Proceedings of the 2023 Australasian Road Safety Conference

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Proceedings Editors

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Preface

Welcome to the proceedings for the 2023 Australasian Road Safety Conference. Conference attendees were able to attend in person at the Cairns Convention Centre in Queensland or virtually, including live streamed plenary sessions. This is the eighth conference in the series that commenced with amalgamation of the Road Safety Research and Education Conference and the Australasian College of Road Safety Conference. This conference is a unique opportunity for everyone involved in road safety including researchers, practitioners, policymakers, police, educators, community and advocacy groups to meet, present and discuss their work.

These proceedings describe the road safety work presented from research and practice, particularly as it related to the conference theme of Safe Travel for All. Presentations including insights into road safety issues, education, policing, implementation of programs and projects, policy and management strategies. Almost 600 delegates from 22 countries attended the hybrid conference.

This year's conference covered a comprehensive range of topics including speed, infrastructure and road design, education, licensing, enforcement, vehicle design, impairment due to distraction, mobile phones, alcohol and drugs. The conference plenaries discussed designing safe road systems from a human factors perspective and building capacity for road policing and road safety professionals. There was also a special plenary session on supporting safe road use and driver licensure among First Nations Peoples followed by a performance by Jute Theatre Company Dare to Dream: Back on Track. The conference included three interactive workshops: *Let's redesign our roads NOW*, *A systems-thinking approach to road safety* and *Emerging vehicle technologies supporting safe mobility of older Australians*.

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 previous conferences, the Conference Scientific sub-Committee initially called for submissions in the form of Extended Abstracts. 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 and poster sessions.

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 to be considered for publication in the Journal of Road Safety, were provided that opportunity by the two peer reviewers.

For the third time in the conference series the ARSC partnered with Monash University's Monash Art, Design and Architecture (MADA) to link Poster authors with final year graphic design students and alumni. Like previous year's collaborations, this gave authors an opportunity to develop high quality visual communications of their poster content. The three 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 3 minute oral rapid-fire presentation slot in a concurrent podium session, followed by a 30 minute poster session, where attendees could ask questions.

In addition to the above, authors of oral presentations that received high scores from reviewers were offered the opportunity of partnering with MADA to develop an infographic that summarised the key highlights of their paper. The 24 authors who accepted this option could then include the infographic in their presentation. The infographics were also displayed in the Exhibition Hall near the posters and could be viewed by attendees during the breaks.

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 8 Extended Abstract submissions across 6 countries: India, Indonesia, Iran, Pakistan, Sri Lanka 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 250 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, interactive workshop organisers and presenters, the Conference Organising Committee, the Scientific sub-Committee, the International sub-Committee, the Interactive Workshops 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 2023 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 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; prize judges; a copy of the conference program; and a list of all the Extended Abstracts. All Extended Abstracts will be available post conference on the Australasian College of Road Safety publication search engine***.

* 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

Company names, acronyms and initialisms

ACRS	Australasian College of Road Safety
CARRS-Q, QUT	Centre for Accident Research and Road Safety – Queensland, Queensland University of Technology
CASR	Centre for Automotive Safety Research
MUARC	Monash University Accident Research Centre
NRSPP	National Road Safety Partnership Program
NTRO	National Transport Research Organisation
TAC	Transport Accident Commission
TARS	Transport and Road Safety
TMR	Transport and Main Roads
UNSW	University of New South Wales
WALGA	WA Local Government Association

Conference Organising Committee

- A/Prof Mark King, CARRS-Q, QUT (Chair)
- Dr Natalie Watson-Brown, CARRS-Q, QUT (Deputy Chair)

- Levi Anderson, University of the Sunshine Coast
- Janelle Andrews, Queensland Police Service
- Jenny Branch-Allen, Kidsafe, Tasmania (ARSC2024 Organising Committee)
- A/Prof Lyndel Bates, Griffith University (Scientific Committee Chair)
- Dr Judy Fleiter, Global Road Safety Partnership
- Simon Kirkpatrick, Gateway Motor Services
- Yasmin Maskiell, Department of State Growth, Tasmania (ARSC2024 Organising Committee)
- Darren Mulholland, TMR, Queensland
- Michael Nieuwesteeg, Austroads
- Prof Andry Rakotonirainy, CARRS-Q, QUT
- Susan Teerds, Kidsafe, Queensland
- Dr Shamsunnahar Yasmin, CARRS-Q, QUT

ACRS

- Emma Jensson (to August 2023)
- Dr Ingrid Johnston, CEO
- Cecily Michaels (from August 2023)

Scientific sub-Committee

- A/Prof Lyndel Bates, Griffith University (Chair)
- Dr Verity Truelove, University of Sunshine Coast (Deputy Chair)
- A/Prof Marilyn Johnson, UNSW and ACRS (Editor in Chief)

- Dr Vanessa Cattermole-Terzic, TMR, Queensland
- Prof Raphael Grzebieta, UNSW and Monash University
- Prof Narelle Haworth, CARRS-Q, QUT
- Craig Hoey, Department of State Growth, Tasmania (ARSC2024 Scientific Committee)
- Dr Sherrie-Anne Kaye, CARRS-Q, QUT
- A/Prof Gregoire Larue, University of Sunshine Coast
- Dr Mario Mongiardini, CASR, The University of Adelaide
- Dr Prasannah Prabhakharan, Transport for NSW
- Dr Amir Sobhani, Department of Transport, Victoria
- Dr Kayla Stefanidis, University of Sunshine Coast
- Susan Teerds, Kidsafe, Queensland
- Joel Tucker, RACQ
- Dr Shane Turner, Abley

ACRS

- Emma Jensson (to August 2023)
- Dr Ingrid Johnston, CEO
- Cecily Michaels (from August 2023)

International sub-Committee

- Dr Lori Mooren, Safety and Communications Pty Ltd (Co-Chair)
- Dr Ray Shuey, International Safety Foundation (Co-Chair)

- Dr Judy Fleiter, Global Road Safety Partnership
- Dr Tana Tan, Safe System Solutions Pty Ltd

ACRS

- Emma Jensson (to August 2023)

Interactive workshops sub-Committee

- Dr Amir Sobhani, Department of Transport, Victoria (Chair)

- Dr Vanessa Cattermole-Terzic, Transport and Main Roads, Queensland
- A/Prof Gregoire Laure, University of Sunshine Coast
- Susan Teerds, Kidsafe, Queensland
- Dr Verity Truelove, University of Sunshine Coast
- Dr Shane Turner, Abley, New Zealand

Conference Committee members, Closing plenary

Left to right: Prasannah Prabhakharan, Raphael Grzebieta, Lyndel Bates, Jenny Branch-Allen, Susan Teerds, Natalie Watson-Brown, Narelle Haworth, Judy Fleiter, Verity Truelove, Gregoire Larue, Marilyn Johnson, Levi Anderson, Vanessa Cattermole-Terzic, Joel Tucker, Amir Sobhani, Shane Turner

Awards Judging Panel

- A/Prof Lyndel Bates, Griffith University
- Jerome Carslake, NRSPP
- Prof Raphael Grzebieta, UNSW and Monash University
- Prof Narelle Haworth, CARRS-Q, QUT
- Craig Hoey, Department of State Growth, Tasmania
- A/Prof Marilyn Johnson, UNSW and ACRS
- A/Prof Sjaan Koppel, MUARC, Monash University
- A/Prof Gregoire Larue, University of the Sunshine Coast
- Dr Mario Mongiardini, CASR, The University of Adelaide
- Dr Ray Shuey, International Safety Foundation
- Dr Amir Sobhani, Department of Transport and Planning, Victoria
- Dr Kayla Stefanidis, University of the Sunshine Coast
- Susan Teerds, Kidsafe
- Dr Verity Truelove, University of Sunshine Coast
- Joel Tucker, RACQ
- Dr Shane Turner, Abley Limited

Conference prize winners

Prize	Winners		
	First Author/ Presenter	**Organisation**	**Submission title**
Peter Vulcan Prize for Best Conference Submission	Andrew Burbridge	Department of Transport and Main Roads, Queensland	A Before-After Safety Evaluation of a New Part-time Protected-Right-turn Signal
Best Conference Theme Submission	Paul Durdin	Abley Limited	Incompatibility of Traditional Economic Appraisal Methods and Safe System Outcomes
Best Submission by a New Researcher	Muhammed Navid Tahir	University of the Punjab, Punjab, Pakistan	Injury Surveillance Database: Promoting Road Safety in Pakistan
Best Submission by a New Practitioner	Dr Daniela Barragan	Transurban	It's Not Me, It's You: Drivers' Perception Bias Improves Safety
Best Submission by a Policing Practitioner	Rachael Mason	New Zealand Police	Uncovering the Urgency for Heightened Drug Testing
Best Submission by a Road Safety Practitioner	Diana Zagora	Transport for NSW	Risk Assessment for Transportation of Dangerous Goods through Tunnels
Best Road Safety Poster (judged)	Helen Nguyen	University of NSW	Older Australian Drivers' Preferences in Purchasing Decisions: Advanced Vehicle Technology
Best Road Safety Poster – People's choice	Andrew Kirk	RACQ	E-Scooter Survey and Testing – A Safety Campaign

Peer Reviewers

- Dr Hafez Alavi, HA Consulting
- Dr Richard Amoh-Gyimah, Main Roads Western Australia
- Dr Fritha Argus, Main Roads Western Australia
- Dr Trevor Bailey, CASR, The University of Adelaide
- Joanne Baker, Transport for NSW
- Dr Matthew Baldock, CASR, The University of Adelaide
- A/Prof Lyndel Bates, Griffith Criminology Institute, Griffith University
- A/Prof Ben Beck, Monash University
- David Beck, Transurban
- Kenn Beer, Safe System Solutions Pty Ltd
- Dr Ross Blackman, Queensland University of Technology
- Dr Graham Brisbane, National Transport Research Organisation (NTRO)
- Samantha Buckis, TAC
- Dr Lisa Buckley, The University of Queensland
- Ms Laurie Budd, Monash University Accident Research Centre (MUARC), Monash University
- A/Prof Lyndal Bugeja, Monash University
- Prof Max Cameron, MUARC, Monash University
- Dr Nimmi Candappa, MUARC, Monash University
- Mr Jerome Carslake, NRSPP delivered by MUARC
- Dr Vanessa Cattermole-Terz, TMR, Queensland
- Mr Eric Chalmers, Kidsafe ACT
- Prof Judith Charlton, MUARC, Monash University
- Belinda Clark, MUARC, Monash University
- Dr Bruce Corben, Corben Consulting
- Louise Cosgrove, Kids and Traffic
- Dr Liz de Rome, Deakin University
- A/Prof Ashim Debnath, Deakin University
- Sam Doecke, CASR, The University of Adelaide
- Paul Durdin, Abley Limited
- Dr Jeffrey Dutschke, University of Adelaide
- Martin Elsegood, CASR, The University of Adelaide
- A/Prof Michael Fitzharris, MUARC, Monash University
- Dr Judy Fleiter, Global Road Safety Partnership
- Charlotte French, GHD
- Bill Frith, Opus Research
- Tia Gaffney, Allied Forensics Group
- Prof Raphael Grzebieta, TARS, UNSW (Sydney) and Victorian Institute of Forensic Medicine, Monash University
- Dale Harris, Abley Limited
- Peter Harris, Road Safety Audits
- Dr Eslam Hassan, Bitzios Consulting
- Prof Narelle Haworth, CARRS-Q, QUT
- Paul Hillier, NTRO
- Elizabeth Hovenden, State Government of Victoria
- Dr Brett Hughes, Curtin University
- Dr Kate Hunter, The George Institute for Global Health
- Dr Christopher Hurren, Deakin University

Peer Reviewers continued

- A/Prof Marilyn Johnson, ACRS and UNSW
- Krzysztof Jurewicz, SafeMobility
- Dr Sherrie-Anne Kaye, CARRS-Q, QUT
- A/Prof Mark King, CARRS-Q, QUT
- Dr Glen Koorey, Viastrada Ltd
- A/Prof Sjaan Koppel, MUARC, Monash University
- Maddison Lambert, Transport Accident Commission
- A/Prof Gregoire Larue, University of the Sunshine Coast
- Prof Mike Lenné, Seeing Machines
- Carl Liersch APV-T
- Dr David Logan, MUARC, Monash University
- Dr Steven Love, University of the Sunshine Coast
- Justin Lu, Real Time Traffic Pty Ltd
- Dr Jamie Mackenzie, CASR, The University of Adelaide
- Dr Hamish Mackie, Mackie Research and Consulting Ltd
- Dr Faisal Magableh, TARS, UNSW
- Fabian Marsh, New Zealand Transport Agency
- Prof Peter Martin, Professor of Practice in Criminology
- Prof Andrew McIntosh, Monash University
- A/Prof Rebecca McLean, University of Otago
- Duncan McRae, Driver and Rider Policy and Program
- David McTiernan, NTRO
- Prof Lynn Meuleners, University of Western Australia
- Paul Mihailidis, Trafficworks Pty Ltd
- Erin Miller, WALGA
- Dr Mario Mongiardini, CASR The University of Adelaide
- Dr Lori Mooren, Consultant
- Ms Christine Mulvihill, MUARC, Monash University
- Prof Stuart Newstead, MUARC, Monash University
- Christopher-Bree Nyko, Transport Accident Commission
- Prof Jake Olivier, University of New South Wales
- Dr Oscar Oviedo-Trespalacios, CARRS-Q, QUT and Delft University of Technology, The Netherlands
- Prof Jennie Oxley, MUARC, Monash University
- Giulio Ponte, CASR, The University of Adelaide
- Dr Jeff Potter, National Transport Commission
- Dr Prasannah Prabhakharan, Transport for NSW
- Prof Andry Rakotonirainy, CARRS-Q, QUT
- A/Prof Gemma Read, University of the Sunshine Coast
- A/Prof Paul Roberts, University of Western Australia
- Dr David Rodwell, CARRS-Q, QUT
- Dr Bevan Rowland, University of the Sunshine Coast
- Prof Teresa Senserrick, University of Western Australia
- Dr Lisa Sharwood, The University of Sydney
- Kerry Shaz, Transport for NSW
- Dr Ray Shuey, International Safety Foundation
- Keith Simmons, University of New South Wales
- Martin Small, Martin Small Consulting Pty Ltd

Peer Reviewers continued

- Dr Carol Snellgrove, Flinders University of South Australia
- Dr Amir Sobhani, Department of Transport and Planning, Victoria
- Dr Kayla Stefanidis, University of the Sunshine Coast
- Dr Basuki Suratno, Transport for NSW
- Dr Tana Tan, Safe System Solutions Pty Ltd
- Fergus Tate, WSP
- Susan Teerds, Kidsafe
- Dr James Thompson, CASR, The University of Adelaide
- A/Prof Jason Thompson, The University of Melbourne
- Prof Rod Troutbeck, Queensland University of Technology
- Dr Verity Truelove, University of Sunshine Coast
- Irene Tse, Auckland Transport
- Joel Tucker, RACQ
- Dr Blair Turner, NTRO
- Dr Shane Turner, Abley Limited
- David Tynan, Survive The Ride Association of NSW
- Michael Tziotis, NTRO
- Andrew van den Berg, CASR, The University of Adelaide
- Dick van den Dool, GTA Consultants
- John Wall, Centre for Road Safety
- Jeanette Ward, Abley Limited
- A/Prof Angela Watson, Queensland University Of Technology
- Prof Barry Watson, Queensland University of Technology
- Dr Natalie Watson-Brown, CARRS-Q, QUT
- Dr Tom Whyte, Neuroscience Research Australia
- Dr David Young, Transport Accident Commission
- Dr Kristie Young, MUARC, Monash University

Communicating our road safety science

Design collaboration: Australasian College of Road Safety + Monash University

This is the third year of collaboration between the Australasian College of Road Safety and Monash University's Department of Design. The collaboration brings together road safety professionals and communication designers and a class of Communication Design students from Monash Art, Design and Architecture (MADA). This year's collaboration was led by Hannah Evans (Lecturer) and Sienna Fernando (Assistant Art Director) and with oversight by Warren Taylor (Art Director).

The collaboration was created in 2021 by A/Prof Marilyn Johnson (ARSC, UNSW) and A/Prof Robbie Napper (Monash University). The designers created posters to translate key findings from research and practice to engage readers and encouraged them to find out more about the project.

In a new initiative for 2023, the collaboration extended beyond posters to infographics. The challenge was to make the complexities and nuances of road safety projects more accessible to professional and lay audiences by capturing essential elements of the work in an engaging graphic. The infographics were designed by Hannah Evans and Sienna Fernando.

All the artwork created for ARSC2023 is included in the proceedings including collaboration artwork and four posters that were created independently by the authors.

Design collaboration credit

Designers
Hannah Evans, Lecturer
Sienna Fernando, Assistant Art Director
Warren Taylor, Art Director
In collaboration with MADA Communication Design students

Project Directors
A/Prof Marilyn Johnson, UNSW and ARSC
A/Prof Robbie Napper, Monash University

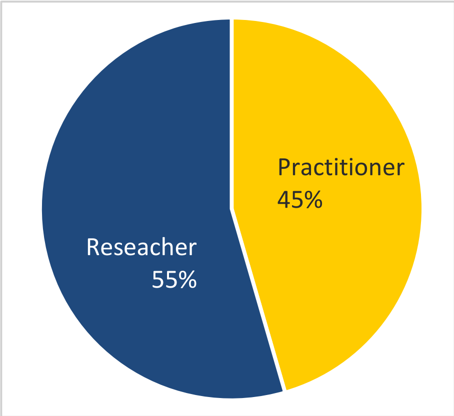
Design collaboration posters

Author	**Title**	**Lead student designer**
Jessica Marigold	The Impact of Acute Alcohol Intoxication on Hazard Perception Performance	Angelo Sarria
Helen Nguyen	Older Australian drivers' preferences in purchasing decisions: advanced vehicle technology*	Yuxiao Shu
Tahlia Wyer	Mobile phone use while driving: Application of situational action theory	Shiyao Zhao

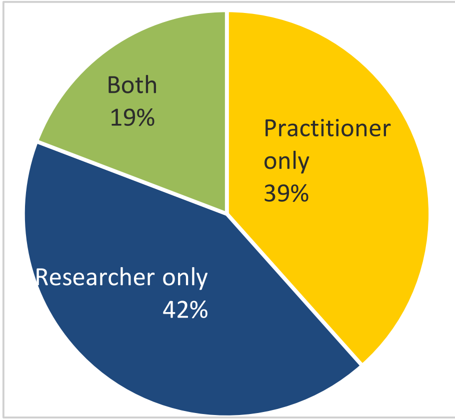
* Winner: Best Road Safety Poster

ARSC2023
Summary of Submissions

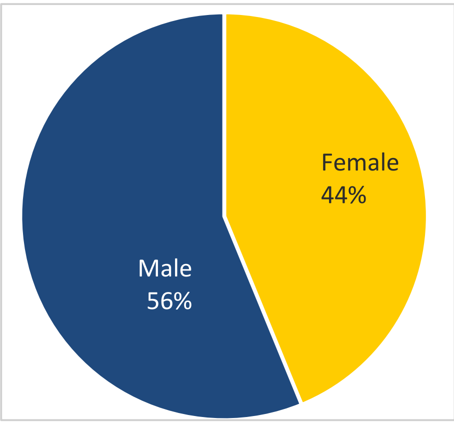
250	Total number of submissions received
47	Withdrawn or rejected
203	Total number of submissions accepted



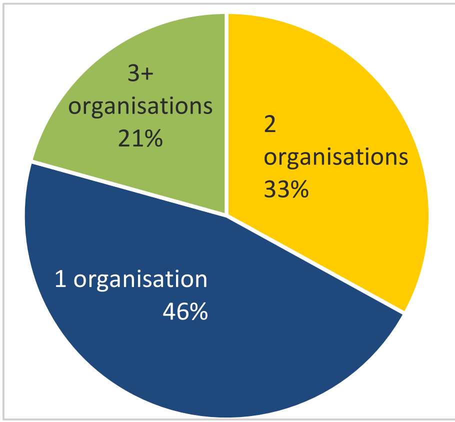
Lead author by Sector (n=203)



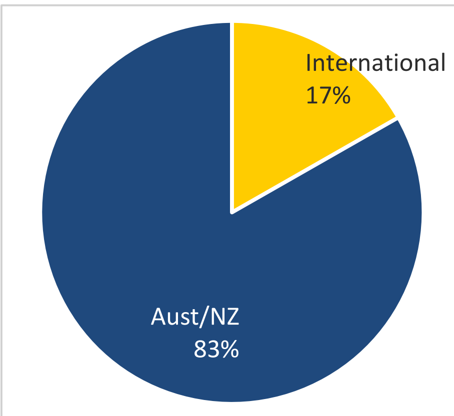
All Authors by Sector
(each submission) (n=203)



