigh down the legs (typical of industry practice) remains stable even at the combined wind velocity of ~15 m/s. A simple retrofit modification to the bi-pod legs enabling the sign to behave as a rigid one up until a threshold of ~8 m/s and then behave like one with leg (yaw) mobility. The observations from the field trial for the modified sign was consistent with the results obtained from simulations and analytical approaches.

Application/importance of findings

The results from both the simulation and analytical analysis have been used to modify the existing road sign. The study had given an insight into the effect of wind induced failures on road signage and potential mitigation measures that could be adopted to solve the issue. The proposed modified sign could be trailed in the industry for a short period of time to understand its effectivensess in different environments and there is a huge scope of design development in the proposed sign design.

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Coaching novice drivers to sustainable road safety

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Abstract

A critical observation in road safety is the statistical aberration in the risk of road trauma from the learner driver cohort to the first year of licensed solo drivers. For decades, reform measures have increased hours and types of learner driver experiences while mandating stringent rules for new drivers. Although achieving a slight decrease in trauma, the road safety risk of these newly licensed drivers has remained relatively stable, globally. The Safe System Approach coupled with the Decade of Action 2030 provides an imperative to review the end-to-end process of the driver licensing system. This paper reviews the learner driver process of the standard instructional method of training vs coaching with a curriculum as a more effective learning methodology for sustainable safety. Both processes are discussed with the coaching model for learner drivers presented as a new paradigm to be considered as the foundation for novice driver safety.

Background

Globally, road fatalities claim 1.3 million lives annually with an additional 20 to 50 million seriously injured (Global Status Report on Road Safety 2018). The *Decade of Action* with the Safe Systems as the underlying principle for its global plan, aims to reduce this trauma by 50% by 2030, with an integrated strategy, including impacting road user behaviours. (UN General Assembly A76/348 2021). The quality of the licensing criteria for entry into *the system* is pivotal to achieve this objective.

Historically, passing a licence test shows minimum standards are met and does not signify being a good driver (Stack, 1956). Contemporary research suggests most current driver education contributes little to reducing accidents or crash risk (Christie, 2011).

The learner driver criteria in Victoria from 2014 mandates 120 hours supervised practice under the Graduated Licensing System (GLS). However, there is no mandated written curriculum, no competency-based education and training, and instructors average 2-hour in-car training around a test route to qualify. The theory and hazard perception test and a known test route complements the 120 hours for the learner. Data shows the highest crash risk is in the first year of licensed driving.

As per figure 1, it is incongruous that novice drivers are exposed to this road trauma risk following a licence test by the State and an indictment on a life skill where a majority of the learning expectation is to be developed post test. This graph typifies a global reality.

Method

This study researches the different methodologies delivered to learners during training. A comparison is made between the traditional instructional methodology without a curriculum as opposed to coaching a pedagogical curriculum to identify the benefits and pitfalls of the two approaches.

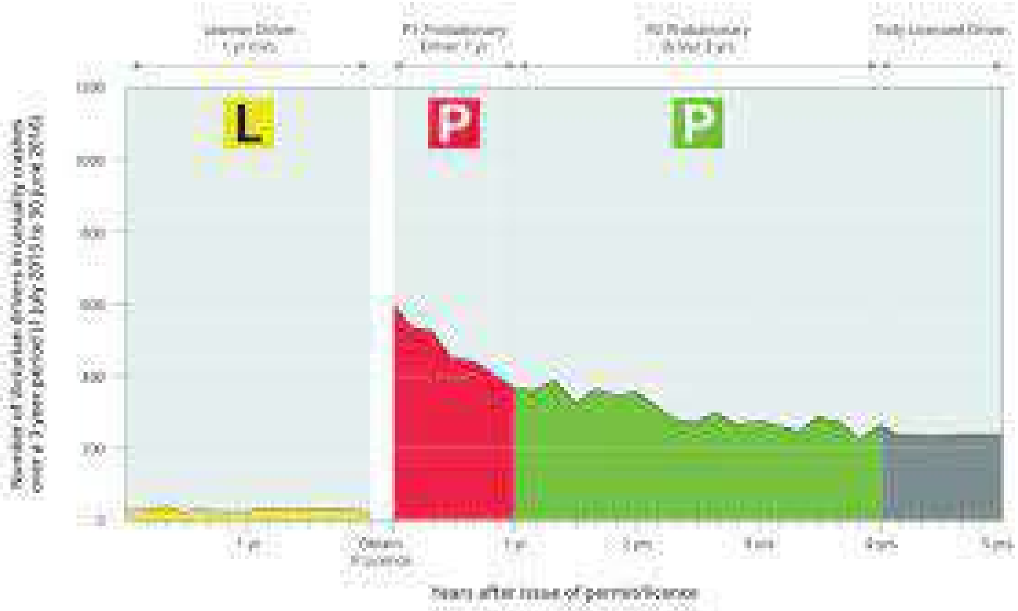

Figure 7. VicRoads statistical representation of road safety risk for probationary drivers

Instruction vs coaching

The principle process for learner drivers, whether by driving instructor or parent/carer is colloquially referred to as "*tell, listen and obey,*" accompanied by *tips and tricks to pass a test.* However, mere instruction, telling learners how to drive does not enable self-calibration of a safe process. Traffic authorities tell learners and new drivers what not to do without ever teaching what to do in each interaction. The problem is never the solution. Undetermined is whether these systems are complementary to, or in conflict with developing empowerment, in which the novice driver is an active learning agent (Glendon, 2014).

While, international research identifies that young driver crashes are most commonly caused by inexperience, immaturity and driving in high risk situations (VicRoads GLS Summary Report, 2017), the causality potentially lies in the foundation of training and testing. Traditionally, learners are not effectively engaging the training and testing system and have an unstructured approach to learning, resulting in young drivers being over-represented in road casualties (Road Safety Research Report No 87). Driving instructors appear to be aware of the skills essential for safe driving, however, generally instructional strategies are unable to target these skills (MUARC Report No 161).

Applying a driver coaching model of active learning methods builds self-awareness, responsibility and competence thereby placing the learner as an active participant managing the interaction with all road users (EU Hermes Project, 2010). Coaching enshrines listening, questioning, constructively challenging, and accountability for both coach and student. Overlaying coaching to a standardised curriculum, competency-based assessment and a *graduated education system*, enables the novice driver to enter the system as a safe road user.

Conclusion

The Safe Systems Approach was initiated to identify and address system deficiencies resulting in road trauma. The current system of learner driver training requires a comprehensive overhaul. A graduated education system delivered by qualified coaches with competency-based education and training is presented as the new paradigm to be considered as the foundation for novice driver safety.

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How will Christchurch reach the Road to Zero target?

Ben Jassin

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Abstract

New Zealand and Christchurch have adopted an interim Road to Zero target: a 40% reduction in deaths and serious injuries (DSIs) on our roads by 2030. It is important to recognise how difficult it will be to meet this target. Numerous cities around the world have adopted Vision Zero, but US cities like Chicago and New York saw road deaths increase in 2020 from 2019. Christchurch City Council conducted research to determine how Christchurch could reach the *Road to Zero* target. After working to understand difficulties in modelling, multiple assumptions were developed. This research ultimately involved evaluating existing DSI savings data. The research concluded that Christchurch is on track to meet the *Road to Zero* target, and led to a number of essential strategic actions to ensure we meet the target, such as ensuring delivery of safe system interventions like raised safety platforms, speed management, and encouraging safe choices.

Background

New Zealand and Christchurch have adopted an interim Road to Zero target: a 40% reduction in deaths and serious injuries (DSIs) on our roads by 2030 (2018 baseline). The Road to Zero Strategy sets us on a path to achieving Vision Zero, a New Zealand where no one is killed or seriously injured on our roads. It is important to recognise how difficult it will be to meet these targets. Numerous cities around the world have adopted Vision Zero with initial success, but in 2020 US cities like Chicago and New York City saw road deaths increase by 45% (CDOT, 2021) and 10% (Hu, 2021) from 2019, respectively. New Zealand saw a 13% decrease in DSIs from 2019 to 2020 (Ministry of Transport 2021), but reaching the *Road to Zero* target will require a continued, broad, and coordinated effort from everyone.

Christchurch City Council has been developing the Christchurch Transport Plan, and one of the policies is to realise *Vision Zero.* Development of this policy involved research into how Christchurch could reach the *Road to Zero* target.

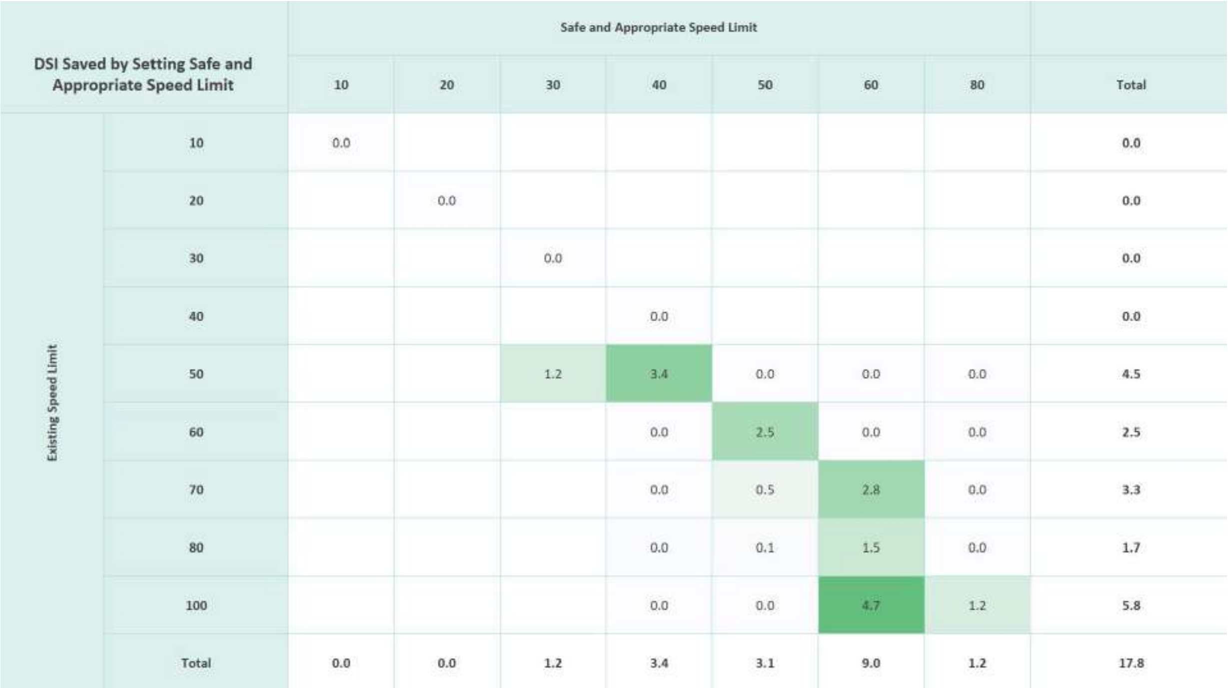
This research worked to understand and evaluate the following challenges and unknowns:

- It is difficult to learn from the results of previous road safety programmes as there are countless external factors that influence road safety outcomes.
- In order to effectively model future DSIs, it is important to understand what the baseline DSI level is and what it will be in future years.
- It is unclear if New Zealand's downward DSI trend will continue, and if we need to change the system to achieve any further savings.
- It is not well understood how many DSIs will be saved by road safety education campaigns, enforcement enhancements, and improvements to the safety of the vehicle fleet.
- Other unknowns include changes to the infrastructure programme at the design and community consultation phases.
- Political will and investment in road safety is not guaranteed over 10 years.

After working to understand all of these challenges, multiple assumptions were developed. This research ultimately involved evaluating and adding up existing DSI savings data from Waka Kotahi NZ Transport Agency's MegaMaps and the *Road to Zero* Speed and Infrastructure

Programme. This research developed new ways of displaying this data for better understanding of the interventions. For instance, Table 1 shows the number of DSIs saved per year if Christchurch aligned all roads to the Safe and Appropriate Speed Limit.