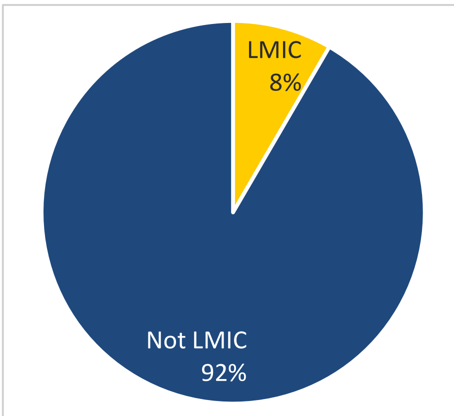
All authors by Sex (n=203)
* No authors identified as non-binary



Number of organisations
(each submission) (n=203)



Author location (n=203)



Author from Low or Middle
Income Country (LMIC) (n=203)


2023 Australasian
Road Safety Conference
19-21 SEPTEMBER • CAIRNS, QLD + ONLINE
Safe travel for all.

Pre-Conference: Monday 18 September					
Emergency Vehicle Safety 12:30 - 15:30	**Local Government Network** 12:30 - 15:30	**ARSC 2023 International Outreach Chapter Event** 13:00 - 14:45	**Early Career Professional Network** 14:30 - 17:00	**Women in Road Safety** 15:30 - 17:00	**Safe Cycling Cairns & Drinks Reception - Amy Gillett Foundation** 16:15 - 18:00
		LMIC Workshop: Designing Safer Roads for PTWs 15:00 - 16:30			

	Day 1: Tuesday 19 September			
Time (AEST)	**Session Chair: Ann Williamson**			
09:00 - 09:30	Welcome Ceremony Welcome to Queensland **Cynthia Lui MP,** *Member for Cook* **A/Director-General Sally Stannard,** *TMR, Queensland*			
09:30 - 10:30	**Keynote: Professor Jan Theeuwes** Designing safe road systems: A human factors perspective			
10:30 - 11:00	**Morning Tea** ***Sponsored by IDEMIA***			
Time (AEST)	Stream 1 Room: Auditorium C	Stream 2 Room: M5-M8	Stream 3 Room: M1	Stream 4 Room: M2-M3
11:00 - 12:15	**Session 1: Impaired driving - Alcohol**	**Session 2: Distractions - mobile phones**	**Session 3: Crash data and road rules**	**Session 4: E-scooters**
	Session Chair: Ingrid Johnston **Co-chair: Laura Mills**	**Session Chair: Jenny Branch-Allen**	**Session Chair: Gregoire Larue** **Co-chair: Courtney Hercus**	**Session Chair: Teresa Senserrick**
11:00 - 11:15	Can a single day Alcohol education programme change recidivism rates? **Rachael Mason** *New Zealand Police*	Technology to avoid being caught for phone use while driving **Verity Truelove** *MAIC/UniSC Road Safety Collaboration*	Modelling Macroscopic Effects of Road Pavement Conditions on Traffic Safety **Nho Viet Huynh** *La Trobe University*	Factors associated with helmet use by e-scooter rider **Narelle Haworth** *CARRS-Q, Queensland University of Technology*
11:15 - 11:30	The NSW Mandatory Alcohol Interlock Program – enablers, barriers to participation **Joanne Baker** *Transport for NSW*	Understanding the impact of penalties on illegal mobile phone use **Adrian Wilson** *TMR, Queensland*	Predicting Temporal Segment-level Crash Risk Map Using Advanced Decision Trees **Seyedehsan Seyedabrishami** *University of Sydney*	e-Scooter-Related Workers Compensation Claims in Queensland **(Kirsten Vallmuur), Joel Tucker & Tanya Smyth** *RACQ & Jamieson Trauma Institute*
11:30 - 11:45	Alcohol-Related Crash Trends in New Zealand **Dale Harris** *Abley*	Mobile Phone Detection Camera Program: The New South Wales experience **(Amy Lovesey), Ben Barnes** *Transport for NSW*	ESRA3 Survey: Comparing the evolution of Australian road safety performance **(Uta Meesmann), Adam Stankevicius** *Office Of Road Safety, Dept of Infrastructure, Transport, Regional Development, Communications and the Arts*	Self-reported e-scooter rider and non-rider near-misses and crashes **Amy Schramm** *CARRS-Q, Queensland University of Technology*
11:45 - 12:00		Can Social Norm Messages Reduce Phone Use While Driving" **Michelle Nicolls** *MAIC/UniSC Road Safety Collaboration*	Descriptive Road User Movements: Taking all Road Users into Account **Michael Gillies** *TMR, Queensland*	Regulating for the new generation of e-mobility **Maddison Taylor** *TMR, Queensland*

	Posters			
12:00 - 12:05	The Impact of Acute Alcohol Intoxication on Hazard Perception Performance **Jessica Marigold** *MAIC/ Road Safety Collaboration Unit*	Mobile phone use while driving: Application of situational action theory **Tahlia Wyer** *University of the Sunshine Coast*	Older Australian drivers' preferences in purchasing decisions: advanced vehicle technology **Helen Nguyen** *University of New South Wales*	E-Scooter Survey and Testing – A Safety Campaign **Andrew Kirk** *RACQ*
12:05 - 12:10	Online education for drink drivers **Sussan Osmond** *TMR, Queensland*	Can greyscale reduce phone use on the road? **Fety Rahmillah** *CARRS-Q, Queensland University of Technology*	Road rules cards: an easier way to understand the rules **(Marilyn Johnson), Robbie Napper** *Monash University*	
Virtual	Using gaming to engage with young males about drink driving **Natalie Doyle** *TMR, Queensland*			
12:15 - 12:30	**Poster presentations in Exhibition Hall**			
12:30 - 13:30	**Lunch** ***Sponsored by IDEMIA***			
12:45 - 13:30	Meet the Journal of Road Safety Team and Q&A, **Marilyn Johnson**			

13:30 - 15:00	**Session 5: Enforcement and Policing**	**Session 6: Novice Drivers and Riders**	**Session 7: Infrastructure (Safer Roads)**	**Session 8: Crash data collection and analysis**
	Session Chair: Janelle Andrews **Co-chair: Jolene Cox**	**Session Chair: Sherrie-Anne Kaye** **Co-chair: Karen Schoots**	**Session Chair: Prasannah Prabhakharan**	**Session Chair: Verity Truelove** **Co-chair: Jessica Marigold**
13:30 - 13:45	Using a procedurally just flyer to reduce speeding **Lyndel Bates** *Griffith Criminology Institute*	Driving instructor accreditation, learner driver training and young driver crashes **Natalie Watson-Brown** *CARRS-Q, Queensland University of Technology*	Raised Intersections - Changing Community Perception **Kenn Beer** *Safe System Solutions Pty Ltd*	Serious Road Crash Injury Data Linkage in Queensland **Angela Watson** *Queensland University Of Technology*
13:45 - 14:00	"The impact of police uniforms on intentions to offend" **Levi Anderson** *University of the Sunshine Coast*	"Can normative messages reduce smartphone use among young drivers?" **Cassandra Gauld** *The University of Newcastle*	"Photoluminescent Linemarking and LED Tactile Ground Surface Indicator Evaluation" **Justin Lu** *Real Time Traffic Pty Ltd*	"How would congestion pricing affect traffic safety?" **Vu Xuan Quynh Duong** *La Trobe University*
14:00 - 14:15	A national overview of current and emerging road safety technologies **Marilyn Johnson** *Monash University*	Validity of Self-Paced Online Education and Assessment: A Review **Teresa Senserrick & Sophie Elliott** *WA Centre For Road Safety Research, UWA*	MASH TL4 crash of safety roller barriers: Numerical simulation **(Funkun Xia), Shanqing Xu** *Swinburne University Of Technology*	Injury Surveillance Database: Promoting Road Safety in Pakistan **Muhammed Navid Tahir** *University of the Punjab*
14:15 - 14:30	What Do Facebook Police Location Groups Mean For Road Safety? **Laura Mills** *MAIC/UniSC Road Safety Research Collaboration*	The age of digital media to influence young drivers **Ursula Bishop** *TMR, Queensland*	Western Australia Blackspot Program: Contrasting treatment criteria and an improved evaluation **Matthew Albrecht** *WACRSR - UWA*	Extensive Hypothesis Testing for Crash Data Considering Multiple Objectives **Zeke Ahern** *Queensland University Of Technology*
14:30 - 14:45	Situational Action Theory and High-Risk Offending on the Beach **Levi Anderson** *University of the Sunshine Coast*	Young drivers co-designing campaigns for young drivers **(Sally Mills Murray), Kerrie Tregenza** *TMR, Queensland*	Factors Associated with Single-Vehicle Crash Occurrences on Indonesian Toll Road **Aine Kusumawati** *Institute Of Technology Bandung*	Mental health disorders in serious injury crashes **Sally Edwards & Lisa Wundersitz** *CASR, University Of Adelaide*
14:45 - 15:00	The road to solving Impaired Driving using Artificial Intelligence **Alexander Jannink** *Acusensus Australia Pty Ltd*	“A Life Over a Fine": Licence acquisition for Indigenous peoples **James Ballangarry, Melissa Freire & Quincy Ross** *University of Newcastle*	On the Variability of Crash Modification Factors for Safety Treatments **Bhagwant Persaud** *Toronto Metropolitan University*	Methodology for analysing crash data as part of Surf Coast Shire Road Safety Strategy 2022-2027 **(Daniel Mustata), Duc Phan** *Road Solutions*

Virtual Sessions Accessible Via the Virtual Platform				
Virtual	Perceived Unfairness in Drug Driving Laws by Medicinal Cannabis Users **Levi Anderson** *University Of The Sunshine Coast*	Improving Speed Compliance Amongst Young Novice Drivers **Max Prestidge** *University Of New South Wales, Canberra*	Impact of Roadway Geometrics on Fatal Crashes- A Retrospective Study **Ankit Choudhary** *Indian Institute of Technology, Roorkee*	Application of geographical information system in blackspots identification: Systematic Review **Mahamendige Asel Anthony Mendis** *Swinburne University of Technology*
	Investigating BAC legal limit reform in Victoria **Christopher Poulter** *Department of Transport, Victoria*	An Evaluation of the Road Attitudes and Action Program (RAAP) **Natalie Watson-Brown** *CARRS-Q, Queensland University of Technology*	Comparing Sliding Window and iRAP Methods to Identify High-Priority Sections **Ali Zayerzadeh** *Road Safety Pioneers (RSP)*	Evidence Based Safety Assessment Applying a UAV and Exposure Principles **Aaron Campion** *Urban Connection Limited*
			Star-Rating Using iRAP-Demonstrator: Case Study BIL-Mandalika Road, West Nusa Tenggara **Alfa Adib Ash Shiddiqi** *Dg Of Highways Indonesia*	
			Update of the AASHTO Highway Safety Manual **Darren Torbic** *Texas A&M Transportation Institute*	
			Intersection Detection Using Vehicle Trajectories Data: Deep Neural Network Application **(Abanoub Kased), Mohammed Elhenawy** *CARRS-Q, Queensland University of Technology*	
			Deep Learning Based Pavement Defect Detection **(Rana Mohamed), Mohammed Elhenawy** *CARRS-Q, Queensland University of Technology*	
			Road Sign Classification Using Deep Learning **(Karim Ashour), Mohammed Elhenawy** *CARRS-Q, Queensland University of Technology*	
15:00 - 15:30	**Afternoon Tea** ***Sponsored by IDEMIA***			

15:30 - 16:30	**Session 9: Youth road safety**	**Session 10: Speed**	**Session 11: Restraints**	**Session 12: Autonomous Vehicles**
	Session Chair: Rebecca MacLean **Co-chair: Rebecca Yacobovich**	**Session Chair: Shane Turner**	**Session Chair: Susan Teerds**	**Session Chair: Shamsunnahar Yasmin**
15:30 - 15:45	How effective are current road safety interventions targeting school-aged children? **Marton Kocsis** *Western Australian Centre For Road Safety Research, The University Of Western Australia*	Improving Driver Compliance with Roadwork Speed Limits on the M1 **(Ross Blackman), Ashim Debnath** *Deakin University*	Do seat belts reduce death for pregnant females and their foetus?" **Lyndal Bugeja** *Monash University*	Designing and evaluating public awareness messaging to increase knowledge about and intentions to use Connected and Automated Vehicles **Ioni Lewis & Max Jamwal-Girdler** *CARRS-Q, Queensland University of Technology & TMR, Queensland*
15:45 - 16:00	Strategy to address youth PTWs crashes in Indonesia **Tri Tjahjono** *Universitas Indonesia*	Doing things differently - road transport safe system champions of Aotearoa **Jeanine Foster & Junine Stewart** *Waka Kotahi*	An evaluation of the effectiveness of user-centred child restraint instructions **Wennie Dai** *The George Institute For Global Health*	Influence of non-driving activities on post-automation driving performance **Neng Zhang** *RMIT University*
16:00 - 16:15	Yarning to link virtual reality with Indigenous road safety **James Ballangary & Charlie Faulkner** *University of Newcastle*	Safety Performance Indicators – Measuring What We Value **Paul Durdin** *Abley*	Improving safety outcomes for Victorian children travelling in vehicles **Kathy Taylor** *Kidsafe Victoria*	Complex task handover in SAE J3016 Level 3 Automated Vehicles **Sebastien Demmel** *CARRS-Q, Queensland University of Technology*
16:15 - 16:30	Addressing the issue of hoon driving behaviours: Four case studies **Natalie Watson-Brown** *CARRS-Q, Queensland University of Technology*	A Comparison of eRideable and Cyclist Behaviour in Perth **Paul Roberts** *UWA*	Observation Study On Restraint Use For Child Occupants In Dubai **Inam Ahmad** *Monash University*	Trust towards Autonomous Vehicles and Human Drivers Under Different Scenarios **Caitlin Reeves** *The University Of Newcastle*
Virtual Sessions Accessible Via the Virtual Platform				
Virtual		Evaluation of the Safe Driving Program for Hoon Drivers **Denny Meyer** *Swinburne University of Technology*		
		It's Not Me, It's You: Drivers' Perception Bias Improves Safety **Daniela Barragan** *Transurban*		
		An Investigation into the Influence of Metacognitions on Aggressive Driving **Steven Love** *University of the Sunshine Coast*		
	Session Chair: Gina Masterson			
16:30 - 17:30	**Supporting Safe Road Use & Driver Licensure Among First Nations Peoples** Caitlin Rofe, Matthew Slatcher, Steven Page & Monica Stevens			
17:30 - 18:00	**JUTE PLAY: Dare to Dream: Back on Track**			
18:00 - 21:00	**Welcome Reception**			

Day 2: Wednesday 20 September					
Time (AEST)	Session Chair: Michael Nieuwesteeg				
09:00 - 10:30	Austroads: Picking up the Pace				
10:30 - 11:00	Morning Tea in the Exhibition				
	Stream 1 Room: Auditorium C	Stream 2 Room: M5-M8	Stream 3 Room: M1	Stream 4 Room: M2-M3	Stream 5 Room: M4
11:00-12:30	**Session 13: Messaging**	**Session 14: Infrastructure and vehicles**	**Session 15: Community Road Safety**	**Session 16: Intelligent Transport Systems**	**Session 17: Cyclists**
	Session Chair: Cassandra Gauld	**Session Chair: Angela Watson**	**Session Chair: Kerry Armstrong**	**Session Chair: Sebastien Demmel**	**Session Chair: Ben Beck**
11:00 - 11:15	How does roadside advertising impact on driver behaviour? **Jane Hinton** *CARRS-Q, Queensland University Of Technology*	Investigating connected vehicle vector data at active transport priority crossings **Wahi Rabbani** *TMR, Queensland*	Road Safety Management System for Rural Roads in LMICs **(Hadunneththi Pasindu), Kelum Sandamal** *Sri Lanka Institute Of Information Technology*	Predicting Hazard Perception Expertise through Machine Learning **Prasannah Prabhakharan** *Transport for NSW*	Detecting stressful events while cycling using physiological and biometric measures **Ben Beck** *Monash University*
11:15 - 11:30	How do we sell the benefits of lower speeds? **Glen Koorey** *Viastrada Ltd*	Innovative Pacemaker Lighting: Enhancing Safety and Efficiency for Burnley Tunnel **Laura Procter & Andrew Eckersley** *SMEC & Transurban*	How to make McLaren Vale Australia's safest wine region **Brett Williams** *City Of Onkaparinga*	Equity of Cooperative-ITS deployment **Andry Rakotonirainy** *CARRS-Q, Queensland University of Technology*	Pedestrian and Bicycle Safety Performance Functions for Segments and Intersection **(Darren Torbic), Shane Turner** *Abley*
11:30 - 11:45	Respect Traffic Controllers Campaign **Jerome Carslake** *NRSPP delivered by MUARC*	Fatalities at Railway Level Crossings in Australia and New Zealand **Gemma Read** *University of the Sunshine Coast*	How the Local Government Road Safety Program delivers to NSW **Fiona Frost** *Transport for NSW*	Pilot Results of Road Safety Incident Investigation Camera **(Vanessa Vecovski), Kerry Shaz** *Transport For NSW*	Eighty-eight ways to Safer Micromobility **Sonny Suharto & Tony L Nguyen** *NTRO & Transport for NSW*
11:45 - 12:00	Trial of VMS Messaging to improve speed compliance **David Beck** *Transurban*	"Understanding factors contributing to crashes in Recreational Vehicles (RVs)" **Danielle Berlin** *CARRS-Q, Queensland University of Technology*	Achieving quality helmets access equity for children in Vietnam **Quyen Bui** *AIP Foundation*	Real-time Detection, Tracking & Analysis of Road User Behavior at Railway Level Crossings **Ziyi Qiu & Amolika Sinha** *The University of Melbourne& NTRO*	Recruiting for road safety research: vital voices, scams and safeguards **Amelia Thorpe** *UNSW*
12:00 - 12:15	Using AusRAP, surveying and focus group to understand the road safety impacts of variable message signs with re-routing messages **Kenn Beer** *Safe System Solutions Pty Ltd*	Lane Keep Assist Systems for Light Vehicles: An Australian Evaluation **Stuart Newstead** *MUARC, Monash University*	New Guidance for the Safety of Supervised Children's Crossings **Samantha Taylor** *TMR, Queensland*	A Before-After Safety Evaluation of a New Part-time Protected-Right-turn Signal **Md Mohasin Howlader & Andrew Burbridge** *TMR, Queensland*	Promoting cycling safety for children in Vietnam **Mai Tran** *AIP Foundation*
12:15 - 12:30	Key functions and characteristics of effective Road Safety Research Programs **Hafez Alavi** *HA Consulting*	Informing Road Safety Policy with Near-miss Detection Technology **Justin Lu** *Real Time Traffic Pty Ltd*	Creating safe road rules for bicycle riders at intersections **Rachel Carlisle** *Road Safety Victoria, Department of Transport and Planning*	Improving active mobility safety at signalised intersections using drone footage **Ryszard Gorell & Madeleine Fletcher-Kennedy** *GHD Pty Ltd*	Cycling under Low-Light Conditions: Insights from Australian Cyclists **Joanne Wood** *Centre for Vision and Eye Research, Queensland University Of Technology*