Table 1. DSI Saved by Setting Safe and Appropriate Speed Limits



DSI Saved by Setting Safe and Appropriate Speed Limit		Safe and Appropriate Speed Limit							
		10	20	30	40	50	60	80	Total
Existing Speed Limit	10	0.0							0.0
	20		0.0						0.0
	30			0.0					0.0
	40				0.0				0.0
	50			1.2	3.4	0.0	0.0	0.0	4.5
	60				0.0	2.5	0.0	0.0	2.5
	70				0.0	0.5	2.8	0.0	3.3
	80				0.0	0.1	1.5	0.0	1.7
	100				0.0	0.0	4.7	1.2	5.8
	Total	0.0	0.0	1.2	3.4	3.1	9.0	1.2	17.8

The research concluded that Christchurch is on track to meet the *Road to Zero* target. This work informed the Christchurch Transport Plan actions which will change today and define a safer tomorrow. These strategic actions include aligning 70% of the network with the Safe and Appropriate Speed, ensuring we implement safe system interventions such as raised safety platforms, incorporating safe system assessments, and encouraging safe choices among other actions. These strategic actions are essential to meeting the target, and we will need to continuously monitor our progress and adapt our programme to ensure we meet the initial target in 2030.

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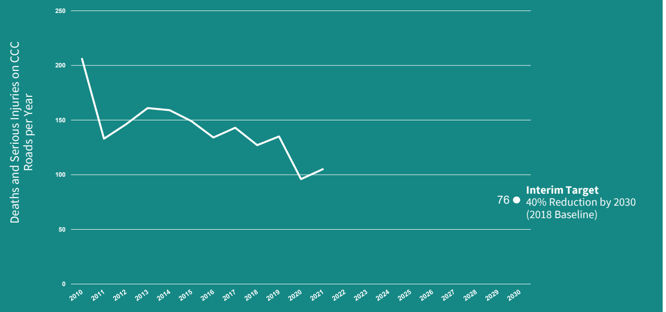
Our journey to road to zero

Overview

New Zealand and Ōtautahi Christchurch adopted an interim Road to Zero target: a 40% reduction in deaths and serious injuries (DSIs) on our roads by 2030.

We're developing the draft Christchurch Transport Plan, and one of the policies is to realise Vision Zero. **This poster shares the research involved in determining how Christchurch could reach the Road to Zero target.**

Ōtautahi Christchurch is trending down in road deaths and serious injuries (DSIs)[3], but we can't expect the trend to continue without further intervention.



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Understanding the Challenge

We worked to understand the following challenges and unknowns:

- It is unclear if New Zealand's downward DSI trend will continue or if we need to change the system to achieve any further savings.
- Strategic road safety programmes can change and evolve through the design and consultation phases.
- Political will and funding for road safety is not guaranteed over 10 years.

Achieving Vision Zero will not be easy

Internationally, cities that have adopted Vision Zero targets many years ago saw road deaths increase in 2020, likely due to increased vehicle speeds during COVID-19 lockdowns.

↑ 45%	↑ 10%
Chicago	New York City

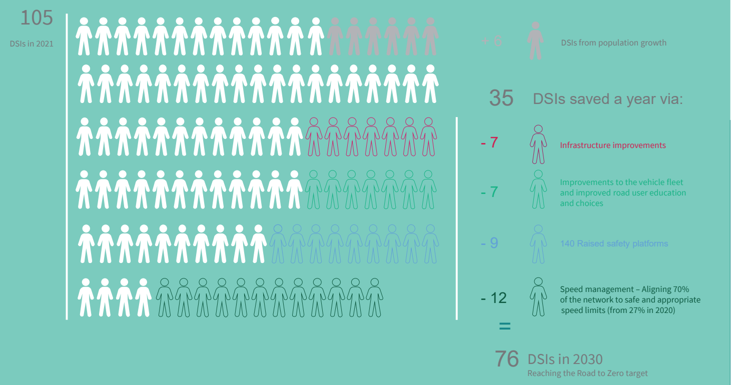
Assumptions

- Baseline DSIs will rise from population growth at 0.6% annually. No change to vehicle kilometres travelled per person or mode share.
- Conservatively assume minimal effect from improvements to the vehicle fleet and improved road user education and choices (20%).
- Speed limit changes will include signs only without traffic calming.
- Raised safety platforms reduce DSIs at intersections by 40-55%.

Intervention Pathway

We evaluated and added existing DSI savings data from Waka Kotahi NZ Transport Agency's MegaMaps and the Pipeline Development Tool.

This strategic pathway illustrates the scale needed to reach the target.



105
DSIs in 2021

+ 6 DSIs from population growth

35 DSIs saved a year via:

- 7 Infrastructure improvements

- 7 Improvements to the vehicle fleet and improved road user education and choices

- 9 140 Raised safety platforms

- 12 Speed management – Aligning 70% of the network to safe and appropriate speed limits (from 27% in 2020)

=

76 DSIs in 2030
Reaching the Road to Zero target

NOT COUNCIL POLICY

Speed Management

This table [1] shows the estimated DSIs saved per year if Christchurch matched the safe and appropriate speed limit for 100% of the network.
A safe and appropriate speed limit is set by the Safe System approach and appropriate in terms of aligning with community wellbeing objectives and the design of a road.

		Safe and Appropriate Speed Limit							
		10	20	30	40	50	60	80	Total
Existing Speed Limit	10								0.0
	20								0.0
	30								0.0
	40								0.0
	50			1.2	3.4				4.5
	60					2.5			2.5
	70					0.5	2.8		3.3
	80					0.1	1.5		1.7
	100						4.7	1.2	5.8
	Total	0.0	0.0	1.2	3.4	3.1	9.0	1.2	17.8

[1] Abley and Waka Kotahi NZ Transport Agency. (2020). MegaMaps (Edition III) [Speed Management Framework].

Conclusion

Christchurch is on track to meet the Road to Zero target, assuming the draft Christchurch Transport Plan strategic actions above are implemented.

The draft Christchurch Transport Plan signals a shift in road safety strategy. It sets the path to Vision Zero, but it also aims to capitalise on the many co-benefits of safety improvements – building healthy, active, comfortable, and vibrant streets.

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Prevention and Mitigation of Fatal Crashes in Regional/Remote Areas

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Abstract

Road users in regional/remote areas have a higher risk of death and serious injuries than those in metropolitan areas. This study used a Safe Systems based approach to investigate the potential of different interventions to prevent fatal crashes or mitigate injury severity in regional/remote areas. The findings showed that, while road user behaviour is a large contributor to fatal crashes in regional/remote areas, it is road and vehicle based countermeasures that provide the greatest potential to prevent these crashes and mitigate related injuries. Investment in safe roadside infrastructure, particularly to protect road users in road departure crashes, and the use of policies and incentives to accelerate the uptake of newer vehicles with safe vehicle technologies are most promising. These interventions should be coupled with effective enforcement strategies to deter unsafe driver behaviours; speed management to match the quality of the road and infrastructure; and measures to ensure restraint use compliance.

Background

Road users in regional and remote areas have a higher risk of death and serious injuries than those in metropolitan areas (Wundersitz et al., 2019). The fatality rate in regional and remote areas of South Australia is 4-5 times higher than in the metropolitan area. To improve road safety on regional and remote roads, this study investigated the circumstances surrounding, and the factors contributing to, fatal crashes on regional/remote South Australian roads. By identifying gaps in the wider road transport system that were contributing to the crashes, the potential for different types of interventions to prevent fatal crashes or mitigate the injury severity was determined using a systems-based approach.

Method

Coroner's case reports investigating 111 fatal road crashes in South Australia from 2014 to 2015 that occurred on regional or remote roads in South Australia were examined. A case-by-case analysis was conducted by three road safety experts with extensive crash investigation experience to determine the factors contributing to the crash and potential preventative measures under each of the Safe System pillars. The interventions considered are all currently defined with some evidence in the research literature indicating their potential benefits. Each intervention was carefully considered as to whether it would have worked effectively in each given crash. Multiple contributing factors and interventions could be selected for each crash.

Results

The most common gaps in the road transport system, or factors identified as contributing to regional/remote crashes (or injury severity), centred around risky driving behaviours, including lack of restraint use (24.3%), speeding (23.4%), drug use (22.5%), alcohol use (19.8%) and driver inattention/distraction (19%).

While road user behaviour was a large contributor to fatal crashes in regional/remote areas, it is road and vehicle-based countermeasures that provide the greatest potential to prevent these crashes and mitigate related injuries (94.6%, 93.7%, respectively). The top twelve interventions and the proportion of crashes that might be prevented or injuries mitigated are listed in Table 1 along with the organisation which has responsibility for the intervention. Investment in safe roadside infrastructure, particularly to protect road users in road departure crashes (i.e., side and centre barriers, audio tactile line marking), and the use of policies and incentives to accelerate the uptake of newer vehicles with safe vehicle technologies (i.e., lane keeping technology, electronic stability control, autonomous emergency braking) can potentially prevent or mitigate a substantial proportion of crashes. These interventions should also be coupled with the most effective enforcement strategies to deter unsafe driver behaviours and increase the perceived risk of detection; speed management, such as lower speed limits to match the quality of the road and infrastructure; and measures to ensure restraint use compliance.

Table 1. Top 12 interventions for fatal crashes in regional/remote South Australia, 2014-2015

Safe System	Intervention	Responsibility	Number (N=111)	% of crashes
Road	Side barrier	Road authority	47	42.3
Vehicle	Lane keep assist	Vehicle manufacturers	42	37.8
Road	Centre barrier	Road authority	40	36.0
Vehicle	Electronic stability control	Vehicle manufacturers	35	31.5
Vehicle	Seatbelt interlock	Vehicle manufacturers	28	25.2
Road user	Apprehension for seatbelt offence	Police	28	25.2
Speed	Speed limit reduction	Road authority	26	23.4
Vehicle	Autonomous emergency braking	Vehicle manufacturers	24	21.6
Road user	Apprehension for drug driving offence	Police	23	20.7
Vehicle	Lane departure warning	Vehicle manufacturers	22	19.8
Road user	Apprehension for drink driving offence	Police	21	18.9
Vehicle	Alcohol interlock in all vehicles	Vehicle manufacturers	20	18.0
Road	Audio tactile centre lines	Road authority	19	17.1
Vehicle	Collision warning	Vehicle manufacturers	19	17.1
Vehicle	Drowsiness detection/warning	Vehicle manufacturers	18	16.2
Road	Sealed shoulders	Road authority	18	16.2
Vehicle	Rollover structural integrity	Vehicle manufacturers	17	15.3
Road	Audio tactile edge line	Road authority	14	12.6
Vehicle	Frontal impact intrusion protection	Vehicle manufacturers	13	11.7
Speed	Apprehension for speed offence	Police	13	11.7

Conclusions

The findings provide those responsible for designing, managing and monitoring the road system with evidence-based guidance for establishing future priorities in order to more effectively prevent road trauma in regional/remote areas. The evidence of the likely effectiveness of each intervention should also be considered.

Acknowledgements

This study was funded by the South Australian Department for Infrastructure and Transport through a project grant to the Centre for Automotive Safety Research.

The authors would like to acknowledge the cooperation of the South Australian State Coroner’s Court in providing access to the Coroner’s investigation files.

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System Failures and Extreme Behaviour in Fatal and Injury Crashes

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Abstract

Within the road system, there are compliant road users who make an error that leads to a crash, indicating a ‘system failure’ and also road users who deliberately take risks and engage in ‘extreme’ behaviour that leads to a crash. This study provides an indication of the relative contribution of system failures and extreme behaviour in fatal and injury crashes to improve our understanding of interventions needed to create a safe system. Using the same methodology and definitions as Wundersitz et al. (2014), crashes from two samples (N=157 fatal crashes, N=235 injury crashes) were reviewed. Consistent with previous findings, the majority of fatal (70%) and injury crashes (93%) in South Australia were attributable to failures within the transport system. The findings demonstrate that strategies focusing on system-wide improvements can be effective in reducing the incidence and severity of a large proportion of fatal and serious injury crashes.

Background

Within the road system, there are compliant road users who may make an error that leads to a crash, indicating a ‘system failure’. There are also road users who deliberately take risks and engage in ‘extreme’ behaviour that leads to a crash. System design that eliminates hazards or system failures from the road transport system is likely to be more effective than attempting to eliminate risk taking behaviour (Salmon & Lenne, 2015). The identification of the relative contribution of system failures and extreme behaviour is important for enhancing our understanding of interventions needed to create a safe system. In 2014, Wundersitz, Baldock and Raftery undertook the first study of its kind to investigate the relative contribution of system failures and extreme behaviour in fatal and injury crashes. The current study provides an updated indication of the *extent* to which a safe road transport system can reduce road trauma on South Australian roads and informs future road safety strategies.

Method

This study used the same methodology as Wundersitz et al. (2014) to determine the relative contribution of system failures and extreme behaviours in recent South Australian crashes. Two samples were used for the study: 157 fatal crashes (Coroner’s crash investigation files, 2014-2015) and 235 injury crashes (CASR in-depth crash investigation data, 2014-2019). Each crash was critically reviewed and coded for the presence and involvement of extreme behaviour, illegal behaviour and failures in the system. The definition of extreme behaviour was the same as used previously by Wundersitz et al. (2014), based on research that has quantified the risk of crash involvement associated with risky behaviours, and was intended to reflect intentional behaviours.