Virtual Sessions Accessible Via the Virtual Platform					
Virtual	Analysis of Speeding Mitigation through Dynamic Message Signs (DMS) **Liz Carpenter** *Transurban*		Giving Young People the Green Light to Travel Safely **Laura Kemp** *Fit To Drive Foundation Inc*		
			Documenting a whole of service approach to road safety education **Louise Cosgrove** *Kids and Traffic*		
12:30 - 13:30	**Lunch in the Exhibition**				
13:30-14:45	**Session 18: Pedestrians**	**Session 19 : Policy and Management**	**Session 20: Local Government**	**Session 21: Workplace and heavy vehicle road safety**	**Session 22: Child restraints**
	Session Chair: Judy Fleiter	**Session Chair: Amir Sobhani**	**Session Chair: Kayla Stefanidis** **Co-chair: Carla Scheimer**	**Session Chair: Joanne Wood**	**Session Chair: Natalie Watson-Brown**
13:30 - 13:45	Understanding the causes of child pedestrian fatalities in Australia **Ann Williamson** *UNSW Sydney*	Charting a Path to Zero: Overarching Project, Role, and Objectives **Hafez Alavi & Michael Nieuwesteeg** *Austroads*	Developing a Road Safety Ratings Tool for Local Governments **Max Bushell** *Western Australian Local Government Association*	Systems Thinking in Action: Optimising learnings in workplace road safety **Sharon Newnam** *Queensland University of Technology*	Child Restraint Legislation and Injury Rates in Children Aged 0-14 **Chen-Chun Ellie Shu** *The George Institute For Global Health*
13:45 - 14:00	Evaluation of an Intervention to Reduce Child Pedestrian Fatalities **Michelle Mclaughlin & Ann Williamson** *Little Blue Dinosaur Foundation & TARS, UNSW*	The Road Safety Consequences of Modal Shift in Victoria **Mohammed Ibrahim** *Monash University*	Probe Speed Data Pilot for Local Government **Chris Jurewicz** *SafeMobility*	Health in Gear: What the Data is Telling Us **Emily Brown & Rebecca Halsey** *OzHelp Foundation*	Identifying effective mechanisms for child restraint services in remote Australia **Catherine Ho** *The George Institute For Global Health*
14:00 - 14:15	NSW Pedestrian Protection Program: Improving Pedestrian Safety at Signalised Intersections **Prasannah Prabhakharan** *Transport for NSW*	Incompatibility of Traditional Economic Appraisal Methods and Safe System Outcomes **Paul Durdin** *Abley*	Australia's most boring roundabout, 10-years without even a fender bender **Christopher Davis** *Vision Zero Australia*	The working environment of drivers of road tankers **Erik Eenkhoorn** *Acorns B.v.*	Development of Child-Restraint Evaluation Program 7 Testing and Scoring Protocols **Basuki Suratno** *Transport for NSW*
14:15 - 14:30	Zebra crossings at T-intersections: Changing the rules for improved walkability **Geoff Browne** *University Of Melbourne*	Use of Back-Casting as a Framework for NSW Strategy Development **Ralston Fernandes** *Transport for NSW*	Supporting Local Governments to Set their Road Safety Targets **Erin Miller** *WALGA*	The no-blame in-depth truck crash investigation study **Sam Doecke** *CASR, University Of Adelaide*	Barriers faced by mothers and fathers to booster seat transition **Stacie Powell** *The George Institute for Global Health*
14:30 - 14:45	Safe travel for pedestrians: reduce 50km/h default limit to 40km/h **Raphael Grzebieta** *TARS, UNSW & Victorian Institute of Forensic Medicine Monash University*			Understanding Telematics Limitations for Evaluating Collisions using Crash Event Data **Tia Gaffney** *Alllied Forensics Group*	

Virtual Sessions Accessible Via the Virtual Platform				
Virtual	Pedestrian Safety Perception at Grade Crossings in Dhaka City **Pretom Md Tahmidur Rahman** *Islamic University Of Technology (IUT)*	Relationship Between Eco-Driving on Fuel Consumption and Carbon Dioxide Emissions **Won Sun Chen** *Swinburne University of Technology*	How do you deliver a programme with Scale and Pace **Aaron Campion** *Urban Connection Limited & Waka Kotahi*	
	Jaywalking Analysis of Dhaka City High School and College Students **Aditya Basunia** *Islamic University of Technology*	Investment Planning to meet the 2030 targets in Victoria **Johan Strandroth** *Strandroth Inc*		
		Road Safety Strategies Comparative Study: Australia and Palestine **(Abanoub Kased), Sameer Abu-Eisheh & Abdallah Abu Aisha** *Monash University*		
14:45 - 15:15	**Afternoon Tea in the Exhibition**			

15:15-16:45	Session 23: Older road users	Session 24: Technology	Session 25: Motorcyclists	Session 26: Interative Workshop	Session 27: Policy and Management
	Session Chair: Joel Tucker	Session Chair: Raph Grzebieta	Session Chair: Christopher Hurren	Session Chair: Robbie Napper	Session Chair: Andry Rakotonirainy
15:15 - 15:30	Development of 'Vehicle Safety for Older Drivers and Passengers' Guidelines **Bianca Albanese** *Neuroscience Research Australia*	Estimation of Potential Road Safety Benefits of Highway Drive Pilot **Azhaginiyal Arularasu** *MUARC, Monash University*	Trail Bike Safety Project Evaluatio" **Kenn Beer & Tana Tan** *Safe Systems Solutions Pty Ltd*	Let's redesign our roads NOW **Robbie Napper & Marilyn Johnson** *Monash University & Australasian College of Road Safety*	Implementing the National Roadmap on Driver Distraction **Martin Small** *Martin Small Consulting*
15:30 - 15:45	Exploring older drivers' perceptions of ADAS and Avs **Joanne Wood** *Centre for Vision and Eye Research, Queensland University Of Technology*	Light Insight Trial (LiT): Enabling a community through technology **David Young & Helen Reddan** *Transport Accident Commission*	Motorcycle Safety - Preparing for Ride to Zero **(Steve Spalding), Peter Do** *TMR, Queensland*		Assessing Fitness to Drive – National Implementation Program **(Fiona Landgren), An Rendell** *Austroads*
15:45 - 16:00	Cognitive correlates of driving performance in older adults: a meta-analysis **Kayla Stefanidis** *University of the Sunshine Coast*	Axle-based vehicle classification using tracking radar for road safety **Victor Deville & Alastair Wiggins** *Sensys Gatso Australia Pty Ltd*	Gearbox: Protect Your Body On Every Ride **Wade Gwynne** *TAC*		Safety Performance Indicators: Observational Studies in New South Wales **(David Wakelin), Ralston Fernandes & Sophie Elliott** *Transport for NSW*
16:00 - 16:15	"Findings from NZ Prospective Older Adult Transport and Health Study" **Rebecca McLean** *University of Otago*	"Raising awareness of advanced rider assistance systems among motorcycle riders" **Sherrie-Anne Kaye** *CARRS-Q, Queensland University of Technology*	"Achieving Safer Road Outcomes for Powered Two Wheelers in Indonesia" **(Shane Turner), Lewis Martin** *Abley Limited*		"Perceptions towards elements of the Safe System and driver behaviour" **Hayley McDonald** *MUARC, Monash University*
16:15 - 16:30	The characteristics of crashes involving medical conditions in South Australia **Simon Raftery** *CASR, The University Of Adelaide*	Risk Assessment for Transportation of Dangerous Goods through Tunnels **(Binod Shrestha), Diana Zagora** *Transport for NSW*	Motorcycle Protective Clothing in the ACT **Matthew Baldock** *CASR, The University Of Adelaide*		Let's talk about parking **Jeanette Ward** *Abley*
16:30 - 16:45	Older pedestrians hit by vehicles in the Australian Capital Territory **James Thompson** *CASR, The University Of Adelaide*	Detecting near-miss events with cyclists using computer vision approaches **Ben Beck** *Monash University*	Contributing factors in motorcycle rider and pillion fatalities **Vy Le** *Queensland Police Service*		National Road Safety Action Plan - an agreed implementation pathway **(Lisa La Rance), Melony Czajor** *Office Of Road Safety, Department of Infrastructure, Transport, Regional Development, Communications and the Arts*
Virtual Sessions Accessible Via the Virtual Platform					
Virtual		Can telematics be used to improve young driver behaviours? **James Boylan** *Swinburne University of Technology*	Perceptual countermeasure for improving motorcyclist safety on rural curves **Mario Mongiardini** *CASR, The University of Adelaide*		

	Implementing the Safe System
	Session Chair: Narelle Haworth
16:50 - 17:10	Implementation - From inception to operations **Chris Konditsiotis**
17:10 - 17:30	**Panel Discussion** Chris Konditsiotis, Mark Terrell, Soames Job & Rob McInerney
19:00	**Conference Gala Dinner**

Day 3: Thursday 21 September				
Time (AEST)	**Building Capacity for a Safe System** **Session Chair: Judy Fleiter**			
08:30 - 09:00	**Building capacity for road policing** Dave Cliff			
09:00 - 09:20	**Why should industry care?** Liz Waller			
09:20 - 09:35	**Building capacity for road safety professionals** Professor (Em) Ann Williamson			
09:35 - 10:00	**Panel Discussion** Dave Cliff, Liz Waller, Professor Ann Williamson & Joanna Robinson			
10:00 - 10:30	**Morning Tea in the Exhibition**			
10:30 - 10:45	Remotely Piloted Aircraft (Drones) for safe road bridge inspections **Diana Zagora & Binod Shrestha** *Transport for NSW*	Lower protection levels observed in women's motorcycle leggings and jeggings **Christopher Hurren** *Deakin University*	Roadside drug testing and risky driver behaviour **Angela Watson** *Queensland University of Technology*	A systems-thinking approach to road safety: policy position statement workshop **(Paul Salmon), Gemma Read & Martin Small** *University Of The Sunshine Coast & Martin Small Consulting Pty Ltd*
10:45 - 11:00	Spatial Mapping of Injury Claims Data to Safety Barrier Locations **Tandy Pok Arundell & Rebecca Teal-Ireland** *Transport Accident Commission & Abley Ltd*	A guide to designing and manufacturing motorcycle protective clothing **Tom Whyte** *Transport for NSW*	Uncovering the Urgency for Heightened Drug Testing **(Laura Alexandrescu), Rachael Mason** *New Zealand Police*	
11:00 - 11:15	Intersections and injuries: Insights from Event Data Recorders **Martin Elsegood** *CASR, University of Adelaide*	Review of the Learner Approved Motorcycle Scheme (LAMS) **Tana Tan** *Safe Systems Solutions Pty Ltd*	Modelling the impact of RBT/RDTs on road crash data **Gisoo Pishdad** *TMR, Queensland*	
11:15 - 11:30	RJAWS Lite: A Low-cost, Technology-based Intersection Safety Treatment **Christopher Stokes** *CASR, University Of Adelaide*	Motorcycle Safety Forum - ACRS Victorian Chapter **(Wendy Taylor), Kenn Beer** *Wendy Taylor, Safe System Solutions*	Investigating Cannabis Flower's Influence on Cognitive Skills Related to Driving **Carla Schiemer** *Maic/unisc Road Safety Research Collaboration*	
11:30 - 11:45	Piloting Sinusoidal Audio Tactile Line Marking (ATLM) in Australia **(Joseph Le), Tony L Nguyen** *Transport for NSW*	The Motorcycle Crash Card – A successful collaborative project **Lloyd Toffolon** *Department Of Transport And Planning, Road Safety Victoria*	Open-label medicinal cannabis use effect on driving performance **Brooke Manning** *Swinburne University of Technology*	
11:45 - 12:00	TAC Clients' Injury Severity and Safe System Road Infrastructure Program **(Allison McIntyre), Antonietta Cavallo** *Transport Accident Commission*	Motorcycle Safety Countermeasures for Inner Melbourne **(Daniel Mustata), Duc Phan** *Road Solutions*	Review of driver monitoring technologies **(Andrew Somers), David Young** *Transport Accident Commission*	
12:00 - 13:00	**Lunch in the Exhibition**			

13:00 - 14:00	Session 32: Speed Session Chair: Paul Durdin	Session 33: Cyclists Session Chair: Gemma Read	Session 34: Heavy Vehicles Session Chair: Levi Anderson	Session 35: Interactive Workshop Session Chair: Judith Charlton
13:00 - 13:15	Perceived effectiveness of traditional and technology-based approaches to reduce speeding **Sherrie-Anne Kaye** *CARRS-Q, Queensland University of Technology*	Light Insight Trial (LiT): cycling safety analysis using crowd-sourced data **Ashim Debnath** *Deakin University*	CLOCS-A – Road Safety Standard for Construction Infrastructure Projects **Jerome Carslake** *NRSPP delivered by MUARC*	Emerging vehicle technologies supporting safe mobility of older Australians **Sjaan Koppel & Jude Charlton** *MUARC, Monash University*
13:15 - 13:30	Uptake of Speed Adviser App with Mobile Speed Camera Alerts **Kerry Shaz** *Transport for NSW*	A 12-month study of cyclist incidents in Australia" **Jolene Cox** *Centre For Human Factors And Sociotechnical Systems*	Truck Drawbar Safety For Vulnerable Road Users **(Tana Tan), Victor Trumper** *Safe System Solutions Pty Ltd*	
13:30 - 13:45	Monitoring speeding using GPS data to inform road safety initiatives **Elaine Luc** *Houstonkemp Economists*	Has cycling safety in New Zealand improved?" **Glen Koorey** *Viastrada Ltd*	The unchallenged acceptance of road tanker accidents **Erik Eenkhoorn** *Acorns B.v.*	
13:45 - 14:00	Review of the Injury Risk Curve for Head-on Car-to-Car Crashes **Kardina Nawassa Setyo Ayuningtyas** *University of New South Wales*	Evaluation of the Australia-first trial of smart bicycle lights **Hafez Alavi** *HA Consulting*	Factors affecting the severity of bridge-related crashes in NSW **Tung Tran** *La Trobe University*	
14:15 - 14:30	Towards updated safe speeds using new speed-injury risk curves **Sam Doecke** *CASR, University Of Adelaide*	Project Velograph: Mass collection of naturalistic cyclist-vehicle passing events **Jamie Makenzie** *CASR, University Of Adelaide*	Keeping vulnerable road users safe during construction periods **Rachel Carlisle** *Road Safety Victoria, Department Of Transport And Planning*	
14:15 - 14:30	Lead and lag indicators of success for Top 20 Roads **Chris Jones & Amir Sobhani** *Department Of Transport and Planning*			
14:30 - 15:00	**Afternoon Tea in the Exhibition**			
	Session Chair: Jessica Truong			
15:00 - 15:10	**Innovative Intersection to Save Lives** Christopher Davis			
15:10 - 15:20	**Roadblocks to Safety: How Red Tape Stifles Innovation** Adam Gardiner			
15:30 - 15:30	**Award Winner 3** Bernard Carlon			

Road Safety National Strategies Comparative Study: Australia and Palestine

Sameer Abu-Eisheh[a] and Abdallah Abuaisha[b]

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Abstract

In response to the United Nations' declaration of the Second Decade of Action for Road Safety, countries have prepared their national road safety strategies with the target of reducing deaths and injuries by half in 2030. This paper intends to present the outcome of a study that utilises a comparative methodological approach to examine what a developed country (Australia) and a developing country (Palestine) have in common or differ in their prepared road safety strategies. The results show that there are similarities in the general themes, yet major differences exist in the goals, strategies, and actions. Such differences are mainly related to the specificities of each country. Recommendations include reducing gaps in road safety indicators between the two countries benefiting from the successes of developed countries, transferring knowledge, and supporting the less developed countries to overcome road safety challenges to achieve the common value of maintaining human life and health.

Background

The United Nations General Assembly (2020) declared the Second Decade of Action for Road Safety (2021-2030), with the target of preventing at least 50 percent of road traffic deaths and injuries by 2030. The World Health Organization (2021) developed a Global Plan to guide the implementation of the Decade of Action. Accordingly, governments have responded and prepared national strategies and action plans aiming to meet the stated target.

This study compares the prepared strategies in two countries, a developed country (Australia) and a developing country (Palestine). In Australia, there are about 1,200 deaths on roads annually (4.6 death per 100,000 population), while in Palestine, there are about 130 deaths on roads annually (2.5 death per 100,000 population). The study presents how these national strategies meet or differ, and how a better harmonization can be achieved to ensure saving lives and maintaining health of population. Australia had prepared its National Road Safety Strategy 2021–30, with the target of reducing fatalities by 50 percent and serious injuries by 30 percent (Commonwealth of Australia, 2021). On the other hand, Palestine has prepared the National Strategic Plan for Road Safety-Palestine 2023-2030, with the target of reducing fatalities and serious injuries by 40 percent (The Palestinian National Institute of Public Health, 2023).

Method

A comparative approach is used to examine the similarities or differences between the developed national road safety strategies in Australia and Palestine. A qualitative methodology involving desktop review of strategy content is followed to compare the basic constituents of these strategies, including the vision, mission, aim, and strategies, which are included in their national road safety strategic plans. Consequently, the conclusions and recommendations are identified with the aim of benefiting from the experiences and successes in achieving safe travel for all.

Results and Conclusions

The results of analysis show that there are similarities in the two strategies in the general aim by the end of the decade. However, the overall vision of the strategy in Australia supports the country's long-term of zero deaths and serious injuries by 2050 (Vision Zero), while in Palestine, the vision is to have safe and sustainable mobility targeting the year 2030.

The themes and the related strategies, meet or differ between the two countries, which can be attributed to the specificities of each country, especially as related to the socio-economic, legislative and enforcement aspects, as well as state of advancement and financial status.

Australia strategic plan's approach concerning injury prevention countermeasures is built on the Safe System Approach, and comes under three key themes; safe roads, safe vehicles, and safe road users. On the other hand, the strategic plan in Palestine has six themes, with three additional themes; legislations, traffic safety management and control, and post-crash response. This is due to the lack of proper legislative framework, weak enforcement, and lagging rescue post-crash services.

Recommendations include to benefit from the successes of the developed countries and transfer knowledge in confronting road injuries, and support the less developed countries in enhancing their traffic management and enforcement systems.

References

Commonwealth of Australia. (2021) National Road Safety Strategy 2021–30, Canberra, Australia: Infrastructure and Transport Ministers, available at (https://www.roadsafety.gov.au)

The Palestinian National Institute of Public Health. (2023). Road Safety Strategy for Palestine 2023-2030, Ramallah, Palestine.

United Nations General Assembly. (2020). Resolution adopted by the General Assembly on 31 August 2020, No. 74/299, Improving global road safety, New York, USA, available at (https://documents-dds-ny.un.org/doc/UNDOC/LTD/N20/213/47/PDF/N2021347.pdf?OpenElement)

World Health Organization. (2021). Global Plan Decade of Action for Road Safety 2021-2030 2021, Geneva, Swtizerland, available at (https://www.who.int/teams/social-determinants-of-health/safety-and-mobility/decade-of-action-for-road-safety-2021-2030#:~:text=Decade%20of%20Action%20for%20Road%20Safety%202021%2D2030&text=In%20September%202020%2C%20the%20UN,deaths%20and%20injuries%20by%202030)

Extensive hypothesis testing for crash data considering multiple objectives

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Abstract

This study proposes a multi-objective optimization framework to search the best model specification for crash data count models and generate as many insights as possible. The estimation of these models involves testing simultaneously numerous interdependent factors, such as functional forms, contributing factors, transformations, and random parameters. The proposed framework aims to minimize the Bayesian Information Criterion (BIC) and Mean Squared Error (MSE) to find the best set of solutions at a low cost for the analyst. The problem was solved using a harmony search algorithm which was tested using Queensland highway data. The results suggest that the proposed framework can significantly reduce the cost and time required to perform extensive hypothesis testing while capturing important insights present in the data.

Introduction

Poisson regression is commonly used to analyse road crashes, but it has limitations when data contains many zero values and is unevenly distributed. The Negative Binomial (NB) model is better for handling over-dispersed data, as it accounts for variability in the data. Additionally, recent research has extended the NB model by incorporating random parameters to account for unobserved heterogeneity. This approach allows for a more flexible and accurate representation of the data. Therefore, the use of random parameters in the Negative Binomial model is preferable for modelling road crashes as it can handle over-dispersed data and account for unobserved heterogeneity. However, the process of developing a model is time-consuming, requires extensive knowledge, and can be limited by human bias and lack of exploration. To overcome these limitations, an optimization-based framework is needed. Veeramisti et al. proposed a metaheuristic search-based approach for estimating clusterwise safety performance functions, but their framework cannot estimate generalized crash prediction models. Therefore, a metaheuristic solution algorithm can effectively test many hypotheses and capture the strengths of various modelling approaches while minimizing human, time, bias, and analysis intervention. This approach can be useful for building precise and efficient crash prediction models without sacrificing interpretability (Paz et al., 2019; Chai and Draxler, 2014).

Results

We developed and tested Harmony Search Solution Algorithm to find the best models in accordance with the BIC and MSE objectives.
Figure 1 shows 6 non-dominant solutions based on two objectives, but the plot only displays a portion of the Pareto-Frontier. The small MSE indicates the models are not overfitting. The plot categorizes the models, with all optimal solutions using Poisson process using all traditional random parameters. None of the visible models use fixed effects, indicating the importance of capturing unobserved heterogeneity in the Queensland highway road data for efficient estimation, Table 1 represent one solution from this frontier.