Results

The results were consistent with previous findings, with a majority of fatal (70%) and injury crashes (93%) in South Australia being attributable to failures within the road transport system (see Table 1). In almost half of the fatal crashes and 72% of injury crashes, road users were fully compliant (i.e., no illegal behaviours). This demonstrates that road users making simple mistakes

within the road system more frequently lead to fatal and injury crashes than those resulting from extreme or reckless behaviour. A comparison of the relative contributions over time revealed that the proportion of extreme behaviours in fatal crashes has decreased from 46% in 2008-09 to 30%

in 2014-15, accompanied by an overall reduction in fatalities (17%) during the same period. This may be, at least partly, attributable to a reduction in alcohol-related crashes within South Australia.

Table 1. Summary of the role of system failures and extreme behaviour in fatal and injury crashes, 2014-2019

Crash Causation	**Fatal crashes (N=157)**		**Injury crashes (N=235)**	
	N	**%**	**N**	**%**
Extreme behaviour	47	29.9	16	6.8
Illegal system failure[a]	35	22.3	50	21.3
System failure	75	47.8	169	71.9

[a] Does not meet the criteria for extreme behaviour but involves non-compliant behaviour.

Conclusions

Overall, the findings suggest that strategies continuing to focus on system-wide improvements to the road transport network such as providing safe road infrastructure (e.g., side and centre barriers) and the accelerated uptake of safe vehicle technologies (e.g., lane keeping technology, autonomous emergency braking), can be expected to be effective in reducing the incidence and severity of a large proportion of fatal and serious injury crashes in South Australia. For more extreme behaviours, greater control of road user behaviour may be required through the increased use of vehicle technologies and more holistic social health initiatives.

Acknowledgements

This study was funded by the South Australian Department for Infrastructure and Transport through a project grant to the Centre for Automotive Safety Research.

The authors would like to acknowledge the cooperation of the South Australian State Coroner's Court in providing access to the Coroner's investigation files.

The authors also thank the members of the dedicated CASR crash investigation team for data collection and case review activities: Sam Doecke, Sally Edwards, Martin Elsegood, Giulio Ponte and James Thompson, and Tori Lindsay for the collection of injury cases.

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Why don't we build safe roundabouts?

Axel Downard-Wilke, John Lieswyn, Warren Lloyd, Megan Gregory

ViaStrada

Abstract

In New Zealand, we are currently being told that it's time we stopped paying the road toll. Yet our roundabout design philosophy utilising a tangential design is based on maximising efficiency. This may also be why urban planners typically decry their use at all – our roundabouts permit high traffic speeds that make crossing (or using) them on foot or by bike difficult – if not impossible for mobility impaired or elderly road users. In contrast, the continental European focus based on radial designs is on maximising safety. Recently, Australasian designers have begun using raised safety platforms for speed control. This paper will assess design philosophies, their underlying reasons, and recommend actions that aim at improved safety.

Background, method, results and conclusions

(500 word limit) The paper will outline the difference in design philosophy between continental European practice and English-speaking countries, as documented in Wilke, Lieswyn & Munro (2014) based on Patterson (2010) in an Austroads research report.

A subsequent project by the authors saw us reviewing German roundabout design guidance in detail. This revealed that some standard facets of roundabout design using Austroads guidance are simply not possible for Germany as they are considered unsafe for people walking and cycling. The intention of this research was to provide practitioners with official guidance on how to design a continental European roundabout but this was “blocked”; it was instead published on ViaStrada’s website (Fowler & Wilke, 2016).

Waka Kotahi NZ Transport Agency issued the High-risk intersection guide in 2013, introducing the Level of safety service (LoSS) concept (NZTA, 2013). LoSS V represents a safety performance in the 90-100th percentile, where the observed injury crash rate is in the worst 10% band. When the authors tested the concept against a number of recently constructed state highway roundabouts, we found several in the LoSS V band.

Based on the experience of submitting numerous drafts (13!) of our 2014 Austroads research paper, some commentary on the entrenchment of the tangential design philosophy that maximises efficiency can be discussed. This was further highlighted when the resulting draft roundabout guidance was blocked from getting published through official channels. Likewise, our offer to review the poor safety performance of recently built roundabouts was not taken up. All of this is inconsistent with the current messaging that it is time we stopped paying the road toll (NZTA, 2022) as part of the Road to Zero strategy.

Through research on raised safety platforms (Blewden, Mackie & Thorne, 2020), there is a slow acceptance that speed control even on state highway intersections is appropriate. This thinking has not found its way to roundabout design guidance. The authors challenge that for roundabouts, shifting the focus from efficiency to safety – for all road users – is crucial for achieving the vision of zero deaths and serious injuries on New Zealand roads.

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Using Video-Based Surrogate Measures for Rural Road Safety Assessment

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Abstract

The traditional methods to evaluate the safety effectiveness of roadway are based on statistical analyses of crash data. However, in low- to middle-income countries like Thailand, such data may be underreported or incomplete. Department of Rural Roads of Thailand has recently developed the new risk-based approach for safety assessment of rural road improvement projects. This approach applied Video Analytics, which processes a video signal from close-circuit televisions using a machine learning algorithm to investigate the near-miss incidents at high-risk locations, and used Traffic Conflict Technique as a surrogate safety analysis to determine the risks of incidents based on the evasive and braking actions of drivers from traffic video recordings. The study presented the application of this video-based surrogate safety to risk assessment of various safety countermeasures on rural road segments in Thailand.

Background, Method, Results and Conclusions

Evaluating the safety effectiveness of a road safety countermeasure is a crucial step in road safety management. It is used to validate how well the countermeasure is performing and to further recommend as a future risk mitigation strategy. Traditionally, a crash-based approach has been widely used to compare between before and after improvement of the high-risk locations. However, it requires actual crash data and long-term observation. This study applied the traffic conflict technique along with video data to assess the performances of safety countermeasures.

This video-based surrogate safety method first identified the near-miss incidents by determining the evasive and braking actions of single vehicle and multiple vehicles from video recordings at different observation points. In this approach, artificial intelligence was developed to determine the speed and trajectory of each vehicle which are the important factors to determine the evasive and braking actions of vehicles as shown in Figure 1.

The study then evaluated the safety effectiveness between before and after improvements of rural road segments by comparing the risk of actions or traffic conflicts. Various rural road safety improvement projects were tested in this study. The study results showed the effectiveness of safety improvements, which can decrease the frequency and severity of traffic conflicts between vehicles. Therefore, the proposed video-based surrogate safety analysis has the potential to evaluate the effectiveness of safety countermeasures on rural roads in Thailand.

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Vehicle rollover crashworthiness Australian Design Rule – it's time!

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Abstract

Fatalities and injuries to seat belted occupants resulting from rollover crashes commonly occurs in Australia. An analysis of 2000–2007 single vehicle rollover fatalities in three Australian states was carried out at TARS UNSW using data from the Australian National Coroners Information System (NCIS). Rollovers accounted for 35% of all occupant fatalities in a single vehicle transport injury event. Of those crashes 16% occur in urban environments whereas 84% are rural crashes. Moreover, vehicle rollovers are among the most common causes of spinal cord paralysis injury (SCI) and traumatic brain injury (TBI) in Australia. Yet no government mandated Australian Design Rule (ADR) exists regarding minimum rollover crashworthiness requirements that mitigates crash severity in such crashes. Evidence demonstrating why such an ADR is needed and recommendations regarding how it can be readily developed based on existing United States vehicle crashworthiness Federal Motor Vehicle Safety Standards (FMVSS) are presented.

Background

Fatalities and serious injuries to seat belted occupants resulting from rollover crashes is of considerable concern to road safety advocates around the world. Debilitating lifelong SCI, TBI and serious thoracic injuries (STI) have been extensively documented in literature. The current problem of rollovers in their contribution to fatalities and life changing injuries such as SCI, TBI and traumatic thoracic injuries (TTI) has been researched by the authors and others but is still not well understood in Australia (Grzebieta et. al. (3013a), Fréchède et al, (2011)). The last robust study in this area involved an analysis of 2000–2007 single vehicle rollover fatalities in three Australian states was carried out by the TARS UNSW team using data from NCIS data (Fréchède et al, (2011)). Rollovers accounted for 35% of all occupant fatalities in a single vehicle transport injury event. Of those crashes 16% occur in urban environments whereas 84% are rural crashes.

Various studies have also reported that around 50% of SCI resulted from land transport incidents and a large majority of those involving motorised vehicles resulted from vehicle rollover (Cripps (2008), Norton (2010) and Lee et al. (2014)). Cripps (2008) reported that high speed and loss of control appear to be major contributing factors in more than half of the crashes involving rollover and a large proportion involved ejection resulting from lack of use or failure of seat belts.

Yet there still is no government mandated ADR regarding roof strength or occupant crashworthiness protection during a rollover. One could manufacture the roof from straw and it would pass the ADRs (Figure 1). Government and consumer groups have focussed their attention on prevention of rollover via assessment and ranking of a vehicle's stability characteristics and electronic stability control. It is well known that the most effective mitigation of crash injuries occurs when there is a combined reduction in crash likelihood and crash severity. For example, frontal crash protection is maximised by combining the effects of automatic braking systems (ABS) with frontal crashworthiness protection. In the case of rollover, there is no akin crashworthiness requirement in Australia. Despite the presence of rollover prevention measures such as traction control or stability control, rollovers continue to occur (Fitzharris et. al. (2020). In these cases, occupants are poorly protected from crash forces. However, it is time that focus change to mandating an effective roof crush standard and associated occupant protection measures such as seat belt pre-tensioners, ejection mitigation via side air curtains and interior padding requirements.

Regulation and consumer testing

As a result of a major Australian Research Council research project titled The Dynamic Rollover Protection (DROP) Research Program (Grzebieta et al, (2012), (2013a), (2013b)) and associated research of the Chief Investigators and Partner Investigators with the support of industry partners, in collaboration with researchers from the United States (US) and United Kingdom (UK), pressure was applied to both the US and Australia to consider the introduction of a dynamic rollover crash test procedure. In response, the Australian federal government signed off on a National Road Safety Strategy for 2011 to 2020 (Australian Transport Council (2011)) where together with the State Road Authorities they sought to "*Expand the ANCAP program to increase the coverage of crash test results across the full range of new vehicles on the Australian market, including light commercial vehicles, and develop a crash test standard and protocol for rollover crashes.*" Tragically for those involved in rollovers who were killed and injured that are now in wheelchairs, this never eventuated.

Figure 1: Poor roof strength resulting in partial ejection of occupant who was fatally injured.

Nevertheless, after two decade of debate and with unrelenting drive from independent crashworthiness safer vehicles researchers and experts, and despite strong resistance from some vehicle manufacturers, the US National Highway Safety Administration (NHTSA) finally enacted an upgrade to the Federal Motor Vehicle Safety Standard (FMVSS Number 216): Roof Crush Resistance, in 2009 with full applicability in 2012. The mandated roof crush test is essentially a metal plate pushed against the side of the forward edge of a vehicle's roof in the region of the intersection of the A pillar and side and forward header rail. The plate crushes this part of the roof at a constant rate and the load is measured at a deformation of 127 mm (5 inches).

The original standard roof minimum strength-to-weight ratio (SWR =1.5) that was enacted in 1973 (NHTSA), was upgraded to doubled the pass/fail criteria (SWR = 3.0). Almost concurrently, in 2009 the US Insurance Institute of Highway Safety (IIHS) implemented a roof strength test, with stringent requirements for achieving a 'GOOD' rating where the SWR was 4 or higher. In parallel, the US Federal Government introduced the FMVSS 226 Ejection Mitigation design rule in 2013 to reduce the partial and complete ejection of vehicle occupants through side windows in crashes, particularly rollover crashes (NHTSA FMVSSS 226). The effects of FMVSS 216 and 226 are coupled with FMVSS 201: Occupant Protection in Interior Impact: Upper Interior Head Impact Protection. FMVSS 201 fires a head form at a specified speed into the various internal surfaces of a vehicle to ensure there is sufficient padding to reduce head injury potential in a crash.

With the suite of new Federal Motor Vehicle Safety Standards in the USA, manufacturers responded with increased roof strength and ejection mitigation systems, improved curtain airbag technology, seatbelts with pretensioning devices, side window glazing integrity, effective roof and pillar head impact padding and advanced electronic stability control. Maintenance of the space surrounding the occupant resulting from the more robust roof strength criteria enabled the suite of passive technologies to function synergistically. As an added benefit, strong roofs also perform significantly better in animal impact crashes such as kangaroos, something that has been well demonstrated in Swedish models designed to withstand moose impacts.