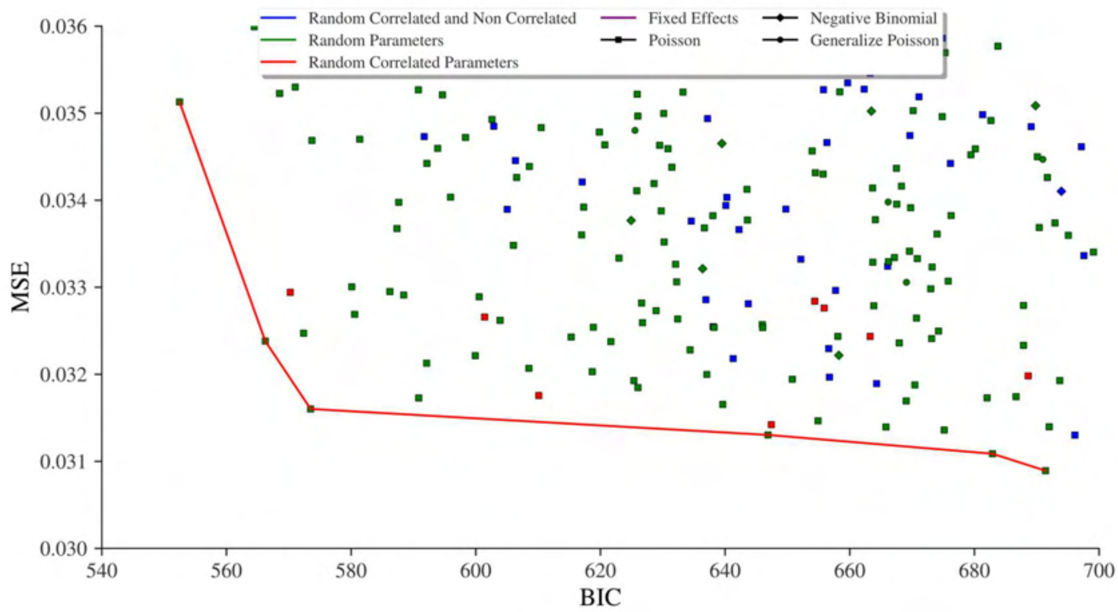

Figure 1. Pareto Frontier Produced by the Harmony Search Algorithm: Solutions Priorities BIC and MSE

Table 1. Poisson model found through the HS algorithm. BIC: 564.75

Effect	Transformation	Coefficient	Standard Error	z-values	Prob |z|>Z
Constant	no	-11.22	1.41	-7.96	0.00***
Length	log	0.40	0.11	3.74	0.00***
AADT	log	0.79	0.18	4.47	0.00***
MCV	sqrt	0.10	0.03	3.30	0.00**
Number of Lanes	log	-2.85	0.83	-3.42	0.00***
Form Width : Rural Single	no	0.13	0.05	2.96	0.00**
Low Speed Highway	no	-7.35	0.00	-50.00	0.00***
Curve Mountain Terrain	no	0.09	0.33	0.26	0.79
Low Speed (uniform)		0.05	0.00	50.00	0.00***
chol. Mt_Curve (uniform): LSP (uniform)		0.12	0.00	50.00	0.00***
Mt_Curve (uniform)		-0.28	0.00	-50.00	0.00***

Conclusions

In conclusion, we have presented a set of Pareto-optimal solutions discovered through our extensive hypothesis testing framework supported by a meteheuristic solution algorithm. Analysts can use the Pareto-frontier to identify solutions that best balance the objectives that are critical for their application. However, practical implications such as costs, implementation, and interpretability should also be considered, especially for applications aimed at saving lives on highways.
For instance, one of the solutions suggests that increasing the number of lanes could improve road safety while allowing for narrower lanes. This solution could lead to the development of new roads that meet these criteria without sacrificing any space. By using other solutions from the Pareto-frontier, a different strategy could be adopted and emphasised, if it is more feasible to implement. Additionally, the entire set of models could be used together to develop potential alternative strategies.

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Observation study on restraint use for child occupants in Dubai

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Abstract

This study describes the restraint use for child occupants in the Emirate of Dubai in the United Arab Emirates (UAE) from an on-road observation study. Of the observed child occupants, 51.7 percent were unrestrained and 8.3 percent were seated on an adult's lap (unrestrained). The observed child occupants' restraint use was classified as: 'appropriate' if seated in middle/rear rows and restrained in a capsule, forward-facing CRS or in a booster seat; 'adult seatbelt' if seated in front passenger seat, middle/rear rows and restrained by seatbelt, and 'inappropriate' if seated in front row and/or seated on an adult's lap or unrestrained when seated in the middle or rear rows. Based on this classification, 68.6 percent of vehicles carried at least one inappropriately restrained child occupant. Unrestrained drivers were more likely to have at least one inappropriately restrained child in their vehicles. Future efforts should focus on improving education, awareness and enforcement programs to improve the safety of child occupants in the UAE.

Background

In the UAE, two out of every three fatally injured children die due to road traffic crashes, which is around three times the global average (Department of Health AbuDhabi, 2019; Department of Health of AbuDhabi, 2017). Despite the UAE's high road traffic fatality rate reported by the Department of Health AbuDhabi (2019), restraint use (i.e., use of child restraint systems [CRS], booster seats, seatbelts) is low for child occupants (Bendak & Alkhaledi, 2017; Bendak & Alnaqbi, 2019). In addition, few observational studies investigating restraint use have been conducted in the UAE, and no studies have investigated 'appropriate' restraint use for child occupants. Therefore, this study aimed to describe the frequency and type of restraint use within private motor vehicles transporting child occupants in the Emirate of Dubai (UAE).

Method

An on-road observation approach was used to describe the frequency and type of restraint use within private motor vehicles transporting at least one child occupant aged ten years and younger at certain peak traffic times in three locations in Dubai. The child occupants' restraint use was classified as:

- Appropriate: child seated in middle/rear rows and restrained in a capsule, forward-facing CRS or in a booster seat.
- Adult seatbelt: child seated in front passenger seat, middle/rear rows and restrained by seatbelt, and
- Inappropriate: child seated in front row and/or seated on an adult's lap or unrestrained when seated in the middle or rear rows.

Results

Overall, 2,000 vehicles were observed transporting at least one child occupant estimated to be aged 10 years and younger. Within these vehicles, only 60.0 percent of drivers and 53.3 percent of front seat passengers were restrained by a seatbelt. The seating position and restraint type was also recorded for 2,940 child occupants (see Table 1). Of the 2,000 observed vehicles, 68.6 percent of vehicles carried at least one inappropriately restrained child occupant. There was a significant relationship between a driver's seatbelt use and inappropriate restraint use for at least one child occupant in the vehicle ($\chi^2(1)=75.450$, $p<0.001$); Unrestrained drivers were more likely to have at least one inappropriately restrained child in their vehicles. There was also a significant relationship between the number of child occupants and the presence of at least one child occupant inappropriately restrained in the vehicle ($\chi^2(1)=44.599$, $p<0.001$). Vehicles with two or more children were more likely to have at least one child occupant inappropriately restrained (77.2%) compared to vehicles with one child (63.0%).

Conclusions

This study has identified an alarming number of unrestrained or 'inappropriately' restrained child occupants who are at an increased injury risk in the event of a crash. These rates do not meet UAE's and international standards recommending all children aged 10 years and younger to be restrained in an appropriate CRS/restraint for their age/size (Department of Health of AbuDhabi, 2017; National Safety Council, 2022; Road safety in Australia, 2022; WHO, 2020; World Health Organization, 2018). Future efforts should focus on improved education, awareness, and enforcement programs to improve the safety of child occupants in UAE.

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Table 1. Seating positions and restraint type for child occupants travelling in the observed vehicles (n=2,940)

Seating position		Capsule (C) %(n)	Forward-facing (F) %(n)	Booster seat (B) %(n)	Seatbelt (S) %(n)	Adult lap (L) %(n)	Unrestrained (U) %(n)	Total %(n)
Front row	Seat one	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.3% (9)	0.0% (0)	0.3% (9)
	Seat nine	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	4.0% (118)	4.0% (118)
	Seat two	0.0% (0)	0.0% (0)	0.0% (0)	5.9% (174)	3.5% (102)	4.2% (124)	13.6% (400)
Middle row	Seat three	2.7% (78)	5.0% (146)	2.3% (69)	4.8% (140)	1.2% (34)	12.5% (368)	28.4% (835)
	Seat four	0.6% (18)	1.2% (34)	1.1% (31)	2.3% (69)	0.9% (26)	17.2% (505)	23.2% (683)
	Seat five	1.6% (48)	6.3% (184)	1.9% (55)	3.9% (116)	2.4% (72)	12.7% (372)	28.8% (847)
Rear row	Seat six	0.0% (0)	0.1% (3)	0.0% (1)	0.1% (3)	0.0% (0)	0.2% (6)	0.4% (13)
	Seat seven	0.0% (0)	0.0% (0)	0.0% (1)	0.1% (2)	0.0% (0)	0.5% (14)	0.6% (17)
	Seat eight	0.0% (0)	0.0% (1)	0.0% (1)	0.1% (4)	0.0% (0)	0.4% (12)	0.6% (18)
Total%		4.9% (144)	12.5% (368)	5.4% (158)	17.3% (508)	8.3% (243)	51.7% (1,519)	100.0% (2,940)

Charting a Path to Zero: overarching project, role and objectives

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Abstract

The Austroads project, "Charting a Path to Eliminating Road Death and Serious Injury," helps road authorities eliminate road deaths and serious injuries by 2050 in Australia and New Zealand through progressing leadership, advocacy, enablers, promotional activities, training, and change management to shift institutional and stakeholder acceptance and implement effective actions to achieve Zero. Key objectives include defining zero-harm and thus the 2050 end state required of the road transport system, assessing the current state of road trauma and systemic gaps, developing a Zero planning framework and Zero Pathway options for all levels of government, identifying stakeholders' needs and developing supporting guidance, and identifying knowledge gaps and research needs. The primary audience includes road safety leaders, managers, and practitioners, transport organisations, private sectors, industry groups, and advocacy groups. Stream 1 of the project began in March 2023, focusing on Zero Harm definition, gap assessments, Zero Planning Framework development, and technical guidance.

Background

This Paper introduces a crucial Austroads project: "Charting a Path to Eliminating Road Death and Serious Injury" for information and feedback. Australia and New Zealand have set targets of zero road deaths and serious injuries by 2050. However, sustained trauma reductions of the required scale have never been achieved. "Charting a Path to Zero" will progress the leadership, enablers, advocacy, promotional, training and change management activities necessary to shift institutional, media, key stakeholder and community acceptance in relevant communities in order to develop and more fully implement effective actions for change to reduce fatalities and serious injuries to zero by 2050.

Objectives

The project provides technical guidance to road and transport authorities in Australia and New Zealand to:

- better understand the concepts of Zero Harm, Safe System End State and Zero Planning
- quantify the benefits of serious road trauma elimination and identify cost-effective actions that all levels of government can take to facilitate serious road trauma elimination in their communities
- align their strategic road safety planning with the proposed Zero Planning Framework and chart their own sustainable path to Zero (Zero Pathway)
- map their key stakeholders and road safety knowledge gaps to achieve Zero.

Audience and Stakeholders

Our primary audiences are road authorities in Australia and New Zealand, including road safety leaders, road managers, and practitioners in road design, vehicle registration, policy, driver licensing, road user regulation, enforcement, among others. The project aims to reach and influence all levels of government, road safety partners, transport organisations, relevant private sector, industry groups, academia, and advocacy groups, who play a role in achieving Zero by 2050.

Scope of Works

Our "Program of Works" is comprised of six areas, the first three of which are addressed in Stream 1, starting March 2023:

1. Definition of zero-harm and 2050 end states for the road transport system
2. Assessment of the current state of road trauma and the road transport system
3. Development of a planning framework that can be tailored to each jurisdiction and level of government
4. Development of Zero Pathway options for each jurisdiction and a sample of local governments
5. Identification of key stakeholders and their needs and development of supporting guidance
6. Identification of knowledge gaps and research needs, and development of research/practice programs to address them.

Stream 1: Methodology

1. Define Zero Harm, Serious injury and Safe System End States for the purposes of "Charting a Path to Zero."
2. Assess the current state of serious road trauma across ANZ to identify the gap with the End States and identify institutional and other enablers and blockers to achieving Zero.
3. Develop a Zero Planning Framework to achieve a zero-harm road transport, tailored for all levels of government.
4. Develop guidance, especially for Local Government and jurisdictions, that builds understanding and supports application of the Zero Planning Framework.

Next Steps

Stream 1 will be completed in late 2023, leading to the development of Zero Pathway options, guidance and engagement material, and knowledge gap maps.

Evaluation of the Australia-first trial of smart bicycle lights

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Abstract

In 2021, the Light Insights Trial (LiT) was launched by the Transport Accident Commission (TAC) in Victoria to investigate the potential of innovative bicycle light technology to enhance cycling safety and participation. The trial involved 800 diverse cyclists using the See.Sense smart bicycle light for 12 months, with data recorded via the See.Sense app. The trial created a network of committed and activated cyclists, providing valuable insights for future cycling policies and initiatives. It also collected and analysed data, creating a platform for surveys on road safety and cyclist mobility, and had potential impacts on policies related to speed management, cycling promotion, bicycle infrastructure, geofencing, and e-bikes. The evaluation recommended ongoing investment in the trial, with opportunities to expand the trial, engage the cycling community, focus on local government areas, and reduce the cost of cyclist trauma while mitigating potential risks.

Background

Active travel has many individual and societal benefits and can mitigate negative effects of the transport system (e.g., road trauma, pollution and noise). Cycling plays a vital role in this, and technology is becoming increasingly important in ensuring cyclist safety and mobility. The Light Insights Trial (LiT) was an iMOVE Cooperative Research Centre project launched in 2021 by the Transport Accident Commission (TAC) in Victoria, which trialled innovative bicycle light technology from See.Sense to improve cyclist safety and mobility. LiT involved a diverse range of stakeholders and planned activities, including 800 cyclist participants, research partners, and cycling advocacy organisations. The trial aimed to create a network of stakeholders, inform policy and strategy, and ultimately increase cycling rates and improve cyclist safety.

Evaluation Project's Objectives and Methodology

The LiT evaluation by HA Consulting aimed to review and evaluate the trial's success in achieving its objectives and to develop recommendations for future improvements. The methodology included a literature and document review, social and transport research findings review, in-depth informant interviews, and technical workshopping. Professor Narelle Haworth (CARRS-Q) provided technical support and expertise throughout the trial and the evaluation project.

Evaluation Findings

The evaluation of the LiT found that the trial successfully established a network of committed and activated cyclists and served as a new stakeholder engagement avenue to reach out to the cycling community. The trial also provided valuable insights into cyclist demographics, riding behaviour, attitudes towards safety, technology, and road infrastructure, and cyclist crashes.

LiT was able to build a cyclist-specific dataset that could be potentially used to inform future strategies, investments, policies, and planning/design. The dataset includes data on the purpose of cycling trips, demographic characteristics of cyclists, type of bicycle, safety and mobility indicators, and the time, length, origin-destination and routes of the captured cycling trips. The trial data could also inform policy and strategy areas such as speed management, cycling promotion, bicycle infrastructure mandates, geofencing, and policies related to bicycle type and e-bikes.

Recommendations for Future Improvements

- Enhance communication and engagement strategy, establish clearer goals and targets, and utilise the trialist network for engagement and collaboration.
- Use the rich dataset provided by the trial for future research and analysis and consider expanding the trial to include micromobility and focus on local government areas.
- Develop a data access strategy and policy to facilitate more research and analysis of the data, leading to valuable insights and improvements in cyclist safety.
- Continue investing in the LiT for its potential to enhance cycling safety and mobility.

Acknowledgements

LiT trial's success was possible due to the contributions of various organisations and stakeholders. TAC offered road safety expertise and partial funding and led the trial's delivery and evaluation. SEE.SENSE provided industry expertise and technology support, Deakin University was the research partner and partial funder, and iMOVE CRC provided partial funding. Painted Dog conducted behavioural research and qualitative stakeholder interviews. Bicycle Network Victoria, the Amy Gillett Foundation, and Aus Cycling advocated for the trial and promoted it to their members and databases.

Key functions and characteristics of effective Road Safety Research Programs

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Abstract

This project aimed to identify best practices for road safety research programs involving government and research agency partnerships to achieve zero road trauma. The methodology included a scoping literature review and in-depth interviews with subject matter experts. The scoping review found that successful road safety research programs require good governance, stakeholder engagement, and a well-structured research administration cycle. Themes from the interviews highlighted the importance of a systems-based and Safe System orientation, focusing on achieving zero serious road trauma targets, developing road safety strategies, identifying systemic road safety risks, and prioritising cost-effective measures. The research program lifecycle should include conception, program and governance development, delivery, monitoring and reporting, auditing, and continuous improvement. The findings of the project illuminate successful road safety research program characteristics, and the recommendations encapsulate strategic implementation of these insights, thereby serving our purpose of establishing a good-practice framework for government and research agency collaborations.

Background

Road safety strategies aim to reduce road trauma and significantly decrease serious injuries. Road Safety Research Programs support evidence base development and are a common initiative to drive high-impact research, with a focus on integrating research findings into agency processes, policy and programs. Good governance of such programs to defend public spending and benefits, include regular program evaluation, together with a review of world's best practice and gap analysis to identify opportunities for program improvements.

Project purpose

Our project sought to address four key questions regarding road safety programs, only two of which could be publicly shared and will be presented here, due to sensitivity of some of the information. Firstly, what is best practice for a road safety research program involving a government and research agency partnership to achieve Zero? Secondly, what do Road Safety Experts believe are key components of such programs including optimising research outputs and impacts as well as knowledge translation and sharing?

Methodology

A multi-approach, stepwise methodology was developed in consultation with Road Safety Partners. For the two key questions discussed here, this included a scoping literature review applying the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) system and in-depth interviews with subject matter experts which were transcribed and analysed using primarily qualitative methods to code, then identify themes for grouping analysis.

Key findings

Our scoping literature analysis indicates that successful road safety research programs require good-practice governance, ethical considerations, and a well-structured research project administration cycle. Stakeholder mapping and engagement are crucial for effective research priority setting and should be reviewed regularly while funding cycles should enable short to medium length project completions. Research repositories should have institutionally defined artefacts, scholarly content, and sustainable management to be successful.

Themes emerging from in-depth interviews with several inter/national experts included that a road safety research program should adopt a systems-based and Safe System orientation including documented processes and gateway decision points, with a focus on proactive vision building and achieving zero serious road trauma targets. Research programs should help develop road safety strategies, identify systemic road safety risks, evaluate road safety countermeasures, and prioritize investment in cost-effective measures. The research program lifecycle should include conception, program and governance development, delivery, monitoring and reporting, auditing and continuous improvement, including feedback to stakeholders. Ideally artefacts should be stored in national road safety research repositories. Key Performance Indicators could include budget monitoring, on-time and full scope delivery, completion of knowledge translation, communication/engagement products and repository material as planned and budgeted.

Improvement recommendations:

Our recommendations focus on the need for strong road safety leadership as expressed in a robust research program which includes clear communication of the program's vision and independence, securing long-term funding, and ensuring the program's strategic alignment with national and jurisdictional road safety targets. The recommendations also highlight the importance of compartmentalised funding (part foundational/evaluation, part responsive/emerging themes), rigorous project management, contributing to road safety datasets, staff induction packages, national and international alliances, resource management, and adoption of a program logic framework for evaluations.

Development of 'Vehicle Safety for Older Drivers and Passengers' Guidelines

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Abstract

Older people often experience difficulties achieving good seatbelt fit and comfort in vehicles. The use of comfort accessories like cushions and pads is common among older vehicle occupants. Research has demonstrated that some accessories can have a detrimental effect on safety in a crash. Health and road safety professionals are ideally placed to provide advice to older people about how to achieve a safe, functional and comfortable position in vehicles. The 'Vehicle Safety for Older Drivers and Passengers' project used a modified Delphi consensus method to develop consensus-based guidelines for providing tailored advice about safe and comfortable travel in vehicles as a tool for use by these practitioners.

Background

The ageing Australian population may result in a proportional increase in car crashes involving older people (Fildes, 2008). Age-related physiological changes increase frailty leading to reduced crash force tolerance and increased injury risk. Chest and abdominal injury resulting from seatbelt interaction are common among older occupants who die or are hospitalised following a crash (Kent et al., 2005; Oikawa et al., 2016; Zhou et al., 1996). Accessories used to improve older occupant comfort have been shown to negatively impact crash protection by altering occupant posture and lap-belt length (Whyte et al., 2020).

Up to 45 percent of older occupants use aftermarket comfort accessories in vehicles (Coxon et al., 2014; Eby et al., 2018a; Sran et al., 2021). It is unknown if these accessories provide any orthopedic benefit or increased comfort. Research suggests few older occupants consult professionals in the decision to use these aids (Eby et al., 2018b; Sran et al., 2021). The aim of this study was to identify challenges faced by older drivers and passengers, present evidence and gather expert consensus to develop guidance to assist health and road safety professionals in providing advice to older people on keeping safe and comfortable in vehicles.

Method

A modified Delphi method of consensus was used (Dalkey & Helmer, 1963). Ethics approval was obtained through UNSW HREC (HC200933). A multidisciplinary panel of 16 health and road safety experts were invited to participate. In Round 1, participants reviewed a summary of evidence regarding vehicle occupant protection, road safety, comfort science, ergonomics and gerontology and responded to open-ended questions to inform decision points to be presented in Round 2. In Round 2, participants rated their level of agreement to these decision points and provided justification for their rating. In subsequent rounds, participants reappraised their ratings in view of the previous round responses until 75 percent level of consensus was reached. There was a total of three rounds in this study. Consensus viewpoints were used to articulate guidelines for how health and road safety professionals can best respond to challenges regarding vehicle safety for older drivers and passengers.