Volvo proved to be a leader in the rollover safety space, initiating stringent internal requirements for roof strength and occupant protection with the introduction of its Volvo XC90 SUV in the early 2000s. The introduction of the XC90 demonstrated what was possible – a vehicle could be engineered to be safe in a rollover crash with a strong roof and good occupant protection features (Volvo XC60 Roll Over Crash Test).

At one stage, a proposal eventuated at ANCAP to introduce roof crush testing with media stating *Roof crush testing to measure the roof strength in rollover crashes will commence as part of ANCAP testing from 2014.* (ANCAP, Paine (2013)). Disappointingly the introduction of an ANCAP roof strength criteria has not eventuated. ANCAP representatives have highlighted a focus on rollover prevention via the introduction of Electronic Stability Control (ESC) and other similar preventative ADRs would be sufficient. And yet we continue see preventable SCI, TBI and TTI and deaths from rollover crashes despite the introduction of ESC.

Conclusions

While the ADRs and ANCAP have been effective in advancing various vehicle crashworthiness and crash prevention measures, there remains an anomalous and serious safety gap where rollover crashworthiness regulation in Australia is lagging the international state of the art. There is sufficient information and precedence now to develop an Australian Design Rule (ADR) that requires all light vehicles (sedans, station wagons, sports utility vehicles (SUVs) and utilities) to undergo and comply with tests required of US vehicles for roof crush, occupant ejection mitigation and head impact force mitigation, i.e. the US FMVSS 216 Roof Crush standard (or akin to IIHS roof strength criteria) and the US FMVSS 226 Ejection Mitigation standard, and the US FMVSS 201: Occupant Protection in Interior Impact: Upper Interior Head Impact Protection padding standard.

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Evaluation of the NSW Pedestrian Protection Program

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Abstract

The NSW Pedestrian Protection Program (PPP) aimed to upgrade all two-phase signalised intersections with timed pedestrian protection (TPP). Specifically, the program sought to eliminate, or temporally separate, the green roundel signal for a turning driver commencing at the same time as a green walk signal on a parallel pedestrian movement. Evaluation of the program sought to identify whether it resulted in reduced pedestrian crash rates, fewer pedestrian-vehicle conflicts, and increased visibility of pedestrians whilst crossing. It also explored whether the program had been delivered as intended.

Background

Timed Pedestrian Protection is a method of traffic and pedestrian control whereby a red turn arrow or a delayed start are used to hold turning vehicular traffic for a period of time, while the green pedestrian signal is displayed allowing pedestrian movement to occur. This type of treatment is consistent with the Safe System approach to road safety and focused on ***Prioritising People***.

Research suggests the introduction of TPP can result in safety benefits to pedestrians including:

- Reduced pedestrian-vehicle crashes (Van Houten et al., 2000; King, 2000; Fayish & Gross, 2010).
- Fewer pedestrian-vehicle conflicts (Van Houten et al., 2000).
- Increased visibility of pedestrians whilst crossing (Van Houten et al., 2000; Saneinejad & Lo, 2015).
- Fewer drivers violating pedestrian right of way (Pecheux et al., 2009).
- Decreased drivers rushing into intersections before pedestrian arrival (Van Houten et al., 2000).

NSW Pedestrian Protection Program

The PPP aimed to upgrade all two-phase signalised intersections with TPP. In preparation for the program, a total of 760 two-phase intersection locations were identified. Of these sites, 200 were excluded from the program because they were identified as either having no pedestrian crossings, having adequate existing pedestrian protection or having more than two phases. As such, the total program consisted of review and upgrade of 560 two-phase intersections.

The overarching aim of the program was to deliver improved pedestrian protection at two-phase, signalised intersections, through signal phasing and infrastructure changes. As such, the evaluation was intended to assess whether implementation of the program contributed to a reduction in pedestrian crashes and to inform decisions about future roll out of the program to larger signalised intersections (three-phase and larger).

Key Evaluation Questions

The evaluation focused on four key evaluation questions to understand implementation and impact of the program:

1. Did the implementation of the Pedestrian Protection Program result in reduced pedestrian crashes, at treated intersections?
2. Did the implementation of the Pedestrian Protection Program result in fewer opportunities for pedestrian-vehicle conflicts, at treated intersections?
3. Did the implementation of the Pedestrian Protection Program result in increased visibility of pedestrians whilst crossing, at treated intersections?
4. Was the Pedestrian Protection Program implemented as intended?

The findings of each evaluation question will be explored in detail as well as the implications of this treatment type in reducing road trauma of our most vulnerable road users. The findings will provide Transport for NSW and key program stakeholders with valuable evidence about the effectiveness of the program in increasing safety benefits for pedestrians.

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Opportunities to improve road safety in developing South Pacific nations

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Abstract

Coinciding with the UN Decade of Action for Road Safety, key Government agencies of developing South Pacific nations, assisted by development partners, have undertaken steps to improve their road safety record. This paper illustrates several efforts and opportunities, firstly from the viewpoint of an ACRS individual member involved in providing technical assistance to Samoa, and Fiji in the road safety arena. Insights are provided on the economic, institutional and political constraints that can compromise successful project implementation. Suggestions for the current decade are made, with a call for a common crash analysis system to be funded and provided for the region to spur evidence-based identification of problem areas, overdue for treatment in the 2011-2020 national action plans. Likewise the benefits of a regional approach to updating traffic regulations and enforcement resources are discussed.

Background

Developing South Pacific nations are remarkably similar with regard to: regulations; enforcement; crash reporting and analysis; black spot/route identification; speed management; national road safety action plans; and implementation of countermeasures and policies. This paper highlights particular elements and positive recent developments with replication potential across the region.

For example:

In Fiji: N/ASRUP and main highway street lighting programmes; planned introduction of Road Safety Audit and Black Spot programmes; improved traffic signals, improved alcohol & speed enforcement; and expanded road safety education & awareness campaigns.

In Samoa: road safety education & awareness campaigns; and improved post-crash reaction & care.

Changing mindsets to take action – fresh approach

On major road projects road safety initiatives are commonly considered an add-on to the primary focus to improve the pavement condition and where possible the alignment. The short term nature of major projects means resources are not provided long term to institutionalize valuable road safety design, operations and maintenance practices. Across the region, governments are severely budget constrained and tend to direct available resources to: improving health and education sector performance; improving access to power; and providing safe water and sanitation services. In this constrained budget environment it is troubling to acknowledge that the available road safety improvement funds are frequently not spent due to inadequate preparation and resourcing.

The region is yet to understand the impact of the continuing road fatality toll - a change in mindset is needed to affect a focus on integrating road safety initiatives within each nation, from arguably a regional approach given the small diverse populations but commonality in culture and governance. Samoa and Tonga are 2 of the 12 Commonwealth nations expected to see an increase in the road mortality rate from 2017 to 2030 (refer Commonwealth Expert Panel report).

In Fiji the former stand-alone National Road Safety Committee overseeing the NRSP was more-or-less dissolved and subsumed within the new Land Transport Authority. This was not as successful as hoped, not helped by the 'silo' mentality of authorities, the competing budget support needs of authorities, and transitory relationship issues that can compromise participation and collaboration in small nations. The FRA Board approved (Oct'17) the creation of a traffic & safety monitoring team to drive the implementation of safe road infrastructure measures – hopefully the team will eventuate and partner to a greater extent with key road safety stakeholders.

Way forward: regional approach

While presenting snapshots of the wider road safety arena and common issues being faced, this paper urges regional development partners to build upon their past fruitful efforts and take the initiative to implement a regional approach to putting road safety on a sustainable path such that "no island is left behind". This will undoubtedly require some management and procedural changes, but follow-up on recommendations has not been readily achieved so a change in approach seems necessary in any event. The creation of a regional crash analysis system is hoped for, along with review of all the traffic regulations and road codes, review of resources/training needs, and development of education and advertising campaign material.

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Eyes On The Wall: Mural Art For Road Safety Advocacy

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Abstract

Lack of road safety awareness among school community, the parents, local residents and road users on the importance of protecting the safety of the children become a major issue which contribute to high number of accidents involving pupils. On this basis, this study assumes that mural art can improve understanding of road safety issues, which, in turn, will improve quality of life for not only the pupils, but also the teachers and school employees. Mural art was painted at three primary schools in Negeri Sembilan State that have high road accident risk. A questionnaire survey was distributed to the teachers and school employees to acquire information on their level of road safety understanding as well as their perception towards mural art painting for improving road safety. The results demonstrate mural art may increase road safety awareness and can become a good medium for advocacy.

Background

Analysis from children's health perspective showed that the principal cause of death for children under five years old was certain conditions originating in the perinatal period which was 35.4 per cent and Transport accidents (1.1%) (Figure 1). The risk of a child especially school children will increase if the schools are located near the main road where the high traffic flow can cause the student more prone to accidents as highlighted by (SMR et al., 2020). This study aims to drive the importance of road safety advocacy to the school community, through mural art which captures the public's curiosity and gets them learning.

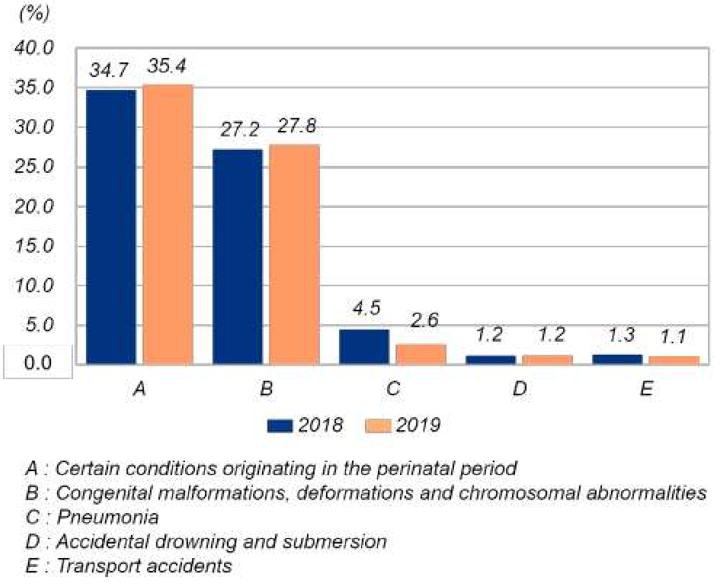

Figure 1. Distribution of the cause of death (Department of Statistics Malaysia Official Portal, 2020)

Method

Three primary schools were selected for this project based on the road accident risk and the potential of accidents and the schools are located in Rembau District, Negeri Sembilan. In term of mural art design, one wall at each school was selected as mural painting location. A questionnaire survey was distributed to the teachers and school employee to acquire information their level of road safety awareness as well as their perception towards wall mural painting for supporting road safety education.

Results and Conclusions

Figure 2 shows an example of mural art painted at the school while Table 1 lists the demographic variables of the respondents that shows 78% of the respondents are female and the total number of respondents who answered this questionnaire was 50. The survey uses a scale of 1 to 5 that interprets a minimum value of 1 to a maximum of 5.

Figure 2. The example of mural art

Table 1. Demographic variables of the respondents

Variables	Category	Percentage
Gender	Male	22
	Female	78
Age	20-30	6
	31-40	34
	41-50	26
	51-60	34
Working experience	1-5	4
	6-10	16
	11-15	24
	16-20	8
	20 years and above	48

Table 2. Level of aggrement using Relative Important Index (RII)

Questions	Level of Agreement using the Likert Scale					Mean	RII
	1	2	3	4	5		
The importance of road safety issue	0	0	2	8	40	4.76	0.95
Level of road safety issue understanding	0	0	1	20	29	4.56	0.91
Mural art increase road safety awareness	0	0	7	15	28	4.42	0.88
Mural art safety advocacy is being shared with children	0	1	9	21	19	4.16	0.83

Table 2 shows the ranking of respondents on four different questions which shows that the majority of the respondents acknowledged the importance of road safety issue and admitted their level of road safety understanding is high. Besides, using mural art to increase road safety awareness was ranked very high and most of the respondents shared the road safety information on the wall with their children at home.

In conclusion, progressive road safety campaign is hope to create more courteous, thoughtful and law-abiding road users and the initiative by inculcating positive values in school through mural art will become a culture in road safety advocacy.

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Safer placement of digital billboards

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Abstract

Digital billboards are becoming more common on our road networks. Static boards are being replaced with digital, with little need for planning approval. Assessment of safety impact of billboards is contentious; placement is often controlled by planning considerations not road safety impacts. We set out to develop a driver centered approach to assessing the potential road safety impact of a digital billboard. Our literature review into cognitive demand, field of view and message processing has resulted in a new methodology for assessment of digital billboards which is robust, logical and defensible. Our approach assesses the location of the billboard on the road network, the placement of the billboard relative to the driver's field of view and the driver's visibility of the billboard.

Purpose

We set out to develop a driver centered approach to assessing the potential road safety impact of a digital billboard.

The goal was to develop an approach that can be easily implemented but more importantly assesses the likely impact of a digital billboard on a driver's performance and hence road safety.

Methodology

The development of the new method involved an extensive review of policies from multiple jurisdictions and literature review of cognitive demand, field of view and message processing.

A synthesis of these key disciplines enabled us to assess how different billboards (e.g., location, placement and visibility) may impact a driver's performance.

Findings

Cognitive demand

We identified two external factors that impact a driver's cognitive effort, driving task demand and roadside environment complexity.

These two facets of our road network can be mapped to identify areas where the cognitive demand on a driver is likely to be higher or lower (in relative terms).

It is therefore possible to provide robust advice on preferred / discouraged locations for digital billboards.

Field of view

A driver's field of view consists of the focal, central and peripheral cones.

The central cone of vision narrows when a driver is under increased cognitive demand. This has previously been associated with speed, however our research indicates attitude, experience and secondary tasks also impact.

The focal cone of vision is narrow and there is merit in the roadway remaining within the central cone of vision whilst a driver's focal cone shifts to a sign (traffic or otherwise).

This has implications for billboard placement with respect to placing them closer to the roadway, but not adjacent to traffic signs.

Message processing

Austroads (AP-R420-13) identified that once a person is engaged with a task, they have a strong tendency to complete it, before moving cognitive effort to a new task.

An engaged driver will likely shift focal vision between a billboard and the roadway until they have finished reading the message. Providing insufficient time may encourage drivers to focus primarily on the billboard and leave no cognitive capacity to process the roadway.

Research indicates that a driver requires between 8 and 10 seconds to process a billboard message.

Therefore, a sign that is visible (and legible) to a driver for more than 8 seconds will be safer. This also has implications for digital sign content transitions.

Assessment method

Our method includes robust objective assessment of the location, placement and visibility of a billboard:

- Location: Is the driver likely to already be under high cognitive demand?
- Placement: Is the roadway within the central cone of vision, when the driver's focal cone is aimed at the sign?
- Visibility: Will the driver have at least 8 seconds to observe and read the sign?

Conclusion

This driver focused data driven method will enable regulators and proponents to keep pace with changes in billboard technology and manage their impact on the roads we drive tomorrow.

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What influences gig economy delivery rider behaviour and safety?

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Abstract

The safety of gig economy delivery riders is a growing area of concern; however, as a relatively new form of work, there has been little research undertaken to examine delivery rider crash causation or the influences on delivery rider behaviour. This study involved the development of an AcciMap showing the factors that influence gig economy delivery rider behaviour and safety in Victoria, Australia, based on a literature review and workshops with delivery riders and gig economy and road safety stakeholders. The findings demonstrate that there are multiple factors influencing delivery rider behaviour and safety spanning all levels of the 'gig economy delivery rider system'. It is concluded that efforts to enhance rider safety should target eight key areas including the delivery task, the workforce, apps, algorithms and data, infrastructure, culture and social influences, clients, customers and other road users, delivery platform processes, and laws and regulations.

Background.

The so-called 'gig economy' is a rapidly expanding area of work involving occasional, short-term, on-demand, task-based labor that is organised via mobile, app-based digital platforms (Tan et al., 2021). One increasingly popular area of gig economy work is the provision of food and product delivery services by riders using either bicycles or powered two wheelers. The safety of these 'gig economy delivery riders' is a growing area of concern, with a series of fatal collisions occurring worldwide and studies showing an enhanced propensity for risk taking behaviour (Papakostopoulos & Nathanael, 2021). In Australia, seven delivery riders were killed during 2020 (Om et al., 2021), and concerns have been raised as riders are engaged as independent contractors and hence not subject to standard workplace safety controls.

The Draft National Road Safety Strategy 2021-30 highlights the need to address the safety of gig economy workers (Infrastructure & Transport Ministers, 2021). Systems thinking is a currently popular approach for understanding and responding to complex road safety issues (Salmon et al., 2021); however, it has not yet been applied in the gig economy delivery rider context. The aim of this study was to apply a systems thinking method, the Accident Mapping technique (AcciMap; Svedung & Rasmussen, 2002), to identify the influences on gig economy delivery rider behaviour and safety in Victoria, Australia.

Method

Development of the AcciMap involved the conduct of a literature review on the factors influencing gig economy delivery rider safety and a series of AcciMap workshops involving delivery riders (5 participants) and key gig economy and road safety stakeholders (14 participants). A draft AcciMap was initially developed based on the literature review and then reviewed and refined during the workshops.

Results

The AcciMap showing the factors influencing delivery rider behaviour and safety is presented in Figure 1. As shown in Figure 1, participants felt that there are a diverse set of influential factors across all levels of the Victorian gig economy delivery rider system. This is in line with the systems thinking approach which suggest that the factors which interact to influence safety span all levels of a sociotechnical system (Salmon et al., 2021).

Conclusions

The findings demonstrate that, according to the literature and workshop participants, multiple factors influence delivery rider behaviour and safety. These factors span all levels of the gig economy delivery rider system, and an additional set of external factors were also identified relating to broader societal issues such as racial discrimination and limited work opportunities. An implication of this research is that future efforts to enhance gig economy delivery rider safety should attempt to address as many of the contributory factors identified as possible. To support this, eight themes were identified based on a synthesis of the factors within the AcciMap. These include the delivery task, the workforce, apps, algorithms and data, infrastructure, culture and social influences, clients, customers and other road users, delivery platform processes, and laws and regulations. Further work exploring interventions designed to enhance delivery rider behaviour and safety is encouraged.

Acknowledgement

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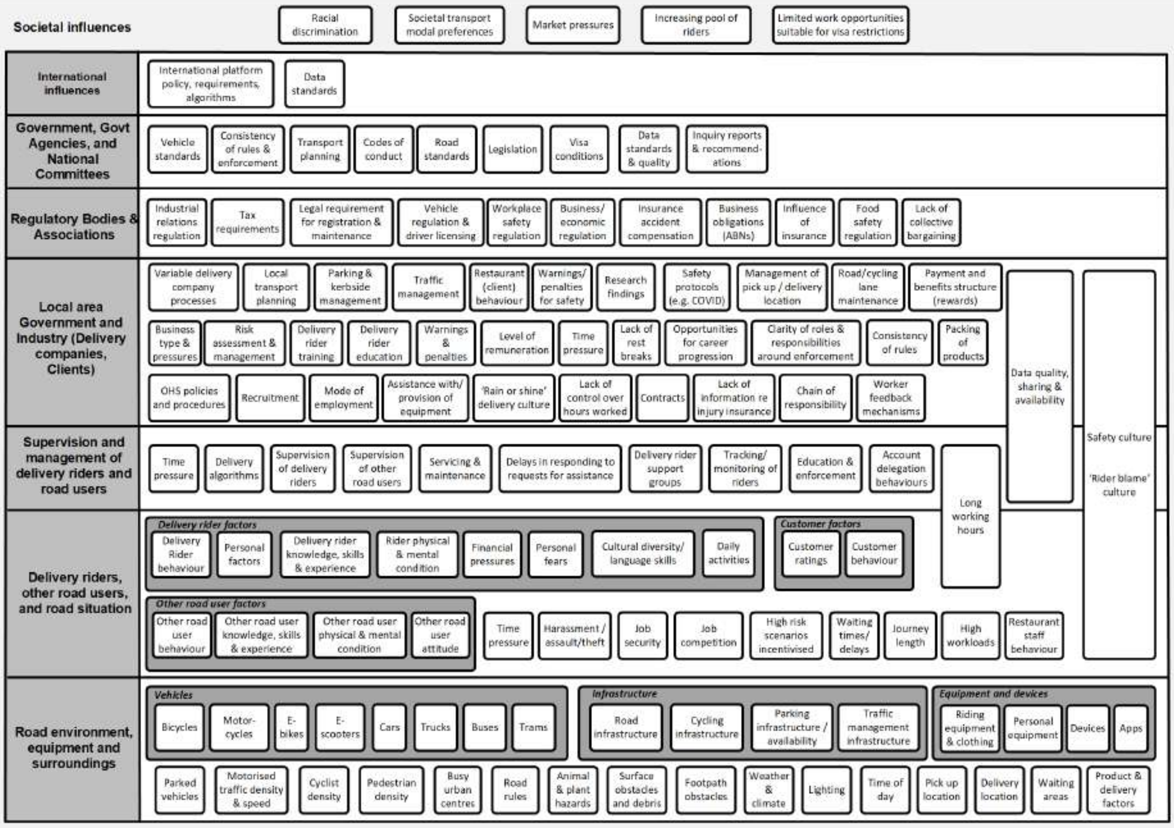

Figure 1. AcciMap showing the factors that workshop participants perceived to have an influence on gig economy delivery rider behaviour and safety.

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A graduated approach for validating roadside fatigue detection technologies

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Abstract

Driver fatigue contributes to approximately 11 per cent of all road fatalities annually in Victoria. The objective of this project was to investigate the efficacy of new and emerging technologies to detect driver impairment from fatigue in a roadside setting. The project adopted the following graduated approach to investigate the efficacy of candidate technologies; 1) desktop evidence review 2) laboratory-based assessment 3) experimental assessment in a driving context 4) operational utility assessment. The outcomes of this project have the potential to inform the establishment of a bespoke impairment assessment protocol for driver fatigue that may be suitable in road safety practice.

Background

It is estimated driver fatigue contributes to approximately 20 per cent of all crashes and 11 per cent of all driver fatalities each year in Victoria. This project embarked on a graduated, stepped approach to determine the efficacy of new and emerging technologies to reliably detect driver impairment from fatigue in a roadside context. Novel technologies that detect changes in physiological markers may offer potential road safety benefits however it is essential these technologies are thoroughly and carefully assessed for their road safety validity and practicability.

Project methodology

This research project adopted the following graduated approach to identify and validate existing candidate technologies for their capability to detect driver fatigue in a roadside context:

<u>(Phase 1) Investigation of potential candidate technologies</u>: A desktop evidence review was initially conducted to identify different technologies currently on the market that are designed to detect drowsiness including continuous monitoring and fitness to drive/fitness for work devices.

<u>(Phase 2) Laboratory assessment</u>: Those devices considered potentially suitable from phase 1 (candidate technologies) were assessed for their construct validity by comparing performance against gold-standard clinical markers of drowsiness in the laboratory. The Pupillary Stability Test (PST) device, which measures involuntary changes in the pupil associated with drowsiness, performed to a high standard in this context and progressed to phase 3.

<u>(Phase 3) Assessment of candidate technologies in a driving context</u>: Following different levels of sleep deprivation, participants undertook a 2-hour drive around an enclosed track simulating the road network ('track trial') to assess the PST device's capability to detect driver impairment from fatigue. Other physiological and performance-based measures of fatigue were collected during the trial including brain electrical activity and vehicle out-of-lane events. The results showed the PST, when combined with another simple ocular screening mechanism, was able to reliably detect excessive levels of driver impairment from fatigue.

<u>(Phase 4) Operational utility assessment</u>: The PST device was tested with Victoria Police personnel to determine its operational utility in a roadside testing context and what future modifications may be required to ensure fit-for-purpose. Operational utility measures included practicability, ease of use, durability, intra and inter-tester reliability and interpretation of results.

A multi-disciplinary technical reference committee was established consisting of the Department of Transport, other government agencies, Victoria Police, academic and clinical researchers to provide technical guidance to the project throughout each phase, as well as to ensure the approach adopted was aligned with strategic directions.

Conclusion

This project outlines a graduated approach from the laboratory to the field for validating ocular-based technologies to detect driver fatigue in a roadside context. The project outcomes have the potential to inform a future standard of impairment assessment screening for driver fatigue. Further testing of these technologies and the impairment assessment protocol is required in real-world settings to determine efficacy in road safety and enforcement practice.

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Effect of speed limit compliance on severe injury crash risk

Chris Jurewicz

SafeMobility

Abstract

The Victorian Road Safety Strategy 2021-2030 has an objective to reduce fatalities and serious injuries (FSI) where speed is a contributing factor. Managing this factor requires not only setting appropriate speed limits but also managing drivers' compliance. There is good research on safety effects of specific speed limit enforcement interventions. Less is known about general relationship between speed limit compliance and road safety. The purpose of this paper is to use recently published research to propose a general relationship between speed limit compliance levels and the risk of FSI crashes. Such relationship could be useful in allocation of enforcement resources to busy locations where speed limit compliance rates are low.