Results

Nine panellists completed all three Delphi rounds. Panellists' agreed that exploring vehicle adjustments should be the first and optimal means for older people to achieve safe and comfortable travel, prior to accessory use. Comfort, physical disability, and achieving appropriate vehicle adjustment were agreed to be challenges common among older vehicle occupants. The final set of guidelines covered recommendations relating to 9 challenges across three broad areas: achieving comfort and safety, addressing cognitive and physical challenges, and addressing pain and discomfort (Table 1).

Table 1: Consensus on advice that should be given to older vehicle occupants by professionals working with them

Challenge	Key recommendations
Achieving comfort and safety	
Older people may experience difficulties achieving a correct seatbelt fit	1. Seatbelts should always be used. 2. Raise awareness of the safety implications of poor seatbelt positioning. 3. Encourage the use of sash belt height adjustment mechanisms to achieve correct and comfortable sash belt position. 4. Encourage correct lap belt positioning. 5. Contact a driver trained occupational therapist or road safety program if good seatbelt fit cannot be achieved.
Older people may not know about the vehicle adjustment features and/or how to make adjustments to the vehicle.	1. Identify and use sash belt height adjustors to achieve a correct and comfortable mid-shoulder position sash belt. 2. Seek information about vehicle safety adjustment features from the vehicle manufacturers sales team at the point of sale. 3. Refer to vehicle manual for information on vehicle adjustment beyond point of sale. 4. Contact driver trained occupational therapists or road safety programs if help is required to access information from vehicle manual.
Different people may need to make different adjustments, depending on their specific circumstances and the features available in the vehicle.	1. Older vehicle occupants would benefit from access to individually tailored advice. 2. To seek assistance from a driver trained occupational therapist or a road safety program designed to provide education and tailored advice to older vehicle occupants. 3. Older people with complex needs should be referred to a driver-trained occupational therapist to identify tailored solutions.
Addressing cognitive and physical challenges	
Older people may have cognitive and/or physical limitations that interfere with their ability to make necessary adjustment to a vehicle.	1. Driver trained occupational therapists are appropriate to assist older people to adjust their vehicles.
Older people may experience difficulties entering and exiting the vehicle due to the vehicle height or due to physical limitations (restricted range of	1. Consider ease of entry and exit to a vehicle at point of purchase. 2. If a comorbidity or injury presents difficulty, contact an occupational therapist, driver trained occupational therapist or physiotherapist.

Challenge	Key recommendations
motion, injury, or comorbidities).	3. If difficulty is due to reasons other than vehicle height or physical limitations, contact a driver trained occupational therapist. 4. Aftermarket accessories should be used only on advice of a driver trained occupational therapist after an appropriate assessment.
Older people may need to raise the seated height in a vehicle to see over the dashboard and/or achieve a correct sash belt position.	1. Consider the ability to achieve adequate seated height for visibility over the dash when purchasing new vehicles. 2. Use vehicle adjustments to achieve appropriate seated height and/or achieve a correct sash belt position. 3. If vehicle adjustments fail to achieve the above, consult a driver-trained occupational therapist or road safety practitioner 4. Household items such as pillows and cushions should not be used to raise seated height.
Older people who are driving may need to make adjustments to the vehicle to achieve appropriate access to the steering wheel and foot pedals.	1. Use vehicle adjustments to achieve appropriate access to the steering wheel and foot pedals. 2. Adjustment to the vehicle should prioritise achieving optimal access to the steering wheel and foot pedals without the use of an accessory. 3. If this cannot be achieved due to a specific functional issue being experienced by the driver, an occupational therapy driving assessment should be considered. 4. If a driver reports discomfort after adjustment to the vehicle, further vehicle adjustments should be explored to alleviate discomfort without compromising the driving position. 5. If comfort cannot be achieved through vehicle adjustment alone, contact a driver trained occupational therapist or appropriate road safety practitioner.
Addressing pain and discomfort	
Older people may experience pain when sitting in or driving a vehicle for a prolonged period.	1. Use vehicle adjustments to alleviate the likelihood of pain. 2. Take regular breaks and stretch to relieve pain. 3. Consult a physiotherapist for tailored exercises and pain management strategies. 4. In general, do not use lumbar supports or place anything behind the back when travelling in a vehicle. 5. If using a lumbar support following surgery/during rehabilitation, consult a driver trained occupational therapist to identify a solution.
Older people may experience discomfort when sitting in or driving a vehicle.	1. Use available vehicle adjustments to achieve comfort. 2. Seek advice from a driver trained occupational therapist or road safety program if there is difficulty resolving discomfort. 3. If comfort cannot be achieved through vehicle adjustment, work with a driver trained occupational therapist to identify a solution that does not involve using a cushion or pad on the vehicle seat.

Conclusions

Consensus statements from a range of experts on challenges faced by older people in vehicles and best-practice advice for addressing these were generated and refined through a Delphi process. A final set of guidelines were established for practitioners to use when providing advice to older people on how best to achieve safe and comfortable travel in vehicles.

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Western Australian Blackspot Program: contrasting treatment criteria and improved evaluation

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Abstract

The Western Australian (WA) State Black Spot Program identifies intersection and midblock locations that have a high incidence/likelihood of crashes for treatment. To be selected, it must satisfy one of two criteria: Benefit Cost Ratio (BCR) or Road Safety Audit (RSA). Treatments are considered for all road users (e.g., roundabouts, shoulder treatments, and shared paths) and the RSA-criteria, in particular, allows expanded access for projects ineligible under the BCR-criteria. Previous evaluations targeted BCR-criteria projects only and used simple before-after methodology. Improving on previous evaluations, we compared both BCR and RSA criteria using before-after analyses incorporating time-trends and a subset were evaluated using a full Bayes before-after analysis. Both Programs were associated with a safety benefit, but the RSA-based Program was less cost-effective than the BCR-based Program. The full Bayes analysis also supported a safety benefit of both Programs, indicating improved safety for all Western Australian road users, metropolitan and rural.

Background/Introduction

The Western Australian (WA) State Black Spot Program targets intersections or segments of road that are considered to have a disproportionately high crash risk. Identifying, analysing, and treating identified black spots are regarded as an effective crash prevention strategy (Elvik, 1997; Levine, 2006). Since its commencement in 2000, the Program has treated over 1,000 sites. Although all road classifications are eligible for funding, they need to meet one of two criteria:

1. Benefit Cost Ratio (BCR): crash history-based criteria with differing levels for metropolitan (10 crashes over 5 years) and rural (3 crashes over 5 years) sites and an economic component where the BCR must be greater than 1
2. Road Safety Audit (RSA): a formal assessment of the risks at a site conducted by an independent team considering all road users from a Safe Systems perspective

Previous evaluations of the Black Spot Program had two major limitations:

1. Projects were restricted to BCR-criteria (e.g., Chow et al. 2018; Albrecht et al. 2022), so sites treated under RSA-criteria were not assessed.
2. Naïve before-after analyses were used which do not address major confounds in crash analyses (Persaud et al., 2010; Cairney et al., 2012).

Aims: to include the RSA criteria in an evaluation of the Black Spot Program and compare the two methods of selecting projects for Black Spot Program (i.e., RSA vs BCR) in order to determine whether one method is more effective at preventing crashes and more economically favourable. In addition, where data were available, to use best-practice full Bayes analyses to improve on previous analyses.

Methods

Sites

There were 1,128 treated sites under the Black Spot Program between 2005-2020 and 4,923 control sites included in the analysis. The breakdown of sites by treatment criteria and region was:

- 144 RSA and 80 BCR rural intersections
- 89 RSA and 488 BCR metropolitan intersection
- 104 RSA (745 km) and 140 BCR rural midblocks (891 km)
- 17 RSA (38 km) and 66 BCR metropolitan midblocks (153 km)

For the full Bayes analysis, a subset of projects between 2013 and 2020 were included due to data limitations, primarily traffic volume availability. This sub-analysis consisted of 137 treated sites (69 intersection) and 1127 control sites (1013 intersection). Treatments were varied and included roundabout installations, traffic signal installations/modifications, new shared paths and pedestrian crossings, delineation improvements, shoulder treatments, etc.

Crash Data

Crash data were extracted from the Integrated Road Information System (IRIS), maintained by Main Roads. Crashes that occurred during the construction period were excluded. The earliest date of crash inclusion was 1.1.2009 and the latest date was 31.12.2022 (latest available crash data in IRIS). Crash severity is recorded in the IRIS data and is coded based on the "most serious injury in a crash", including crashes involving a fatality (level 1), requiring hospitalisation but no fatality within 30 days (level 2) or medical treatment not requiring admission to hospital (level 3), and two-levels of property damage only crashes based on cost (level 4 or level 5).

Three primary groupings of severity were used:

- Killed or seriously injured crashes (KSI – level 1 or 2 crashes)
- Casualty crashes (level 1, 2, or 3 crashes)
- All crashes (level 1, 2, 3, 4, or 5 crashes)

Analysis

The overall analysis used negative binomial generalized linear mixed-effects regression. The full Bayes analyses used a Poisson-lognormal model (Persaud et al. 2010; Park et al. 2010). Both accounted for yearly-trends (modelled as non-linear cubic splines). The overall analysis accounted for the interaction between intervention time (before to after intervention) and treatment criteria (RSA, BCR, and control). The coefficient for the interaction exponentiated to derive the crash reduction factor (CRF). Length was included as an offset variable for midblock sites. The full Bayes analysis further included traffic volumes (the intersection analysis included primary and secondary road volumes), speed limit, and single/dual carriageway status for both midblocks and intersections. The intersection analysis additionally included number of intersection legs, roundabout presence, and traffic signal presence. The full Bayes analysis then summed the post-treatment crashes and divided that by the expected number of crashes in the post-treatment period had no treatment occurred to derive a crash reduction factor (CRF). Finally, economic analyses were conducted for the Programs using the estimated crash reductions compared to baseline periods and using willingness-to-pay estimates for each crash severity to inform savings.

Results

Overall before-after analysis

The overall analysis found:

- Projects treated under the BCR- and RSA-based criteria were associated with crash rate reductions, with a global reduction of ~17% for all crashes, ~23% for casualty crashes, and 27% for killed or seriously injured (KSI) crashes.
- BCR-based sites were associated with greater all crash reductions than RSA-based sites at both metropolitan (11.1%) and rural (20.4%) intersections, and rural midblocks (26.9%)
- Despite smaller safety effects of the RSA-based Program, there was still an overall benefit to road safety
- The lower crash base-rate for the RSA-based Program resulted in lower cost-effectiveness compared to the BCR-based Program, the corresponding benefit cost ratios for each program were: BCR-based = 0.9 and RSA-based = 2.7

Full Bayes before-after analysis

Table 1 presents the CRFs for crashes of all severities and all road user movements. Consistent with the overall analysis, midblock sites found crash reductions for BCR-based rural and RSA-based metropolitan and rural sites. For intersection sites, all crashes were reduced across all Programs and regions. In this analysis, there was no superiority of the BCR-criteria.

Table 2. CRFs from the full Bayes analysis for crashes of all severities and road user movements

	Midblock All Crashes			Intersection All Crashes		
	CRF	95% CI		CRF	95% CI	
Overall	0.12	0.04	0.18	0.22	0.18	0.25
BCR	0.07	-0.02	0.16	0.21	0.17	0.24
RSA	0.22	0.14	0.30	0.24	0.18	0.29
Rural	0.22	0.13	0.29	0.22	0.09	0.32
Metro	0.06	-0.03	0.15	0.22	0.18	0.25
Rural BCR	0.21	0.10	0.30	0.21	0.03	0.35
Rural RSA	0.23	0.10	0.34	0.23	0.03	0.37
Metro BCR	0.01	-0.11	0.12	0.21	0.17	0.24
Metro RSA	0.21	0.11	0.29	0.24	0.17	0.30

Conclusions

The State Black Spot Program was associated with consistent reductions in crash rates across rural and metropolitan jurisdictions and resulted in positive economic outcomes for Western Australia. Sites treated under the RSA-based criteria were often only modestly less effective than sites treated under the BCR-based criteria in the overall analysis, likely due to the lower base crash rates. Interestingly, the full Bayes analysis suggests no inferiority of the RSA-criteria to the BCR-criteria. Although selection factors may play a role. With this success, it will be important that the WA program be continued and extended to hazardous locations not yet treated by the appropriate countermeasures.

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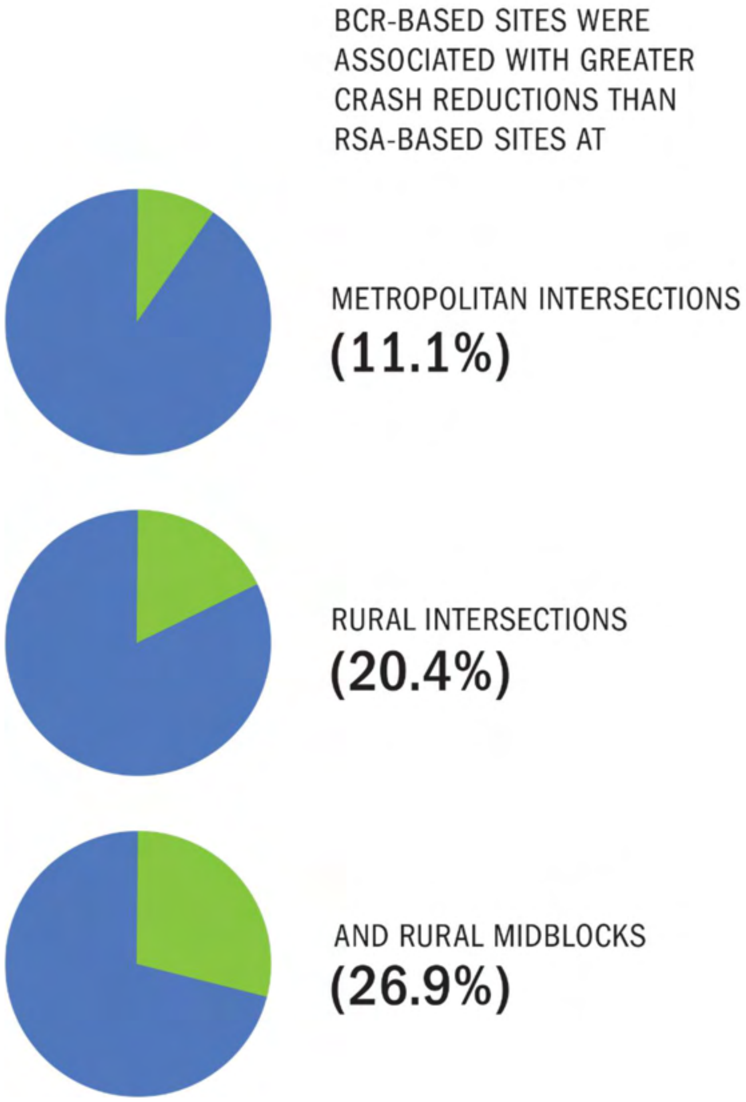
BCR-BASED SITES WERE
ASSOCIATED WITH GREATER
CRASH REDUCTIONS THAN
RSA-BASED SITES AT
METROPOLITAN INTERSECTIONS
(11.1%)
RURAL INTERSECTIONS
(20.4%)
AND RURAL MIDBLOCKS
(26.9%)

Uncovering the urgency for heightened drug testing

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Abstract

Drivers involved in traffic crashes are typically tested less for drugs than for alcohol. Estimates of the prevalence of various drug types present in traffic crashes are therefore based on incomplete data. To address this issue, a study involving the comprehensive reanalysis of blood samples collected from drivers hospitalised post traffic crashes was conducted in 2021. The toxicological results demonstrated that 47% of blood samples contained at least one drug of interest, and combinations of up to five drugs of interest were found in 18% of the samples. These results suggest that drug use among drivers involved in traffic crashes is prevalent, and this use consists of many drug types. Additionally, drugs of interest were detected in 39% of the blood samples that had previously only been tested for alcohol. This finding indicates that analysis for drugs other than alcohol could be relevant for all drivers involved in severe traffic crashes.

Background

The presence of drugs (other than alcohol) in crashes has increased significantly in New Zealand, with drug-positive traffic crash fatalities rising from 5% in 2014 to 21% in 2017 (van Lamoen, 2019). However, less than half of drivers involved in crashes resulting in hospitalization are tested for drugs. Moreover, when drug testing is requested, the drug panel is not sufficiently sensitive to detect certain drug types, such as GHB/GBL.

Method

In 2021 retesting was performed on all available blood samples collected from hospitalised drivers involved in crashes that occurred between October 2019 - January 2020. The retested blood samples were previously tested for alcohol only or for alcohol and a limited number of drugs. An extended drugs panel, able to detect a wider range of drugs, was used for retesting to show whether other drugs of interest are missed by the routine drug testing panel. ESR undertook the toxicological reanalysis.

Results

Alcohol was the single most detected substance, with 38% of the samples testing positive for alcohol above the legal limit. However, the presence of drugs surpassed the prevalence of alcohol, with 47% of blood samples containing at least one drug of interest. The results of the retested blood samples by drug type are presented in Table 1. Polysubstance use was detected in almost one third of the samples (32%), with the most detected two-substance combination being alcohol and THC (12%).

Testing for drugs in samples previously tested for alcohol-only, showed that 39% also contained at least one drug of interest and 12% contained at least one drug of interest in the absence of alcohol above the legal limits. The use of an extended drug panel detected few additional drugs.

To assess whether testing positive for a drug was associated with previous offending, crash records were matched to police-recorded offence data. A binary logistic regression was used to check whether a previous drug offence was associated with the odds of testing positive for a drug. After controlling for gender, age, crash time, and passenger count, the model showed that drivers with a prior drink/drug driving offence (OR = 1.606, 95% CI [1.045, 2.469], p=.031) and non-traffic drug offence (OR = 4.721, 95% CI [2.783, 8.011], p<.001) were more likely to test positive for a drug when involved in a crash. Additionally, drivers aged <35 were more likely (OR = 1.722, 95% CI [1.164, 2.548], p=.007) to test positive for a drug when involved in a crash.

Table 1. Full toxicology results from all retested blood samples taken post-crash 1 October 2019 to 31 January 2020 (number of drivers)

Substance	Previous analysis alcohol only (n = 320)	Previous analysis drugs and alcohol (n = 230)	Total drivers (N = 550)
Alcohol	**197 (61%)**	**23 (19%)**	**220 (40%)**
Alcohol only	88 (28%)	4 (3%)	92 (17%)
BAC above infringement[1]	192 (60%)	15 (7%)	207 (38%)
BAC > 80mg/mL	174 (55%)	7 (3%)	181 (33%)
Drugs			
Drugs of interest (DOI)[2]	124 (39%)	137 (59%)	261 (47%)
DOI and alcohol	86 (27%)	9 (7%)	95 (17%)
DOI without alcohol	38 (12%)	128 (53%)	166 (30%)
THC	**77 (24%)**	**86 (38%)**	**163 (30%)**
Stimulants	**40 (13%)**	**64 (28%)**	**104 (19%)**
Methamphetamine	25 (8%)	58 (25%)	83 (15%)
MDMA	11 (3%)	9 (4%)	20 (4%)
Cocaine metabolite	4 (1%)	1 (<1%)	5 (1%)
Phentermine	2 (<1%)	2 (<1%)	4 (<1%)
Opioids	**29 (9%)**	**31 (14%)**	**60 (11%)**
Tramadol	15 (5%)	13 (6%)	28 (5%)
Codeine	11(3%)	14 (6%)	25 (5%)
Methadone	2 (1%)	4 (2%)	6 (1%)
Sedatives	**17 (5%)**	**26 (11%)**	**43 (8%)**
Benzodiazepine	17 (5%)	24 (10%)	41 (7%)
Zopiclone	0	5 (2%)	5 (1%)
Other known drugs of abuse			
Synthetic cannabinoids	1 (<1%)	0	1 (<1%)
GHB/GBL	0	5 (2%)	5 (<1%)
LSD	0	1 (<1%)	1(<1%)
Dextromethorphan	0	1 (<1%)	1(<1%)
Ephylone	1 (<1%)	0	1 (<1%)
Modafinil	1 (<1%)	0	1 (<1%)
Prescription medicines only[3]	37 (12%)	17 (7%)	54 (10%)
No substance detected[4]	59 (18%)	69 (30%)	128 (23%)

Note. Numbers and percentages between drugs and categories cannot be added up as a driver can test positive for multiple substances. [1]Different limits apply based on driver age. [2]Drugs of interest include Misuse of Drugs Act drugs (Class A-C Part 1 and Class B Part 2 & 3) and additional known drugs of abuse. [3]Drivers detected with no scheduled drug or known drug of abuse. [4]No drugs or alcohol detected

Conclusion

These findings are expected to improve the understanding of the presence of various drugs in traffic crashes in New Zealand. By providing more accurate estimates of the prevalence and types of drugs present in the blood of drivers involved in crashes, decision makers will be better equipped to develop, test, and implement effective strategies in relation to drug-involved driving. The findings also have implications for law enforcement, prosecution practices, and prevention-based initiatives. Given the high prevalence of drugs among the samples initially not tested for drugs, it should be considered to standardise drug testing for all blood specimens taken post traffic crashes.

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Perceived unfairness in drug driving laws by medicinal cannabis users

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Abstract

Over the past four years, access to medicinal cannabis in Australia has been growing rapidly. To investigate cannabis usage patterns, driving behaviors, and interactions with police regarding drug driving laws, this study interviewed 59 Medicinal Cannabis Users (MCUs) from Queensland, Australia. The interview data was analyzed based on the four elements of procedural justice, including voice, neutrality, respect, and trust. The participants reported feeling unfairly treated and overlooked by current drug-driving legislation. They also expressed a lack of opportunity to voice their objections and challenge any drug driving charges, given their legal access to the drug and perceived lack of impairment when pulled over by the police. This study highlights the potential implications for future iterations of drug-driving legislation, particularly for the rapidly increasing population that is using cannabis as a prescribed medication.

Background

The number of people being prescribed medicinal cannabis has risen exponentially in Australia (the country where this study was conducted). Specifically, it has been found that since 2018, the number of Australians that are accessing medicinal cannabis has increased by 7,169% (Hallinan et al., 2021). As of March 2021, over 100,000 individuals were granted approval from the Therapeutic Goods Administration (TGA) under the Special Access Scheme Category B to use cannabis for various medical reasons including mental health and chronic pain management (Arkell et al., 2021).

Procedural justice theory stipulates that a perceived fair legal process builds a high perception of the legitimacy in the law, which leads to more compliant behaviours from members of the public (Barkworth & Murphy, 2015; Bradford et al., 2015; Dai et al., 2011; Murphy & Tyler, 2008). Within procedural justice, there are four elements; voice, neutrality, respect, and trustworthiness (Bates et al., 2020; Goodman-Delahunty, 2010; Sargeant et al., 2012). This study heard the experiences of MCUs and examined them in alignment with the four pillars of procedural justice to understand the continued drug driving offending from MCUs.

Method

Eligible participants had to be residents of Queensland, Australia, with a valid prescription and the ability to obtain medicinal cannabis. The age range of participants was 19 to 73 years old (M = 42.46, SD = 14.02). A majority of the participants were male (n = 41, 69.5%). Throughout 2021, a total of 59 semi-structured interviews were carried out within a span of six months. These interviews aimed to delve into the participants' perceptions and experiences related to the usage of medicinal and illegal cannabis, as well as their present driving behavior, awareness and understanding of existing drug driving regulations, and any encounters with law enforcement pertaining to drug driving issues.

Results

Neutrality	Voice
• MCUs believed they were being targeted for their cannabis use, regardless of their legal access to the drug. • MCUs discussed the disparity between using prescription cannabis and other prescription drugs. Only cannabis is tested for roadside, as opposed to including other impairing drugs.	• MCUs discussed how the justice system did not allow their medical access to cannabis to be heard as a mitigating factor. • MCUs felt powerless to explain their situation and their legal access and use of the drug.
Respect	**Trust**
• While MCUs explained they felt they were being treated like criminals for their cannabis use, regardless of the prescription.	• Due to the lack of a need to prove impairment, there is a deep distrust of the justice system and the drug driving laws by MCUs. • The disregard for other impairing prescription drugs makes some MCUs perceive the enforcement as targeting cannabis users as opposed to drug or impaired drivers.

Conclusion

This study sheds light on how medical cannabis users' perceived inequity in the drug driving laws using the procedural justice framework. The results suggest this may be contributing to frequent offending and reoffending, as MCUs continue to operate vehicles with cannabis in their system to maintain their independence and employment. The study highlights that the perceived unfairness in the current drug driving legislation may be contributing to a willingness to reoffend and this needs to be considered as we move forward with drug driving enforcement on Australian roads.

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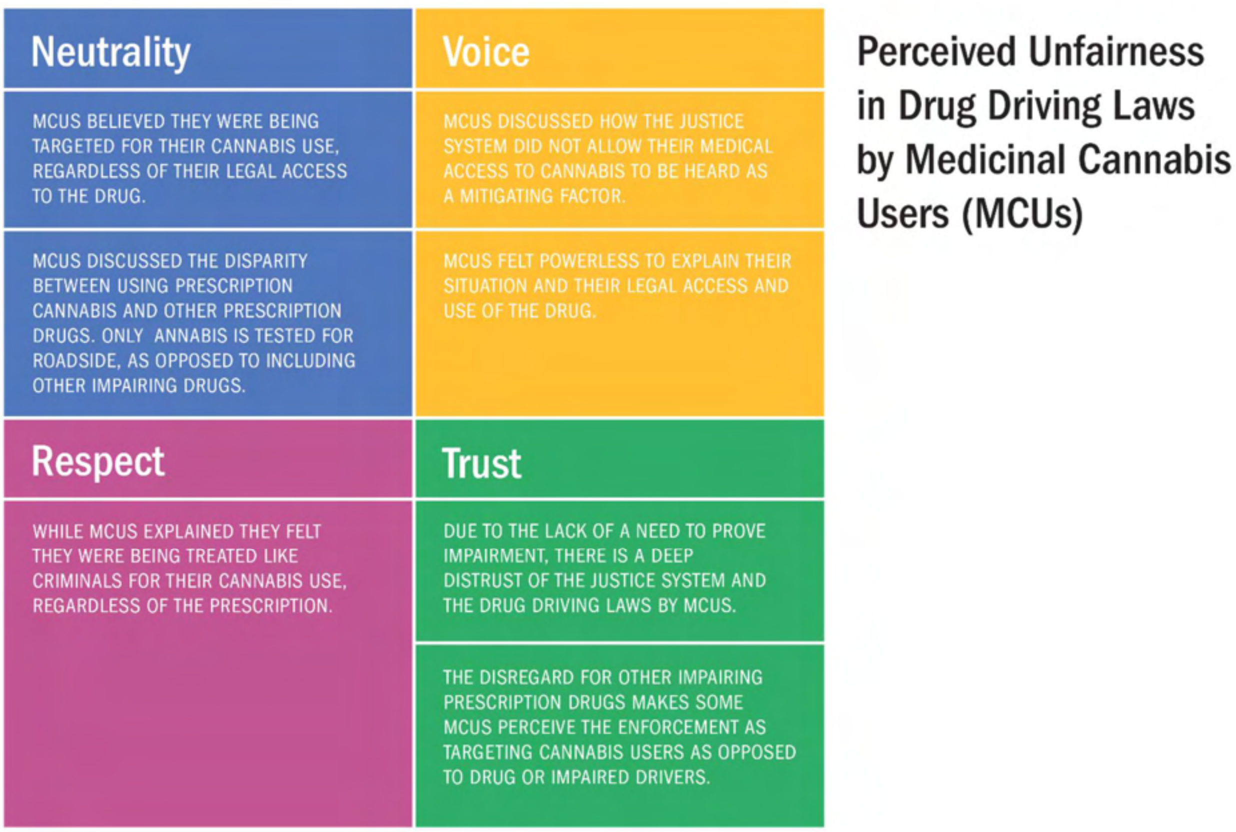

Situational Action Theory and high-risk offending on the beach

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Abstract

Previous research conducted by the MAIC/UniSc Road Safety Research Collaboration in partnership with the Queensland Police Service identified high rates of dangerous driving and offending behaviours on non-typical roads, specifically: beach recreation areas. This study employs a qualitative approach by surveying drivers on the beach to determine factors that contribute to their willingness to offend on the beach. The purpose of this research project is to investigate the attitudes and beliefs of beach drivers that may be contributing to high levels of offending behaviours. Specifically, we are looking at how these drivers differentiate beach and road offending, how risk is perceived surrounding these behaviours, and what factors might increase offending behaviours.

Background

Situational Action Theory (SAT) explains crime as a result of a perception-choice process that is moderated by moral and situational factors (Pauwels et al., 2018). SAT provides a theoretical framework that to date, has been largely overlooked within road safety research. Building upon the typical use of Deterrence Theory for understanding traffic offending, SAT considers personal and situational factors such as peers and the environment as key determinants of offending. In recent research and a report from CARRS-Q for the ACT government, SAT was applied to understand speeding (Rose, 2022; Rose et al., 2022). The report found that personal factors such as individual morals moderate the countermeasures achieved through traditional Deterrence Theory. Apart from the use of SAT in the context of speeding by CARRS-Q, there appears to be no other research that applies the theory within the domain of road safety. Specifically, SAT has never been applied to a unique sub-group of road users that demonstrate a high rate of situational offending. SAT is an appropriate framework due to the nature of the offending with most offenders reporting they would not commit similar offending on the roads. Consequently, the social, situational, or moral factors that contribute to the offending require examination.

Method

This study surveys drivers on Queensland beaches. The surveys are designed to examine the personal (such as morals) and situational factors of beach drivers and how these factors contribute to offending, moderated by deterrence theory. The survey is designed to contrast how drivers perceive two situations, namely, driving on the beach and driving on the roads.
This study aims to address the following research questions:

1. Is there a specific demographic that traverses the beach compared to roads?
2. Is there a difference in perceptions of risk for offending on the beach compared to on the road?
3. To what extent does SAT explain situational offending in the context of road safety?
4. Are there situational factors that influence high-risk driving behaviour on the beach?

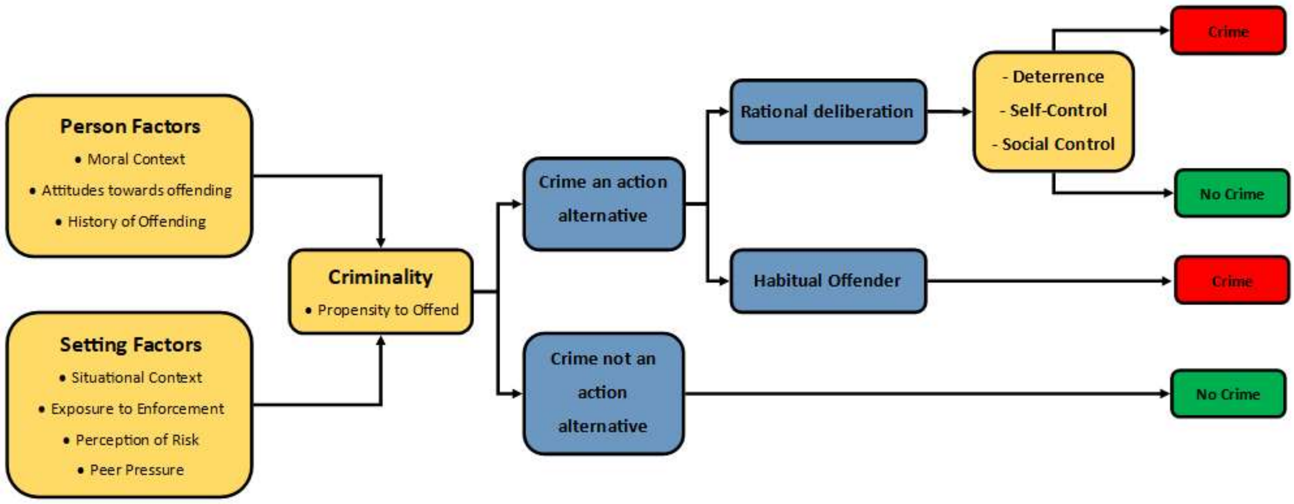

Figure 1. Logic Model for SAT and Beach Offending

Results

This research explored risky driving behaviours and attitudes among various demographic groups and in different contexts, guided by the SAT framework. Independent t-tests showed no significant gender difference in speeding, attitudes towards offending, and drug driving, but males were significantly more likely to engage in drink-driving. No significant differences were found between younger (17-25 years) and older (>25 years) drivers, although some trends suggested further exploration with larger sample sizes may reveal significant relationships. In contrasting driving behaviours on the beach versus the road, paired sample t-tests showed participants were more likely to engage in drink and drug-driving, and had poorer attitudes towards traffic laws on the beach. However, they reported a lower tendency to speed and perceived a lower risk of injury there. Factors most likely to prompt risky behaviours to occur were a low chance of social judgement and a low chance of apprehension, with speeding being the most readily engaged in behaviour examined.

Conclusion

This study has demonstrated that there are environmental factors, social factors and personal factors that contribute to the decision to offend on our beaches. While the cohort of drivers on the beach skew younger, and this is represented in the sample, there was no significant differences within the ages. Furthermore, the study demonstrated that beach drivers were more willing to commit impaired driving offences on the beach compared with the road environment. Finally, this study has demonstrated that by using a SAT framework and considering the environment, social and personal factors, we can better understand the motivating factors that are likely to be key in deploying targeted countermeasures to ensure road safety on our beaches.

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The impact of police uniforms on intentions to offend

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Abstract

This study aimed to determine if young people's views of police legitimacy and intentions to offend on the road are affected by the delivery of a police-led road safety program by uniformed police officers (control) compared with plain-clothes police officers (experimental). Participants in this study were grade 12 students from private (fee-paying) high schools located in Queensland, Australia. The study used a randomised field experiment, whereby schools were randomly assigned to one of two conditions: the road safety program was delivered by uniformed police officers or the same officers in plain-clothes. The study findings indicate that young drivers who received the road safety program from uniformed police officers reported significantly lower intentions to offend on the road compared to those in the experimental condition. Additionally, young people's perceptions of police legitimacy were positively affected to a greater extent when the program was delivered by uniformed officers rather than plain-clothed officers.

Background

While there is yet to be any research that has examined the impact on uniforms on the effectiveness of road safety education presentations, the role of uniforms worn by police is an aspect considered in research that has examined views of police legitimacy (Jenkins et al., 2021; Simpson, 2017). Sunshine and Tyler (2003) defined legitimacy as "a property of an authority that leads people to feel that the authority or institution is entitled to be deferred to and obeyed". Police officers in uniform are generally perceived as more legitimate than those in plain clothes as uniforms serve as a visible symbol of legal power and authority (Bell, 1982; Johnson et al., 2015). Simpson (2017) found that police were viewed more favourably by members of the public when presented in a fully operational police uniform, as opposed to wearing civilian clothing (such as the attire a detective would wear. Building upon the research by Simpson (2017) this study sought to field test previous findings and determine if, along with changes in views of police legitimacy, the uniformed police officers would have a greater impact on the intentions of young drivers to offend in the future. From a pre-post perspective on the program, earlier research involving the same road safety program found that it was effective at significantly lowering intentions to offend, especially for young males, compared to their baseline scores obtained before the program (Anderson et al., 2020).

Method

In this study, a randomized field experiment was conducted to examine whether the method of delivery of a driver education program, by uniformed or plain-clothed officers, influenced the reported intentions to offend on the road among young drivers. A survey was administered to a group of high school students (across 6 schools in total; 2 of the schools received the program from plain clothes officers) who were participating in a police road safety program. The survey included a series of questions intended to evaluate the views of police legitimacy, as well as their future driving intentions.

Results

Our study found that for both future intentions to offend (see Table 1) and views of police legitimacy (see Table 2), the participants that received the program from uniformed police reported more positive results. Between the plain clothes and uniformed conditions, there was a statistical difference in the mean scores of their intentions to commit fixed traffic offences, their intentions to commit transient traffic offences, and views of police legitimacy. It should be noted that while the research is scarce on the translation of intentions into behaviour, especially within road safety, there is research available with young people that indicates intentions can play a significant role in engagement in behaviour (Norman et al., 2019).

Table 1 - Independent T-Tests examining future offending intentions across the conditions.

	Items		n	M (SD)	Cronbach Alpha	t	df	p	d
Fixed Offending	8	Uniformed	150	1.14 (0.37)	0.950	-1.945	228	.026**	-.269
		Plain clothes	80	1.25 (0.41)					
Transient Offending[1]	15	Uniformed	151	1.04 (0.25)	0.955	-1.805	121.65	.037**	-.277
		Plain clothes	80	1.12 (0.36)					

[1] *Equal Variance not assumed*

Table 2 – Independent t-tests examining police legitimacy across the conditions.

	Items		n	M (SD)	Cronbach Alpha	t	df	p	d
Police Legitimacy	19	Uniformed	175	4.51 (0.56)	0.951	2.274	261	.012**	0.30
		Plain clothes	88	4.34 (0.55)					

Conclusions

The findings of this study indicate that the delivery of an educational program by uniformed police officers can decrease intentions to offend and enhance perceptions of police legitimacy which could have an impact on the safety of young people on the road. Furthermore, the results suggest that police attire can significantly influence participants' views of police legitimacy and thus their willingness to participate in future offending.

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Estimation of potential road safety benefits of Highway Drive Pilot

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Abstract

A prototype simulation model was developed to estimate future reductions in fatal and serious injuries (FSI) on Victorian roads to 2050 from the adoption of a SAE Level 3 (Society of Automotive Engineers [SAE], 2021) automated vehicle (AV) technology, Highway Drive Pilot (HDP), which automates car following and lane-keeping. The introduction of HDP using a sample take-up curve and projected fleet size was modelled**.** The Operational Design Domain (ODD) (SAE, 2021) of HDP and addressable crash types were synthesized from publicly-available data from vehicle manufacturers. The relevant pool of FSI was extracted from police-reported crash data for 2017-2019. Using the sample scenario, the effectiveness of HDP was estimated to be 78.3% (95% C.I. 74.0-82.6%) and the model predicted savings of 47 FSI (95% C.I. 44-49) annually by 2050. Future research will involve model refinement and the inclusion of higher-level AV technologies to estimate the road safety benefits for Victoria under a range of future scenarios.

Background

Over the past five years, an average of 236 people were killed on Victorian roads annually, demonstrating the significant work still to be done to achieve the goal of Vision Zero (Victorian Department of Transport, 2020). Some authors have speculated that a future transportation system comprising a large proportion of AVs (Litman, 2023; ABI research, 2018) may have promising benefits in reducing road crashes (LaFrance, 2015; Sinha et al.,2020; Plumer, 2014). These assertions are based on the claim that human error contributes to a high proportion of road crashes, albeit in the context of its role in the broader system (Mackie et al., 2017; Fitzharris et al., 2022), many of which may be eliminated as AVs permeate into the fleet. To date there has been little evidence-based research quantifying the technology-specific safety benefits, taking into account technology effectiveness and potential take-up rates. This research aims to utilise a simulation model to estimate future reductions in FSI through the adoption of HDP (Li and Liu, 2023) in light passenger and light commercial vehicles.

Method

The prototype model was built using the software package *Analytica* for the period 2018 to 2050, and includes two sub-modules: (a) a fleet propagation module to model the penetration of HDP into the light vehicle fleet at various levels and rates of technology take-up and (b) a module to project FSI reductions.

Module (a) projects total light vehicle numbers and the proportion fitted with HDP, assuming an S-curve (Litman, 2021 and Lavasani, Jin & Du, 2016) from 2% of total sales in 2026 to 97% by 2037. Module (b) incorporates an estimation of effectiveness of HDP in crash prevention and identification of the applicable FSI pool from Victorian police-reported crash data for 2017-2019. The relevant ODD was synthesised using a composite of publicly-available data from vehicle manufacturers, allowing 295 FSI to be extracted from the crash data collected. Assuming a mix of HDP-equipped and conventional vehicles, the effectiveness of each of the 11 crash types addressable by HDP was estimated based on (i) the vehicle path and the possibility of the crash being prevented and (ii) HDP market penetration by year, which were combined to yield an overall effectiveness of HDP of 78.3% (95% C.I. 74.0-82.6%).

Results

The model estimated that 47 FSI (95% C.I. 44-49) would be prevented annually by 2050 (Figure 1) with a cumulative 496 FSI (95% C.I. 468-523) prevented over the simulation period (2018-2050).