Background

The Victorian Road Safety Strategy 2021-2030 has an objective to reduce fatalities and serious injuries (FSI) where speed is a contributing factor (Victorian Government 2020). The assumption behind such objective is that there is a strong relationship between speeding / compliance and safety outcomes.

Much of the evidence for this was very dated and based on driver choice of speed (e.g. Kloeden et al. 2001, 2002). Publication of Fitzharris et al. (2020) provided new evidence based on in-depth crash analysis, including travel speeds of vehicles involved in FSI crashes. This new research was still based on individual driver's speed choice.

The purpose of this extended abstract is to apply this new research to model a relationship between speed limit compliance and risk of FSI crashes. Compliance is simply another traffic metric, one which is easier to measure than individual speed choice. Then, two environmental scenarios were explored: 60 km/h speed zone typical of urban arterials, and 100 km/h speed zone, typical of rural arterials. Practical applications to road safety planning in these cases were discussed.

Such model relationships could be useful in considering allocation of enforcement resources to sections of the road network with significant numbers of drivers and low speed limit compliance rates.

Methods

The TAC-funded Enhanced Crash Investigation Study (ECIS, Fitzharris et al. 2020) provided new research linking individual driver's speed choice cf. speed limit and risk of hospitalization crash (FSI level in Victoria).

The driver speed – FSI crash risk curve from the study is presented in Figure 1. Crash risk was calculated comparing odds of such a crash at different travel speeds. Speeds of crashed vehicles were derived from crash reconstructions. Control group of non-crash vehicles had their speeds measured at each crash not long after the crash. The log-linear model was fit to speeding categories only.

The model was representative of speed limits between 50 and 110 km/h in Victoria, Australia. It was valid for all vehicle crash types, but excluded pedestrian and cyclist crashes, and heavy

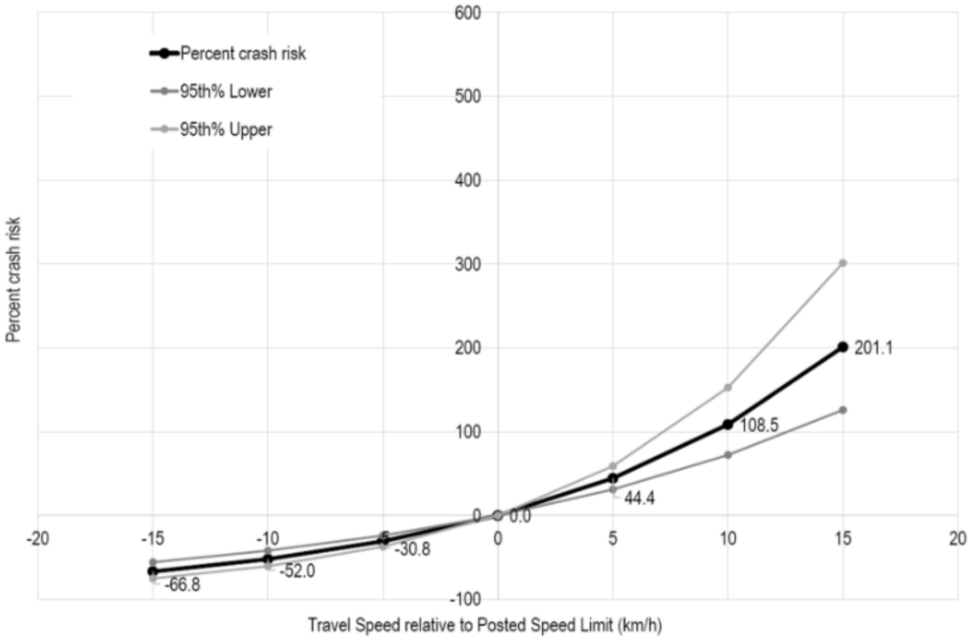
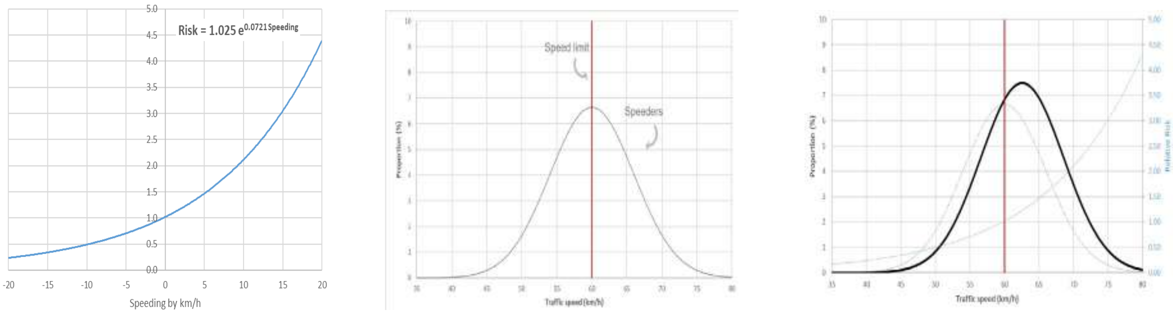


Figure 1. Speed choice cf. speed limit vs. risk of a fatal or serious crash (Fitzharris et al. 2020)

vehicles. Further, crashes involving alcohol and drug use were excluded. The model was adjusted for effects of age and gender. The Fitzharris et al. model was deemed the most relevant choice for the purpose, due to its local relevance, acceptable data, and methodology.

The basic approach in this paper was similar to these taken by Elvik (2013, 2019) and Doecke et al. (2020). An individual driver risk relationship is combined with a distribution of driver speeds in traffic to produce a theoretical crash distribution by speed. Figure 2 shows this concept.



Individual crash risk by speed Traffic speed distribution Crash distribution by traffic speed

Figure 2. Approach used in this study

This combination allows to model effects of individual speeding behaviours on the behaviour of the overall population of drivers. Further, the model allows to test safety effects of mean speed change, changes in speed distributions and in speed variability. The model can also be presented in different ways, e.g. crash risk by percentage speeding or by speed limit compliance. For the latter, multiple random combinations of mean and standard deviation speed values (within expected ranges) were run through the model to produce scatter of crash risk values for different levels of speed limit compliance levels and speed standard deviations.

The basic assumption that traffic speeds are normally distributed can be changed in the model. This enables considering skewed effects of speed enforcement which affects only the speeding drivers.

Results

The above method was applied for 60 and 100 km/h speed zone scenarios. This represents types of roads commonly found in urban and rural environments. Several simple model forms were fit to the generated data, with the linear model providing the best fit.

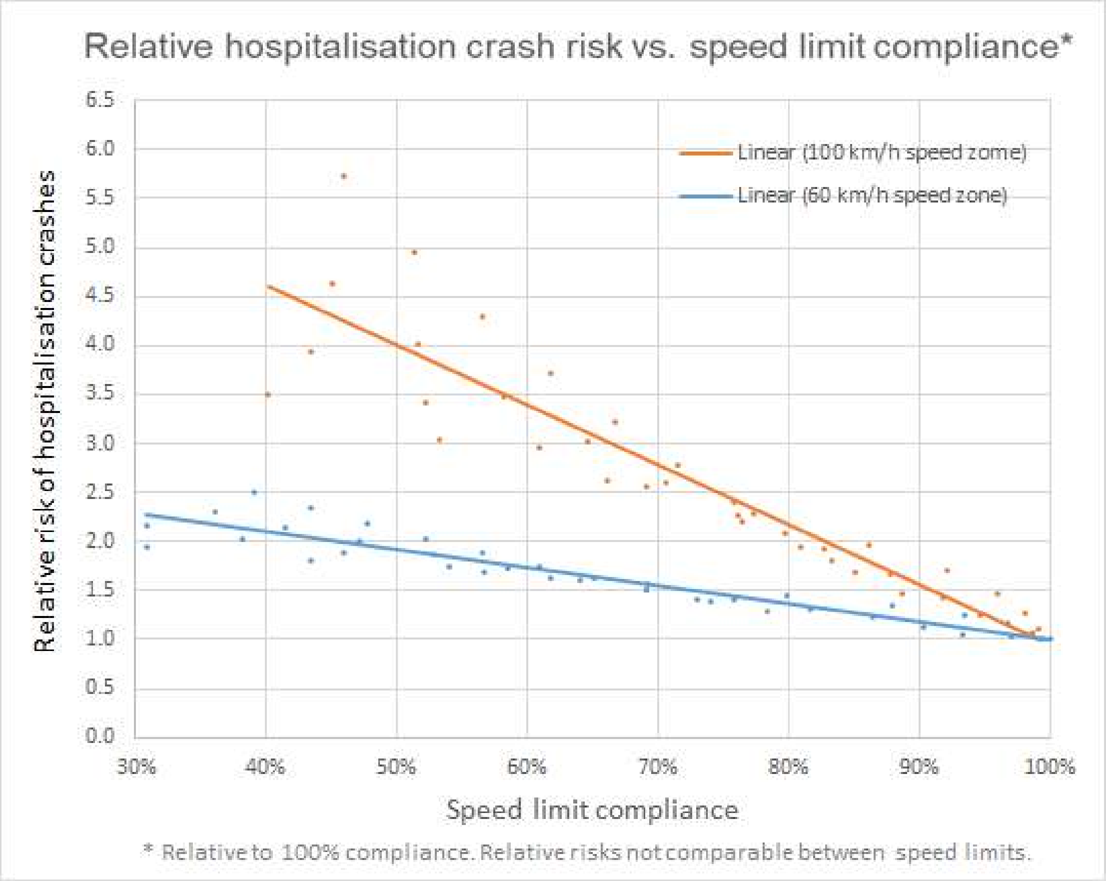


Figure 3. Speed compliance vs. FSI crash risk

Figure 3 shows that FSI crash risk reduces with improving compliance. This has been confirmed by most published speed limit enforcement program evaluations.

The risk response to compliance is stronger in 100 km/h zones than in 60 km/h zones (steeper line). This is reasonable as crash risk is more responsive to changes in high speeds than in low speeds. This is shown well in Elvik et al. (2019) and in other speed-safety models.

Discussion of practical applications

The speed limit compliance – FSI crash risk relationship could be useful to illustrate potential safety effects of some common speed management initiatives.

One application shows the effect of the 'nudge effect', i.e. reducing low-level speeding, in a 60 km/h speed zone by shifting the mean speed from 60 to 56 km/h, shown in Figure 4 (standard deviation was constant). The two curves are FSI crash distributions by traffic speed. The first 'before' curve in red shows that most FSI crashes would occur above the speed limit of 60 km/h. The black 'after' curve shows a shift in cash distribution to the left, and a reduced area under the curve.

The model estimated a 25% FSI crash reduction, and a 40% reduction in FSI crashes due to speeding. This estimate was similar to that used with DOT adopted Elvik 2009/2004 hybrid

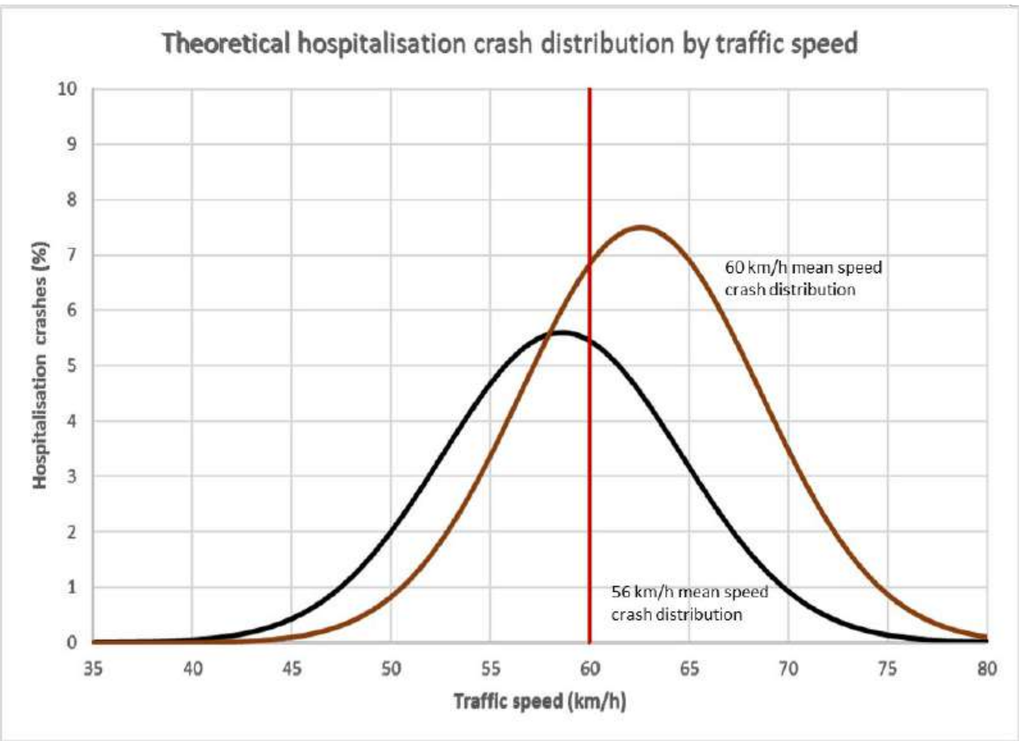


Figure 4. The 'nudge effect' of enforcing low-level speeding

model for estimating speed crash reduction factors often used by the Victorian Department of Transport (20%, CL: 10% – 27%).