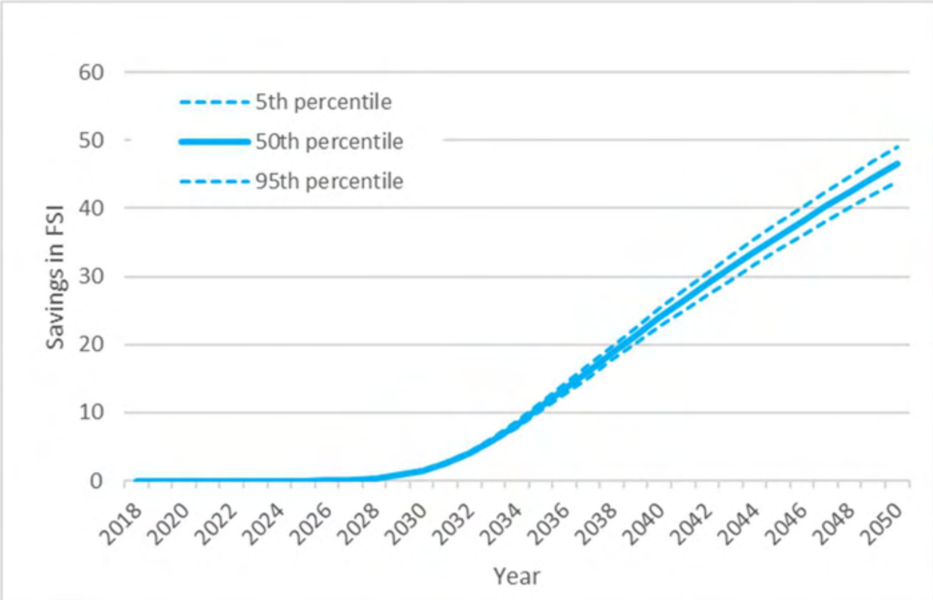

Figure 1. Estimated savings in FSI 2018-2050

Discussion/conclusion

The results provide an indication of the safety benefits potentially achievable by HDP, subject to the simplifying assumptions of this prototype model. The model does not account for the uncertainties regarding AV real-world capabilities, technology limitations and the potential negative consequences relating to human factors, interactions with conventional vehicles, etc. The model is intended to provide a framework to allow the updating of estimates as information becomes available. Future work will involve model refinement, validation and further application to estimate the safety effectiveness of other Level 3 and higher-level technologies in Victoria under a range of future scenarios.

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Road sign classification using deep learning

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Abstract

Road sign classification is essential for safety, especially with the development of autonomous vehicles and automated road asset management. Road sign classification is challenging because of several factors, including lighting, weather conditions, motion blur and car vibration. In this study, we developed an ensemble of fine-tuned pre-trained CCN networks. We used the German Traffic Sign Recognition Benchmark (GTSRB) to train and test the proposed ensemble. The proposed ensemble yielded a preliminary testing accuracy of 96.8%. Consequently, we customized the architecture of the worst-performing network in the ensemble, which boosted the accuracy to 99%.

Background

Road sign classification is a challenging task with many practical applications. Efficient classifiers can be run on dash cameras or Mobile apps to enhance driving safety by alerting drivers to important signs such as stop signs and speed limit signs, reducing the risk of accidents. Moreover, it can be used with Geo-tagged images in automated road assets management to detect damaged or fainted signs. Autonomous vehicles also need a traffic sign classification system that ensures accurate and fast sign classification.

Road Sign Classification

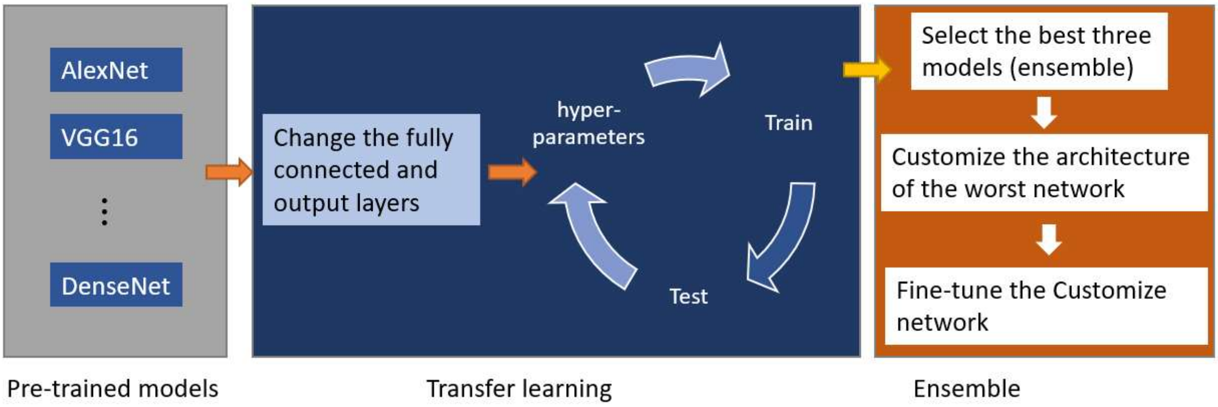

Figure 1. Illustration of our proposed approach to building an ensemble of road sign classifiers

Method

In this study, we followed a greedy approach to build our ensemble, as shown in Figure 1. We started by selecting a group of pre-trained networks, including AlexNet (Krizheysky et al., 2012), VGG16 (Simonyan & Zisserman, 2014), and DensNet (Huang et al., 2017), which are relatively small networks. Consequently, we used transfer learning and grid search to fine-tune the pre-trained models using the German Traffic Sign Recognition Benchmark (GTSRB) dataset. Therefore, the best three fine-tuned models were chosen to form the ensemble. Finally, we customized the VGG16 network architecture and refine-tuned it.

Results

Table 1 shows the top three fine-tuned pre-trained models' accuracies, ensemble accuracies.

Table 1. The top fine-tunned pre-trained networks (before customization)

Model	**Accuracy**
VGG16	68.0%
DenseNet	95.4%
AlexNet	96.0%
Ensemble **(Soft Voting)**	96.8%
Ensemble **(Hard Voting)**	96.1%

As shown in the above table, the highest accuracy of the ensemble is 96.8%; however, when we customized the VGG16 network, the ensemble accuracy reached 99.0%

Conclusion

This study proposed a greedy approach to form a traffic sign classification ensemble of customized and fine-tuned pre-trained networks. The test accuracy shows a promising result. Our next steps in this study will include using the ensemble and the sliding window technique to classify signs in outdoor images. Moreover, we will compare the results in terms of accuracy and efficiency with YOLOv5 (Jocher, 2022) and YOLOv8 (Jocher et al., 2023).

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Review of the fatality risk curve for head-on car-to-car crashes

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Abstract

Cross over head-on crashes are one of the most dangerous crash modes. These crashes typically occur on roads without median road safety barriers, and higher speeds can exacerbate the chance of fatal injury. The widely cited Wramborg risk curve for a head-on collision estimates a 10 percent probability of a fatality at an impact speed of 70 km/h, and this figure is used by most developed nations to set safe speed limits on roads with no median barriers. However, Wramborg does not provide any evidentiary basis to this value. A literature review has identified a wide variation in the impact speed for a 10 percent probability of a fatal head-on crash, ranging from 50 km/h to 69 km/h. Consequently, given the large speed variation from prior studies, it was decided to carry out a systematic review using quantitative studies based on real world crashes, and report on that study here.

Background

The impact of speed on crash outcomes has been well-established as a significant contributing factor to road casualties. Reducing serious injuries and fatalities resulting from road crashes has been a global priority, and one strategy is the setting of safe speed limits. Head-on crashes are commonly reported on road networks where median road safety barriers have not been installed. Modern five-star safety rated cars and sports utility vehicles (SUVs) have been designed for survivability for an impact into an offset deformable fixed barrier at 64 km/h, which simulates an equivalent head-on 50 percent off set impact between two cars of equivalent mass at that speed (Euro NCAP). Wramborg (2005) proposed adopting an impact speed of 70 km/h for head-on crashes where the risk of a fatal outcome is 10 percent as shown in Figure 1. However, no evidentiary basis for this risk curve was provided, as well as for other fatality curves provided by Wramborg: e.g pedestrian and side impact curves.

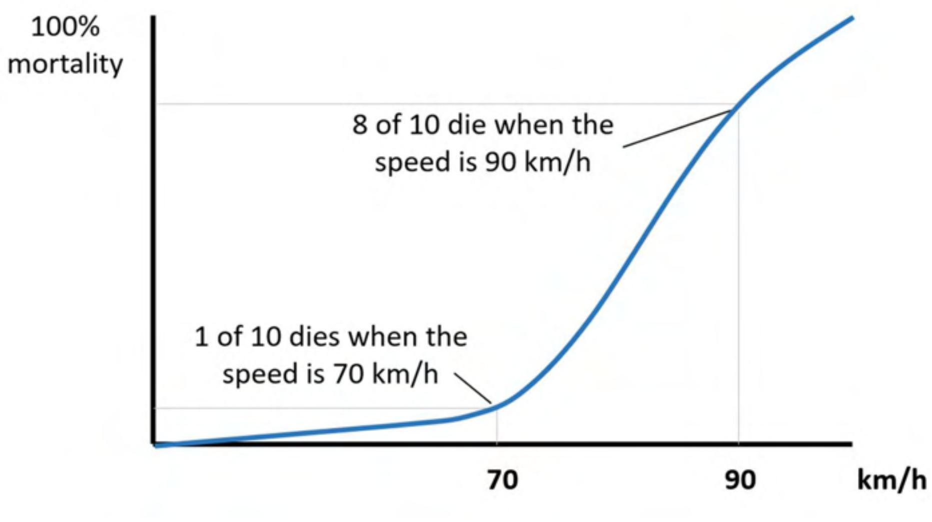

Figure 1: Probability of a car driver or passenger fatality in a head-on collision (Wramborg, 2005)

Previous studies have been conducted attempting to establish a fatality risk versus impact speed curve for cars/SUVs involved in head-on collisions (Doecke et al., 2020; Jurewicz et al., 2016). In a previous study by two of the authors, a fatality risk versus impact speed curve was determined for car/SUV into pedestrian impacts (Hussain et al., 2019) on the basis of a systematic review of the evidentiary data available. Four electronic databases (MEDLINE, EMBASE, COMPENDEX, and SCOPUS) were searched to identify relevant studies. Records were assessed, and data retrieved independently by two authors in adherence with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher et al., 2009). Therefore, the purpose of this paper is to repeat such a systematic review albeit specifically for car/SUV head-on crashes in order to establish an evidentiary based fatality risk versus impact speed curve that could be generally considered when setting safe speed limits on roads without a median safety barrier.

Method

The PRISMA guideline will be used for the study. Relevant head-on crash data published will be synthesised into a meta-analysis to determine the probability of a fatal outcome versus impact speed. Full text studies will be included if they report the results of a logistic regression of head-on crash fatality (including non-fatal injuries) and the impact speed of motor vehicles. Studies which do not provide logistic regression results but provide sufficient summary statistics will also be included. Meta-regression models will be developed from the data and a final model will be identified, and funnel plot methods will be used to assess potential publication bias.

Results and Conclusions

From the literature and logistic regression model, the risk of a head-on fatality that will reach 5 percent, 10 percent, 50 percent, 75 percent and 90 percent for a particular impact speed at these percentage values will be determined and a risk curve similar to the Wramborg curve shown in Figure 1 will be generated for each study identified as well as a summary risk curve.

Previous studies primarily used logistic regression models to estimate the relationship between speed and probability of injury, and all of the studies used data from developed countries, mainly from the United States (NASS-CDS). The speed parameters and injury/fatality codes used in previous studies are varied, including Delta V and impact speed for speed parameters; and coded using AIS (Abbreviated Injury Scale). Delta V is the total change in vehicle velocity over the duration of the crash event while impact speed is the speed at which vehicle collides with another object. MAIS (Maximum Abbreviated Injury Scale) and ISS (Injury Severity Score) are derived from AIS and may also be reported. Regardless, the authors are not aware of any systematic review to date of all available evidentiary crash data synthesised to determine a fatality risk versus impact speed curve for a head-on crash.

Based on literature, Funk et al. (2008) determined that 10 percent risk of fatality occurred at 61 km/h whereas Wood et al. (2007) established an impact speed of 67 km/h for the same risk. On the other hand, Buzeman et al. (1998) determine an impact speed of 69 km/h for a 10 percent risk of fatality. Using logistic regression model based on raw data from the articles, it was found that 10 percent risk of fatality for head-on crashes occurred at 62 km/h based on data from Evans (1993), 54 km/h based on Grime (1997), and 50 km/h from Richards and Cuerden (2009). Specifically for head-on crashes, Delta V can be used as a proxy for impact speed into another object. Hence, for a 10 percent risk of a head-on fatality the impact speed range is from 50 to 69 km/h while Wramborg suggested 70 km/h. Therefore, further research needs to be carried out to establish the more accurate value for it.

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The NSW Mandatory Alcohol Interlock Program – enablers and barriers to participation

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Transport for NSW

Abstract

The first comprehensive outcome evaluation of the NSW Mandatory Alcohol Interlock Program (MAIP), introduced in 2015 found the program was effective in reducing further drink driving offending among high range and repeat drink drive offenders, at least while the interlock device was installed (Rahman, 2022a). Modest reductions in drink driving offending remained, following removal of the interlock. Despite these overall positive findings, a number of barriers persist which make it challenging for many drink driving offenders to participate in and complete the program. This paper draws upon additional findings from the evaluation, and qualitative and program data, to further explore some of the key enablers and barriers to participation. Findings will identify areas where there is opportunity to improve participation in the program, and enhance its effectiveness in reducing drink driving on NSW roads, helping to create a safer road environment for all.

Background

Alcohol interlocks have increasingly been introduced, both internationally and in Australia, 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 in the vehicle, but there is less evidence of their longer-term effectiveness, once the device is removed (Blais et al., 2013). Low participation rates in interlock programs are also not uncommon (Rahman, 2022a).

Program purpose

The Mandatory Alcohol Interlock Program (MAIP) was first introduced in NSW in February 2015. It operates as a mandatory program, in that it is a mandatory court-ordered penalty for drivers convicted of high range (BAC >= 0.15) or repeat drink driving offences. Once issued with a mandatory alcohol interlock order, drink drivers must serve a set disqualification period, and then can either elect to have the interlock device fitted to their vehicle (at a cost), or alternatively they may elect to remain disqualified from driving for 5 years. MAIP was subsequently extended to include first time mid-range (BAC >=0.08 and < .015) drink driving offences in 2018 and combined drink and drug driving offences in 2021. The program aims to reduce drink driving reoffending and alcohol related road trauma.

Program evaluation

A recent evaluation of the NSW program found it was effective in reducing drink driving offending among high range and repeat drink drive offenders while the interlock device is installed, and to a modest extent, following removal of the interlock (Rahman, 2022b). For example, the there was an 86 percent reduction in the likelihood of drink driving offending during the interlock period, among first time high range offenders who elected to have the interlock fitted to their vehicle, compared with first time mid-range offenders, just below the high range threshold who were not eligible for MAIP.

While there are a range of enabling factors which support participation in the program, and support the positive findings of the program, there are a range of barriers which persist, making it challenging for many drink driving offenders to participate in the program and successfully complete it. This paper explores some of the key enablers and barriers to participation in more detail.

Key enablers and barriers to participation and completion of MAIP

MAIP has widespread reach across NSW, with interlock orders being issued to almost 90 percent of high range and repeat drink drive offenders. Two-thirds of those issued an interlock order elect to participate in the program, by taking up the interlock device. While this participation rate is considerably higher than for many other programs, a significant proportion of offenders (one in three) elect not to participate in the program. Participation rates vary by a range of factors, with drink driving offenders who are older, identify as Aboriginal, or reside in more regional, remote, or disadvantaged areas less likely to participate in the program. Those with longer interlock periods, or with more extensive offending histories, are also less likely to take up the interlock.

Key enablers for participation and completion of the program included being able to afford the financial costs of the program, the availability and acceptability of local interlock providers and work arrangements that support participants to meet program requirements, such as regular interlock servicing.

Key barriers included participants having difficulties understanding and meeting program requirements, with many returning multiple failed (i.e. positive) breaths test on the interlock. This often results in their program being extended and can make program exit challenging.
The cost of MAIP also remains a significant barrier to participation for many, despite some financial support being available. Limited engagement with MAIP among general practitioners has also limited the extent to which they have been able to support participants throughout the program with alcohol use issues.

Conclusions and next steps

The findings provided in this paper provide valuable evidence about the enablers and barriers to participation in MAIP, and will help inform efforts to improve participation and further enhance the program's effectiveness in reducing drink driving, to create a safer road environment for all.

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Motorcycle protective clothing in the ACT

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Abstract

This study involved an investigation of the use of protective clothing by motorcyclists in the ACT, encompassing both commuting (n=33) and recreational (n=45) riders. Rider knowledge about MotoCAP, the star rating scheme for protective clothing that operates in Australia and New Zealand, was also examined. Rates of wearing of protective clothing among ACT motorcyclists was found to be high, especially for jackets and gloves. Gains could still be made through the promotion of the importance of wearing protective motorcycle pants, especially garments fitted with armour. Only a minority of riders were aware of MotoCAP and only a small proportion had ever visited the website. The high importance placed by riders on physical protection when riding suggests that there is a big market for the resources provided by MotoCAP and expanding publication of star ratings beyond the website may assist with reaching them, something which MotoCAP is currently pursuing.

Background

It has long been recognised that riders of motorcycles have a substantially higher risk of serious injury or fatal road crashes than other road users in Australia (Johnston et al., 2008). There is a variety of countermeasures for motorcycle crashes, one of which is improving the levels of protection provided by the clothing they wear when they ride.

The benefits of protective clothing, especially in preventing lacerations and abrasions, are well-established but there is still a degree of reluctance among some motorcyclists to wear protective gear when riding. One reason for this is that wearing protective clothing in warm weather leads to heat-related discomfort for riders. Increases in skin temperature and core body temperature have been linked to increased workload, decreased mood and increased reaction times, which could potentially impair riding performance (de Rome, 2019).
To assist riders with choosing high quality protective clothing, a new star rating system for motorcycle apparel has been introduced in Australia and New Zealand. The Motorcycle Clothing Assessment Program (MotoCAP) is an independent resource that provides star ratings for the protective capacity and breathability of motorcycle clothing and covers jackets, pants and gloves (www.motocap.com.au).

Method

This present study involved interviews with motorcyclists in the ACT, encompassing both those riding for commuting purposes (n=33) and those riding recreationally (n=45), investigating the extent to which they were wearing protective clothing, and their awareness of, and use of, the MotoCAP website. The riders' clothing was directly inspected by the researchers to determine whether it was protectve or not (e.g., extra layer of protective material, impact protectors). Data were collected across three days in October, 2022.

Results

Rates of wearing of protective clothing among ACT motorcyclists were found to be high, especially for jackets (69 out of 78 riders) and gloves (73 of 78). Pants and footwear were less likely to be protective, however. A large majority of riders rated physical protection as very important or important in choosing their riding apparel, while a small majority also reported that the weather was important in choosing the level of protection they wore. The rider's destination or the type of riding being done were typically rated as less important. Only a minority of riders were aware of MotoCAP (35 of 78) and only a small proportion (10 riders) had ever visited the website. However, most of the riders were interested in using a star rating scheme to choose their riding gear in the future.

Conclusions

Rates of wearing of protective clothing among ACT motorcyclists is high, especially for jackets and gloves. Gains could still be made through the promotion of the importance of wearing protective motorcycle pants, especially garments fitted with armour. The high importance placed by riders on physical protection when riding and their interest in using a star rating scheme to help with choosing future riding gear suggests that there is a big market for the resources provided by MotoCAP. Expanding publication of star ratings beyond the website may assist with reaching them, something which MotoCAP is currently pursuing.

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"A life over a fine": driver licence acquisition for Indigenous peoples in NSW

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Abstract

The process of obtaining a learner permit and driver licence ensures that road users complete the necessary training on road rules and develop safe driving behaviours. For many Aboriginal and Torres Strait Islander peoples (hereafter referred to as Indigenous peoples with respect to the heterogeneity of culture, communities, and peoples), the process of getting a driver licence can be arduous. This is influenced by a multitude of compounding factors, many of which remain unexplored. To ensure that the driver licence acquisition process meets the needs of Indigenous peoples, we need to understand first-person perspectives of the barriers and facilitators that affect this process. We report on the outcomes of Yarning sessions held with Indigenous teenagers and Community members regarding their perceived barriers and facilitators to getting a driver licence. Outcomes of this study provide insight into ways in which research and industry partners can support the driver licence acquisition process for Indigenous peoples.

Background

Many systemic and complex socio-cultural barriers contribute to the overrepresentation of Indigenous peoples in road crash-statistics and unlicensed driving, including limited access to instructors, a distrust of systemic processes and the high cost of testing and instruction (AIHW, 2019, ALRC, 2018). Having a debt due to non-payment of driving- and licence-related fines is a common barrier that prevents Indigenous peoples from obtaining a licence, is often a reason for losing a licence and contributes to the overrepresentation of Indigenous peoples in the criminal justice system (ALRC, 2018). Another barrier that is known but unexplored, is that the materials and methods availible to teach road safety do not align with the learning styles and understandings of young Indigenous people; as a consequence this leads to difficulty understanding the road rules in sufficient depth to gain a driver licence (Clapham et al., 2017; Pammer et al., 2020).