Sensitivity testing showed that further 'nudging' of low-level speeding might not be as effective, and other speed management techniques could be more effective.

Another application could be using the compliance – crash risk relationship in Figure 3 to prioritise enforcement. Enforcement could be directed to the parts of the road network where the risk was highest and applied to most road users.

As shown in Figure 5, point-to-point enforcement could be given a priority on a 100 km/h road section with 70% compliance and 10 000 vehicles per day (vpd). Enforcement would reduce FSI crash risk by 2.75 times (CRF of 64%) for all road users by acting on 3 000 speeding drivers.

In contrast, enforcing a similar road with 90% compliance and 5 000 vpd would reduce risk up to 1.5 times by acting on only 500 speeding drivers. Hence the benefit would be greatest where more drivers are speeding. Additional risk factors could also be considered, e.g. high proportion of heavy vehicles or vulnerable road users.

Such modelling could become a monetised safety benefit and a BCR using a predictive crash model or reliable FSI crash history. Road sections with lowest compliance and highest traffic flow (i.e. more speeding drivers) could be prioritised for effective enforcement to provide a measured contribution to a strategy objective.

Monitoring speed limit compliance is likely to become easier with greater deployment of point-to-point enforcement over time. Data from connected vehicles will also assist decision makers in identifying sections of the road network with low compliance (Ambros et al. 2020).

Finally, a similar dose-relationship relationship could be refined for fatal and MAIS3+ crashes, or injuries. A continuous rather that categorical for of the Fitzharris et al. relationship would be more accurate. Development of confidence limits on the risk changes estimated in this abstract is possible and would improve confidence in application. Future studies could seek to achieve these objectives.

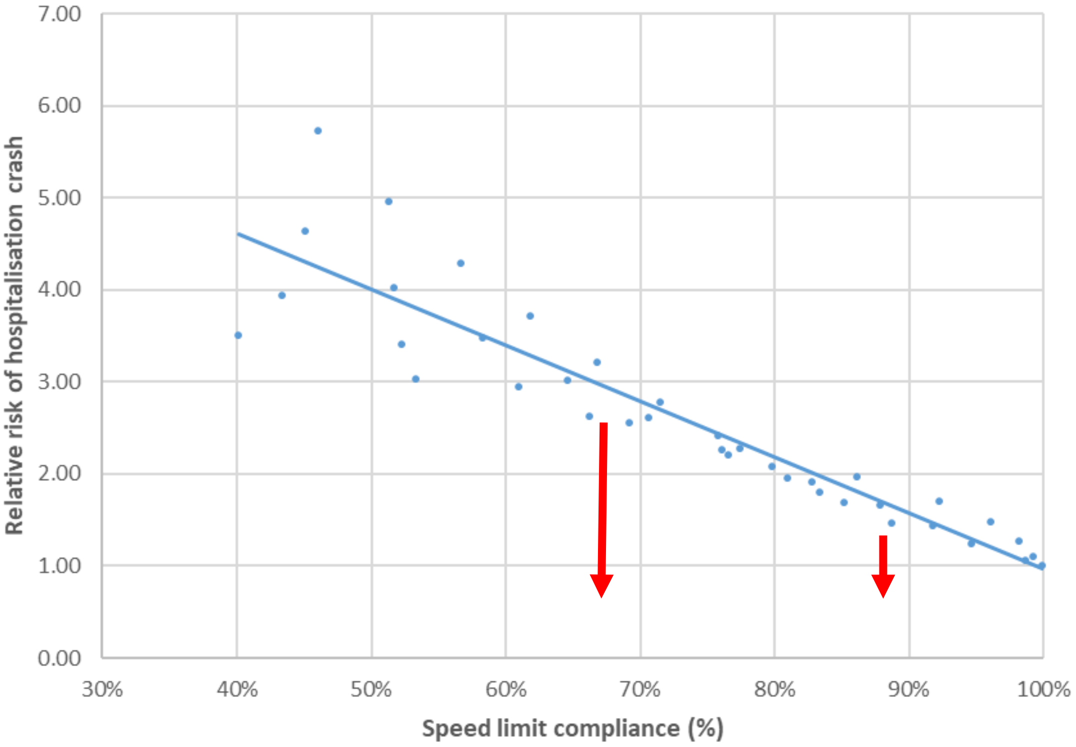


Figure 5. Relative FSI risk reductions on 100 km/h roads by level of speeding

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Developing road safety strategies in low and middle income countries

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Abstract

Developing a jurisdictional strategy is a critical starting point for achieving sustained reductions in road trauma. Regrettably, strategy setting is often bogged down with planning jargon and analysis of available information rather than strategizing around major issues and options that can cut through and deliver lasting change. Effective road safety strategy focuses on the vital few, the big issues through which lasting change can be delivered, and this is particularly important in low and middle income countries. Data is always an issue, but there is almost always sufficient data to present a strong case for change with an approach which can be delivered within the local context. This paper will outline four key elements for developing effective road safety strategies in low and middle income countries with examples drawn from Asia and Africa, at both a national and sub-national level. Lessons learned include focusing on the vital few, appropriately using available data, and promoting lasting stakeholder engagement.

Background

Developing a jurisdictional strategy is a critical starting point for achieving sustained reductions in road trauma. Regrettably, strategy setting is often bogged down with planning jargon and lengthy analysis of available information rather than strategizing around major issues and options that can cut through and deliver lasting change.

This paper explores the value of simplicity in strategy development, through the preparation of road safety strategies in Asia and Africa. An effective national road safety strategy is genuinely strategic in outlook, and addresses critical priorities. It is integrated with a set of inter-agency management arrangements to oversee implementation by government, and it is supported by a separate action plan which specifies high priority activities, and accountable agencies.

Effective Strategy

Key components of a good road safety strategy are:

Vision & Targets

- An ultimate vision of road safety
- Quantitative targets

Critical Analysis

- Description of the critical road safety issues now and expected
- Description of the strategic approach that will be taken to address these issues

Strategic Direction

- A set of strategic directions which will provide lasting road safety improvements over the lifetime of the strategy

- Linkages between the vision, the targets (particularly intermediate outcome targets), and the critical analysis which lay the platform for a separate road safety action plan

Management and implementation

- The road safety management arrangements for implementing the strategy (institutional accountabilities, monitoring and reporting, funding)
- An associated action plan addressed in major project form and itemising responsibilities, timeframes and evaluation.

Lessons Learned

Effective road safety strategy focuses on the vital few, the big issues through which lasting change can be delivered, and this is particularly important in low and middle income countries. Given the similar issues apparent in many jurisdictions across the world, the paper will discuss the extent to which safety strategies can respond to each particular country context, and avoid the one size fits all approach.

Data is always an issue, but there is almost always sufficient data to present a strong case for change with an approach which can be delivered within the local context. The paper will discuss the extent to which data can illustrate key issues and can also distract attention from key issues.

Any strategy document risks being overtaken by events, but the lasting value of the strategy as a reference point for safety improvement depends upon the quality of the various stakeholder engagements and how that engagement is built upon.

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Prioritising pedestrians in a safe system

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[a]Abley, [b]Waka Kotahi NZ Transport Agency

Abstract

The recently launched Pedestrian Network Guidance (PNG) sets out how to apply safe system principles for pedestrians which means full separation from motor vehicles or where this cannot be achieved, ensuring vehicle speeds do not exceed 30km/h to reduce the risk of death or serious injury. However, many other factors contribute to making a place walkable such as ensuring walking routes are direct and connected to places pedestrians wish to reach; and that routes are legible and attractive for people. Often, safe system treatments can also contribute to or support these important walking network characteristics. However, sometimes a proposed safe system treatment conflicts or hinders providing other important aspects for pedestrians? What do practitioners need to consider when a primary safe system treatment for pedestrians does not fit with the needs of other modes on a corridor? This presentation will explore the challenging aspects of adhering to safe system principles whilst still ensuring places that people walk are attractive and comfortable.

Background

Walking is a key element of a balanced transport system, both in itself and combined with other modes. As walking is healthy, inexpensive, great for the environment, and accessible to all people, it has the potential to become a much more important way to travel in our towns and cities of the future.

The recently launched Pedestrian Network Guidance (PNG) sets out ways to improve New Zealand's walking environment. It provides best practice guidance specifically based on New Zealand's regulatory and operating environment and promotes a consistent approach to planning, designing, managing and maintaining the walking network.

The design of places where pedestrians are present should align with safe system principles. For pedestrians this means full separation from motor vehicles and other faster moving modes (for example cyclists) or where this cannot be achieved, ensuring vehicle speeds do not exceed 30km/h to reduce the risk of death or serious injury. However, many other factors contribute to making a place walkable such as ensuring walking routes are direct and connected to places pedestrians wish to reach; and that routes are legible and attractive for pedestrians.

Discussion

In practice, many primary safe system treatments can also contribute to or support important walking network characteristics. For example, providing a raised zebra crossing on a low speed street will improve safety for people crossing but can also provide a more direct and comfortable route to their destination.

However, there are situations where a proposed primary safe system treatment conflicts or hinders the ability to provide for other important aspects for pedestrians. For example, providing grade separation between pedestrians and vehicular traffic is considered a safe system treatment by removing the likelihood of a collision. However, if the facility results in pedestrian journeys being much less direct or people feel isolated and therefore less safe using it, then some pedestrians are likely to take an alternative at-grade route which may be much less safe, or they are deterred from undertaking the walking trip.

Similarly there are situations when a safe system treatment for pedestrians does not fit with the needs of other modes on a corridor? In this case, how do we as practitioners balance these differing needs without compromising on the walkability aspects that encourage people to walk?

Incremental decisions that only consider the safety aspects of walking journeys and neglecting the other factors important for walking, will likely lead to disconnected and uninspiring walking networks that will only be used by those who have no other option. This will be a missed opportunity to transform our streets and places into vibrant and exciting places used by everyone.

This presentation will explore the challenging aspects of adhering to safe system principles whilst still ensuring places that people walk are attractive and comfortable.

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Crash Bash – Engaging Road Safety Messaging for Young Drivers

Angela McDonnell

Christchurch City Council

Abstract

Young drivers on restricted licences are over represented in death and serious injury statistics. This reinforces the importance and need to embed safe road safety education and practises at an early age by targeting secondary school students, especially young males. In collaboration with the New Zealand Police and The Court Theatre, Crash Bash is an interactive touring show exploring the risks of driving with high school students and teaching young drivers how to make safe choices on the road. Delivering key road safety messages in an entertaining, informative and memorable performance today will lead to better outcomes for our young drivers and their friends tomorrow.

Background

Young drivers on a restricted licence are seven times more likely to be involved in a fatal or serious injury crash than other drivers. They are also more at risk of having a serious crash in the first 6-12 months of driving solo than at any other time in their lives. This is partly due to inexperience (Waka Kotahi, 2021).

The majority of young driver crashes in Canterbury between 2015 – 2019 were due to poor observation, followed by failing to give way, alcohol, poor judgement and speed.

In Canterbury for the 5 year period between 2015- 2019, young male drivers aged 15-19 accounted for 4.7% of total deaths in Canterbury. Female young drivers aged 15-19 years in this period accounted for 3.1%. In the 20-24 year old age bracket the death rate for male drivers in Canterbury during that period was 8.9% and females accounted for 1.0% (Te Manatū Waka, 2021).

The evidence of young male deaths in Canterbury as they enter the 20-24 age bracket is concerning and reinforces the importance and need to embed safe road safety education and practises at an early age by targeting secondary school students, especially young males.

What is Crash Bash

Crash Bash is a road safety education programme presented as a stage performance to secondary schools students in years 11-13. The programme reaches up to 10,000 students annually in Christchurch and parts of Canterbury during the first term. Crash Bash has now been running since 2012.

The purpose of Crash Bash is to convey key road safety information to young people in an engaging and relatable way about making safe choices when driving and as passengers.

The format for Crash Bash is an audience-interactive 25 minute stage performance with professional actors from The Court Theatre.

The context of the theme is developed in collaboration with Canterbury Police who play a pivotal role in the programme providing an evidence base of the risk factors and crash factors involving young drivers in the region.

Figure 1. Actors from The Court Theatre with Police

The 2021 theme was 'What if…' conveying to young drivers the importance of being aware of their surrounding and other road users and distractions – including cyclists, pedestrians, motorcyclists and scooter riders.

Previous themes have included: 'What's the Rush' (speed, intersections and seatbelts), 'Reaction', why crashes occur and what driving behaviours can help young drivers avoid crashing; 'Speak Up', undertstanding the consequences of speed, distractions from mobile phones and passengers and; 'What if', being aware and observant of surroundings and other road users.

Why is it so popular?

Survey feedback from students and teachers shows that the interactive approach with students holds their attention and that the young actors presenting invoke age relatable and entertaining education. Humour especially is a fundamental aspect of the Crash Bash stage performance and this has proven to be one of the most effective tools to gain and hold student attention for road safety, which is traditionally not a rousing subject matter for young people.

Police who also tour with the have proven to be an integral element of the programme's success by adding credibility and validity to the key messages.

Figure 2. Using acting and humour to convey important messages

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Angela McDonnell

CONNECTION
COLLABORATION
CREDIBILITY

CRASH BASH

What is Crash Bash?
Crash Bash is a road safety education programme presented as a stage performance to secondary schools students in years 11-13. The programme reaches up to 10,000 students annually in Christchurch and parts of Canterbury during the first term. Crash Bash has now been running since 2012. The purpose of Crash Bash is to convey key road safety information to young people in an engaging and relatable way about making safe choices when driving and as passengers. The format for Crash Bash is an audience-interactive 25 minute stage performance with professional actors from The Court Theatre. The context of the theme is developed in collaboration with Canterbury Police who play a pivotal role in the programme providing an evidence base of the risk factors and crash factors involving young drivers in the region. The 2021 theme was 'What if...' conveying to young drivers the importance of being aware of their surrounding and other road users and distractions – including cyclists, pedestrians, motorcyclists and scooter riders. Previous themes have included: 'What's the Rush' (speed, intersections and seatbelts), 'Reaction', why crashes occur and what driving behaviours can help young drivers avoid crashing; 'Speak Up', undertstanding the consequences of speed, distractions from mobile phones and passengers and; 'What if', being aware and observant of surroundings and other road users.

Christchurch City Council

THE COURT THEATRE

NEW ZEALAND POLICE
Ngā Pirihimana o Aotearoa

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Auckland Transport Safe Speed Programme - A Step Towards Zero

Michael Brown[a] and Lewis Martin[b]

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Abstract

On 30 June 2020 Auckland Transport implemented the majority of Tranche 1 of the Safe Speeds Programme. This included the delivery of speed limit changes on approximately 10% (over 800km) of Auckland's local road network to achieve safe and appropriate speed limits. Tranche 1 roads were a mixture of high-risk roads and those that were already operating at lower speeds than the existing speed limit. It included roads from high-risk rural areas, the city centre, a number of town centres, residential areas and urban roads. The overall target of these speed limit changes was to reduce the number of death and serious injury (DSI) crashes on the roads. Using an area based approach, Tranche 1 has an estimated 86.6 reduction in death and serious injuries over 5 years. Though it is to early to provide a statistically robust evaluation, early results show a reasonable decrease in crashes across these roads.

Extended Abstract

From 2013 to 2017 Auckland tragically experienced a 65% increase in road deaths and serious injuries (DSI), and in 2017 alone there were 64 deaths and 749 serious injuries; a level of road trauma last seen twenty years ago. This far exceeded population or vehicle travel growth and was harming more people walking, cycling or motorcycling than ever before.

In response to this rising Tāmaki Makaurau road trauma crisis, the AT board commissioned an independent Road Safety Business Improvement Review (BIR) in November 2017. This review made far-reaching recommendations on how AT could lead a partnership-based response to save lives and prevent injury. This BIR alongside the 10-year Road Safety Programme Business Case (PBC) helped support a widespread speed management programme to combat the road safety crisis.

On 30 June 2020, Auckland Transport implemented the majority of Tranche 1 of the Safe Speeds Programme. This included the delivery of speed limit changes on approximately 10% (over 800km) of Auckland's local road network to achieve safe and appropriate speed limits.

The extent of the Tranche 1 programme can be seen in Figure 1 below.

Tranche 1 roads were a mixture of high-risk roads and those that were already operating at lower speeds than the existing speed limit. It included roads from high-risk rural areas, the city centre, a number of town centres, residential areas and urban roads. The overall target of these speed limit changes was to reduce the number of death and serious injury (DSI) crashes on the roads.

Using an area-based approach, Tranche 1 has an estimated 86.6 reduction in death and serious injuries over 5 years. The table below shows a breakdown of which workstreams these injury reductions were expected.

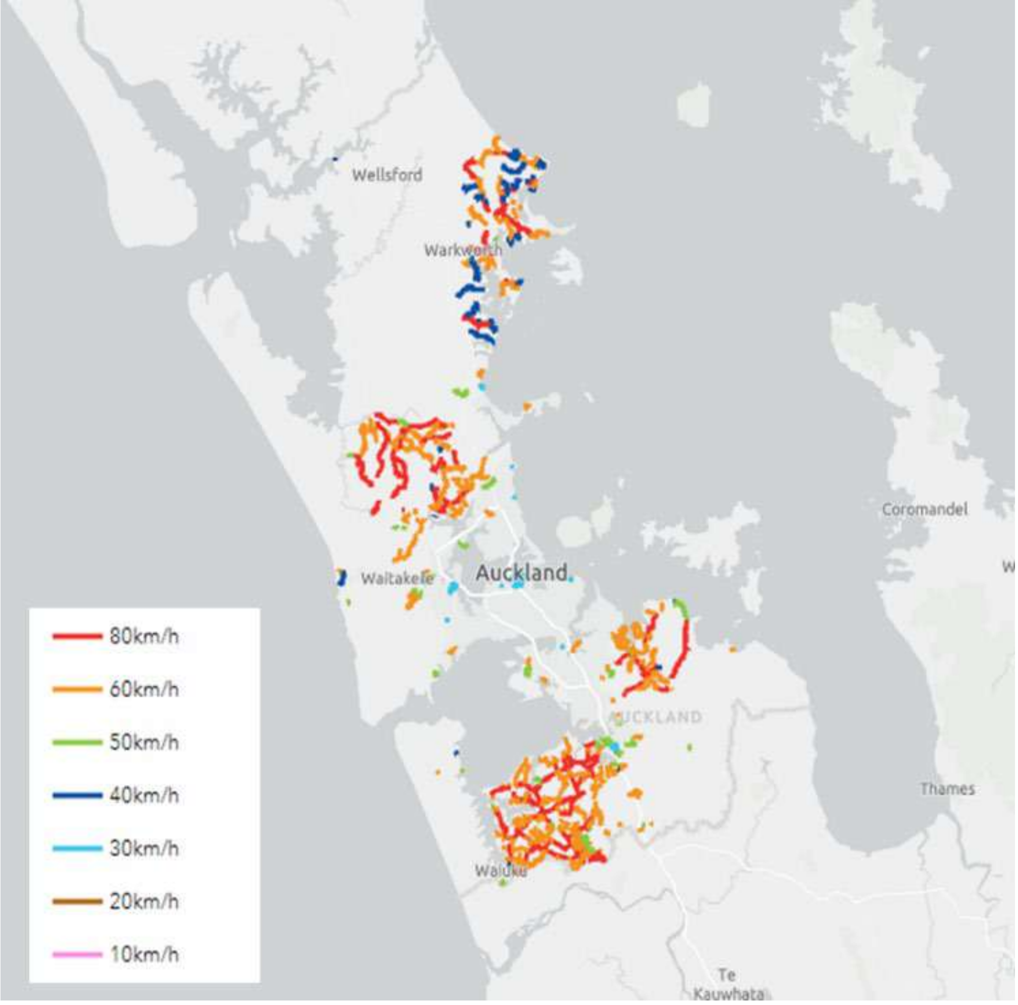
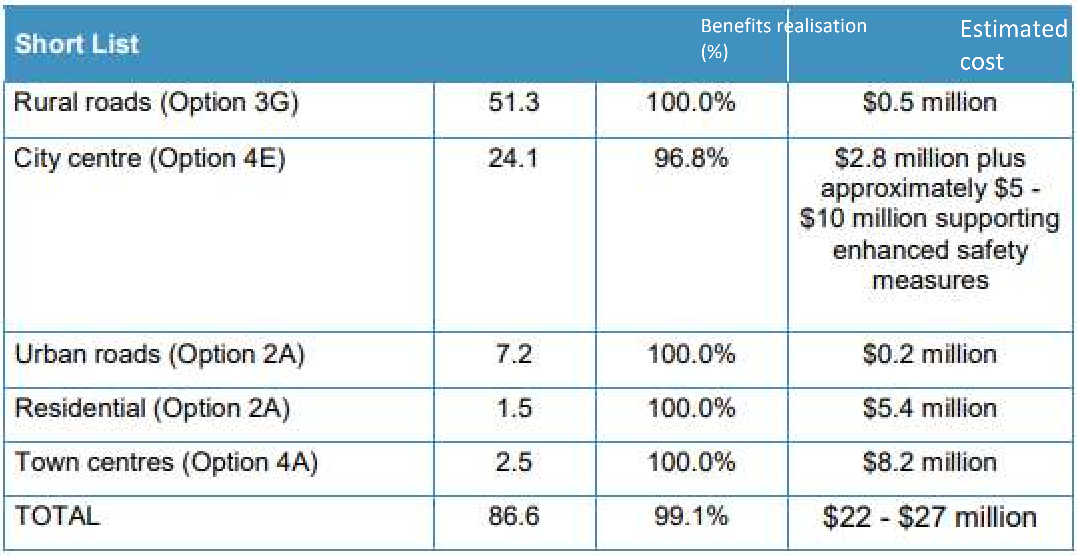


Figure 1. Tranche 1 programme



Short List		Benefits realisation (%)	Estimated cost
Rural roads (Option 3G)	51.3	100.0%	$0.5 million
City centre (Option 4E)	24.1	96.8%	$2.8 million plus approximately $5 - $10 million supporting enhanced safety measures
Urban roads (Option 2A)	7.2	100.0%	$0.2 million
Residential (Option 2A)	1.5	100.0%	$5.4 million
Town centres (Option 4A)	2.5	100.0%	$8.2 million
TOTAL	86.6	99.1%	$22 - $27 million

Figure 2. Option 3 estimated costs and benefit table (https://at.govt.nz/media/1981112/item-131-attachment-6-open-22-october-2019-safe-speeds-implementation-options-report.pdf)

Auckland Transport is currently conducting a review of Tranche 1's performance. This review covers a wide range of areas.

Early results show a reasonable decrease in crashes across these roads, though it is too early to provide a statistically robust evaluation of the crash reduction has been achieved.

The geospatial speed analysis is looking at Tomtom speed data on these roads to estimate what effect the speed limit decreases have had on operating speeds. Using the change in operating speeds recorded from the Tomtom data as a key indicator, an estimated decrease in death a serious injury crash will also be estimated.

Interim results will be provided when they are available.

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[i] The segmentation breakdown in this report included several iterations and combinations of variables to construct. The method by which segmentations were analysed for usefulness was based predominantly on sums of Z-scores on key questions. Twenty-two separate segmentations were constructed using the latent class algorithm, with two segmentations that were found more useful than others. Usefulness was ultimately determined by the way in which segments were distinctively different, logical and actionable after Z-scores were examined. The final segmentation used the sensation seeking questions (SS1) and attitudes (AR3) to define the segments. Segment names were devised by examining behaviours, attitudes, psychographic traits and beliefs within each segment.

[ii] Data were weighted to reflect the Victorian population for age, sex and location and by week of interview. The weighting had an efficiency of 84% with an effective sample size of n=411. The sample has a confidence interval (95%) of ±4.8% for a survey estimate of 50% of the full sample and ±2.9% for a survey estimate of 10% of the full sample. Comparisons between sub-groups are significance tested at the 95% confidence interval with a multiple comparison correction applied. Analysis may include discussion of non-significant findings where there is a trend evident in responses or to illustrate maximum/minimum response by subgroup. Tables indicate which responses are statistically significant. Language such as 'indicatively' indicates an interesting, but not statistically significant, finding.

[iii] The LOTE (Language Other Than English) subgroup refers to whether respondents spoke a language other than English at home