Method

The current study reports on the perceived barriers and facilitators that affect Indigenous teenagers' likelihood or willingness to get a driver licence. Using the Indigenous research methodology of Yarning (Bessarab & Ng'Andu, 2010), we engaged with Indigenous peoples in various regional and remote locations in NSW to understand the beliefs and motivations that influence getting a driver licence. This is essential for understanding how driver licence acquisition impacts equitable access to health, education, and employment (McKenna et al., 2021). Cultural Safety and Responsivness was ensured through establishing partnerships and relationships with local Indigenous experts and Indigenous community members who specialise in Indigenous social-cultural knowledge and understandings (Ramsden, 2002; The University of Newcastle, 2020). Beliefs and motivations regarding licensing were explored using Indigenous research methodologies complimented by psychological theory, using thematic content analysis to identify other key factors that predict driver licence acquisition (Ajzen, 1991; Bessarab, & Ng'Andu, 2010). Both narrative and thematic analyses were used to analyse transcribed results.

Results

Results identified key themes associated with driver licence acquisition. These include knowledge and understanding of the driver licence acquisition process, compounding individual and systemic barriers such as financial costs, reading and comprehension skills, and difficulty accessing services. Additionally, themes around motivation and support were identified, including intrinsic and extrinsic motivators such as freedom, accessibility, necessity, reciprocity and obligation, family and Community responsibilities, as well as a need for authentic and consistent licensing support programs for Indigenous peoples. A key them to also emerge was individual and Community resilience, demonstrated by a determination to overcome barriers through innovative problem solving. Overall, through Yarning with Indigenous teenagers and Community members, this research demonstrates that there are compounding barriers associated with Indigenous people getting and retaining a driver licence, and these compounding barriers require compounding solutions.

Importantly, identified themes have been contextualised with respect to the cultural history and community circumstances of the area and peoples that participated. This cultural context included concepts such as cultural dynamics, cultural capital and possible residual effects of past government policies affecting Indigenous peoples. It is important to note that these cultural contextual factors differed between group to group and within individuals in each group and are critical when interpreting the findings.

Conclusions

Research outcomes highlight the perceived motivating factors that encourage Indigenous drivers to get their driver licence and the identified barriers to driver licensing acquisition, and stresses the resiliance and innovation of Indigenous people. Themes arising from this research will further knowledge around Indigenous experiences regarding driver licensing, to inform current research and industry understandings of issues associated with being a licensed or unlicensed driver, with a more general view to facilitate and improve road safety for Aboriginal and Torres Strait Islander peoples.

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Yarning to link virtual reality with Indigenous road safety

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Abstract

Educational road safety tools need to be developed so that they are suitable for use by target populations. This is especially important for Aboriginal and Torres Strait Islander peoples (hereafter referred to as Indigenous peoples with respect to the heterogeneity of culture, communities, and peoples). We report on the ongoing development of an Indigenous-centric Road Safe and Ready virtual reality application that provides road rule and road safety information to Indigenous pre-learners in an interactive virtual reality context that is aligned with Indigenous ways of knowing, being and doing. Development is informed by Indigenous teenagers, who provided feedback on a VR prototype via Yarning discussions. Emerging themes relating to the suitability of the application for use with Indigenous teenagers are discussed, together with participant recommendations for future VR road safety application development.

Background

Indigenous Australians are overrepresented in road crash and incarceration statistics. Issues associated with getting and retaining a driver licence are known to contribute to this overrepresentation. The process of obtaining a driver licence is influenced by complex systemic and socio-cultural barriers including limited access to driving instructors, the high cost of testing and instruction, and distrust (AIHW, 2019; ALRC, 2018). One known but unexplored barrier is that young Indigenous people have difficulty understanding the road rules in sufficient depth to gain a driver licence (Clapham et al., 2017; Pammer, Freire, Gauld, & Towney, 2020). This occurs partly because of a lack of engagement with learner driver resources, such as the NSW Road User Handbook. Low literacy levels are known to contribute to this, but so too the fact that such resources are contextualised within a Western learning framework, which fails to accommodate the learning needs of Indigenous peoples, a factor that is similarly recognised in other educational contexts (Freire & Pammer, 2022).

Responsively aligning linear, systematic and sometimes abstract Western pedagogy with the visual, immersive, narrative-based epistemologies of Indigenous peoples results in higher educational engagement and better outcomes for Indigenous learners (Freire & Pammer, 2019). However, this has never been explored in a skills-based practical framework. We propose that aligning road safety learning objectives of the Road User Handbook with Indigenous ways of knowing, being and doing will facilitate communication of road safety information to Indigenous populations to support driver licence acqusition.

One way to address the road rule knowledge gap of Indigenous learner drivers and empower them to gain their driver licence is to transform the learning modules from the Road User Handbook into culturally responsive virtual reality (VR) modules. VR is an increasingly accessible technology that has the potential to bridge knowledge gaps by creating engaging, immersive, and culturally relevant experiences for the learner (Southgate et al., 2019). Our research team has developed a VR "Road Safe and Ready" (RSR-VR) prototype as a mobile phone application that can be used with an inexpensive Google Cardboard VR headset to communicate road rules and road safety information.

Method

Using Indigenous Yarning research methodology (Bessarab, & Ng'Andu, 2010), we explored Indigenous participants' perspectives and recommendations on the potential effectiveness and usability of a VR application to deliver essential road safety information required to understand road rules and drive safely. The Yarning sessions were informed by Indigenous social-cultural knowledge and understandings, that were provided through partnerships and relationships with local Indigenous experts and Indigenous community members.

Results and Conclusions

All data was analysed using a Yarning anlaysis methodology that incorporates thematic and narrative analyses. Outcomes of ths study provide insight into the suitability of a VR application for communicating essential road safety information. Key themes to emerge were i) usability, ii) practicality, and iii) effectiveness. Specifically, participants felt that a VR road safety application such as the RSR-VR prototype would enable them to more effectively learn the road rules and indicated that they would prefer such technology, when available. Further development of the RSR-VR application will work towards the broader aim of improving Indigenous road safety more generally.

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It's not me, it's you: drivers' perception bias could improve safety

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Abstract

This study analysed drivers' road safety behaviour with the objective of exploring perception bias related to one's view of their driving skills versus others. Subsequently, drivers' changes in road safety attitudes were tested after being exposed to on-road messaging framed around the identified confidence in drivers' own driving abilities, but not others. Based on self-reported before and after ratings, perception bias-related messaging aimed at causing cognitive dissonance, improved drivers' likelihood to obey traffic laws and avoid distractions but did not affect the ability to stay calm in traffic. Results of this study should be applied to real-world scenarios to reduce unsafe driving behaviours such as speeding and engaging in distractions while driving, two leading causes of automobile crashes.

Background

In 2021, fatal automobile crashes increased by 10.5 percent from 2020 (National Center for Statistics and Analysis, 2022a). Roadway safety can be improved through safety campaigns presented on Dynamic Message Signs (DMS synonymous with VMS; Fontaine, Carlson, & Hawkins, 2000). Though, Hall and Madsen (2022) found that negatively framed messages displayed on DMS increased crash risk. An alternate approach, which has not been studied, is to frame messages to cause cognitive dissonance, namely a conflict between a behaviour and a corresponding attitude (Harmon-Jones, 2019) causing people to want to change their behaviour (Bran & Vaidis, 2020). Research has found that cognitive dissonance was a strong motivator in changing behaviour such as, improving safety compliance during COVID-19 (Pearce & Cooper, 2021). In the driving context, framing messages in this way may be beneficial because drivers tend to overestimate their driving skills and think that others are the problem (Williams, 2003).

Purpose of Project

The purpose of this project was to assess the perceived effectiveness of safety campaigns (framed to cause cognitive dissonance) displayed on DMS. Safety campaigns were selected based on the prevalence of resulting in severe automobile accidents including, violating of traffic laws, engaging in distractions, and exhibiting anger or stressful behaviours. For example, 28 percent of fatal automobile accidents result from illegal roadway behaviour such as speeding (National Center for Statistics and Analysis, 2022b).

Evaluation and Effectiveness

In May 2022, four hundred drivers (190 men; M_{age} = 47.45, SD_{age} = 16.30) from the Greater Washington D.C. area completed a 10-minute survey online containing demographic and driving-related questions, such as situations which caused changes in driving behaviour, side-by-side perception of theirs and other drivers' behaviours, and effectiveness of DMS messages in changing driving behaviours. Effectiveness of messages were measured by the difference between self-reported likelihood to obey traffic laws, avoid distractions, or stay calm before and after being exposed to the messages.

The findings of the study indicate statistically significant disparities in drivers' perception of own safe driving behaviours versus others: 85 percent of drivers regularly obey traffic laws, but believe only 39 percent of other drivers do the same; 82 percent are able to stay calm vs. 38 percent other drivers; 72 percent avoid distractions vs. 24 percent other drivers, $ps < .001$.

As expected, drivers were more likely to anticipate safer behaviours after looking at signs with clear consequences, such as law enforcement or speed limits compared to DMS. However, when shown a cognitive dissonance message, experienced and risk averse drivers were more likely to obey traffic laws for, "Other Drivers Speeding – Stay Alert", and more likely to avoid distractions for, "Drivers Near You Texting Stay Alert!". "Everyone is in A Hurry – Breathe" received the highest rating among messaging intended to keep drivers calm but did not promote a significant improvement compared to the baseline behaviour.

Conclusions and Implications

This research helped to gain further insight into driver attitudes to help inform how to best communicate about road safety. The findings have urged a new approach to on-road electronic messages to replace traditional reminders such as "drive safely" with messages prompting drivers to be alert for others' unsafe behaviours and be ready to react, if necessary. The impact of new messaging on mitigating speeding behaviours on high-speed corridors is currently being investigated.

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Jaywalking analysis of Dhaka City High School and College students

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Abstract

Most educational institutions in Dhaka, Bangladesh, are located alongside crash-prone arterial/collector roadways, making it significantly risky for students to jaywalk. However, research regarding student jaywalking is scarce in developing countries like Bangladesh and needs attention. Apart from students' socioeconomic, demographic, travel behaviour, road safety perception, road safety knowledge, and situational features, this study also aims to determine the effects of parental supervision, BMI, weather conditions, psychological traits, and crash history on initiating jaywalking which are rarely explored in developing countries' context. For this, 273 students in year levels 6 to 12 (with ethical approval taken from the Department of Research, Extension, Advisory Services and Publication (REASP) of the Islamic University of Technology, Gazipur) from 13 schools completed a questionnaire that examined these issues. Factors influencing students' decision-making process for jaywalking were explored with logistic regression (fixed and random coefficients) models and the Bayesian Belief Network (BBN). The model results will reveal significant variables influencing jaywalking, e.g., parental supervision, companionship, safety perceptions, etc. The findings will help authorities undertake safety interventions, have policy implications, and assist infrastructural development in reducing teenage student pedestrian crashes.

Background

Two-thirds of fatality victims worldwide are pedestrians and bicyclists, and a significant portion are students (WHO, 2018). In 2022, among 6829 road crashes (pedestrian and passenger) in Bangladesh, 16 percent involved students, and 26.96 percent occurred in Dhaka (Rahman, 2022). The current research surveyed Dhaka city high school and college students to examine the factors influencing their decision to jaywalk. Thirty-seven percent of the children's fatalities (pedestrian and passenger) occurred on National highways, followed by arterial roads (Afifah & Hossain, 2016). Dhaka also has the highest number of educational institutions, making the dangerous practice of jaywalking on these roads common. Research on this issue (pedestrian safety and behavioir) has been conducted in Israel (Meir et al., 2015), India (Avinash et al., 2020), South Korea (Blazquez et al., 2016), and Qatar (Shaaban et al., 2018). However, there is limited research on this issue in Bangladesh. The current research surveyed Dhaka city high school and college students to examine the factors influencing their decision to jaywalk.

Method

The questionnaire included 59 questions categorized into seven sections from Dhaka city. Existing literature, issues faced by the target group (obtained from field observation), and a single focus group discussion were considered while preparing the questionnaire. The questionnaire was completed by 273 students in year levels 6 to 12 from 13 high schools and colleges in Demra, Dhanmondi, Tejgaon, Motijheel, Mirpur, Uttara, and Newmarket. Academic instruction modes of National curriculum, Edexcel and Cambridge, etc., and respondent gender were equally important in the survey. The questionnaire examined the respondents' socioeconomic and demographic information, travel behaviour, road safety knowledge, crash history, road safety perceptions, and situational characteristics (prior to jaywalking). Unique characteristics of parental supervision (prior to jaywalking) and general psychological traits were also considered, as they are rarely explored in developing countries.

Modelling Methodology

Independent variables will be formed from the information gathered in the survey and based on hypotheses about the factors that lead students to either jaywalk or not jaywalk (e.g., at designated pedestrian crossings). Logistic regression models (fixed and random coefficients) and Bayesian Belief Networks (BBN) will be used to find the effect of independent variables on influencing either jaywalking or legal crossing, which are the dependent variables in the models. The logistic regression model uses Odd Ratios to determine the probability of initiating jaywalking relative to not jaywalking. Moreover, the BBN will examine the complex interactions of independent variables and their effect on jaywalking. Numerous iterations will be made to reach the final model.

Results

The model results will reveal significant variables influencing jaywalking formed from parental supervision, socio-economic conditions, companionship, safety perceptions, etc. Instead of legal crossing, variables that provoke the jaywalking of teenage students will be identified in this study in the local context of a developing country. Results from similar studies conducted in other countries' context will also be compared with the results of this study. The most vulnerable cohort of students often involved in jaywalking while crossing the road will be identified.

Conclusion

Lastly, our study will help policymakers, urban planners, and educators to develop targeted safety interventions (for example, promoting road safety education, training, etc.) to reduce jaywalking and pedestrian crashes involving teenage students. It will also help improve and develop appropriate safety measures (identifying missing road signs, demarking the proper zebra crossing, imposing appropriate speed limit in school zones, designing adequate pedestrian road crossing, sufficient signal time in signal design) and infrastructure solutions to reduce road casualties. Educators can use our findings to develop programs incorporating psychological and situational factors to minimize jaywalking behaviour among students.

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Using a procedurally just flyer to reduce speeding

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Abstract

This study used a randomised field experiment design to assess whether the inclusion of a flyer incorporating the principles of procedural justice with camera detected offence notices reduces subsequent speeding behaviour. Batches of camera detected offence notices were randomly assigned to the business-as-usual (control; *n* = 7,946) or the procedural justice flyer (experimental; *n* = 8,209) conditions. Administrative data for the following 12 months was used to identify if the drivers had been caught committing a subsequent speeding offence. The results indicate that individuals over the age of 25 years were 11% less likely to have a subsequent speeding offence in the following year if they received the flyer with their camera detected offence notice. This suggests that police agencies should consider incorporating the principles of procedural justice when issuing camera detected offence notices.

Background

Evidence suggests that speed camera programs reduce travelling speeds as well as injuries and fatalities associated with crashes (e.g., Blais & Dupont, 2005; Carnis & Blais, 2013). However, many drivers do not hold positive views of speed cameras and speed enforcement (Soole et al., 2008; Wells, 2008). This project involved the provision of a flyer that was constructed using the principles of procedural justice to individuals who had been issued a camera detected speeding infringement notice. Procedural justice has been found to increase compliance and improve perceptions of police when delivered in face-to-face contexts (e.g., Trinker et al., 2019; Mazerolle et al., 2012) but there is limited research in alternative types of interactions. The objective of this research was to identify if (a) a procedurally just intervention has an effect if it is delivered in a written format and (b) if there is an impact on subsequently detected speeding behaviour.

Method

The intervention was trialled using a randomised field experiment design. During the trial period (August-September 2017), 16,406 drivers received a camera-detected infringement notice. Batches of these notices were randomly assigned to either the control (business as usual; *n* = 7,946) or experimental (included the procedural justice flyer; *n* = 8,209). The flyer incorporated the principles of procedural justice and key road safety messages. Administrative data for the 12 months following the intervention was used to identify if participants engaged in subsequent speeding behaviours. Given the highly skewed nature of the data, difference-in-difference tests with a negative bionomial approach were used to evaluate the effectiveness of the intervention by identifying if drivers had received subsequent speeding infringements.

Results

Individuals over the age of 25 years who received a procedural justice flyer with their camera detected speeding infringement notice were 11 per cent less likely to receive an additional speeding fine when compared with those who received the standard traffic infringement notice without the additional flyer. There was no difference for drivers 25 years or younger.

Conclusions

This project indicates that it is possible for police agencies to engage in procedurally just interactions with individuals in a written format and that these can subsequently change offending behaviour. In this case by reducing speeding behaviour. Thus, police agencies should consider incorporating the principles of procedural justice when issuing camera detected offence notices.

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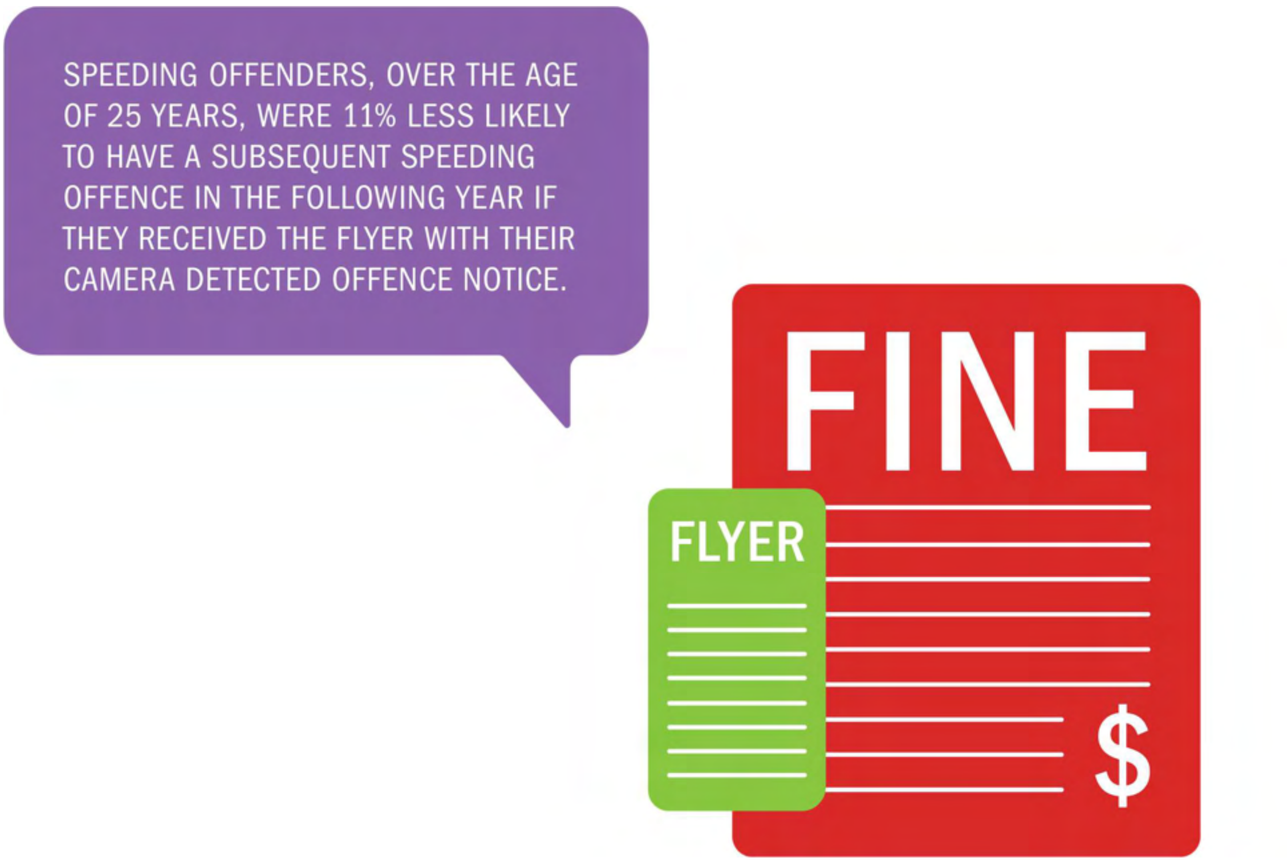

Detecting near-miss events with cyclists using computer vision approaches

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Abstract

There has been emerging interest in the use of technology to detect near-miss events between cyclists and other road users. The increasing quality and availability of on-bike video data provides opportunities to detect near-miss events from video data. In this study, we develop a new computer vision approach for detecting close pass events, the most common type of near miss event, for cyclists. Our models can achieve up to 88.1% accuracy in detecting close pass events in real-world video data. Such approaches hold promise to rapidly advance our ability to capture near-miss data using on-bike video and deploy this technology at scale.

Background
Given frequent interactions between cyclists and motor vehicles, the detection of unsafe events has become an important focus for improving cyclist safety. Previous studies have employed various forms of on-bike technology, such as ultrasound sensors, to be able to measure the lateral distance that motor vehicle drivers provide when passing cyclists, and therefore detect unsafe passing events (Beck, et al., 2019). Through rapidly advancing developments in computer vision, there are opportunities to utilise deep learning techniques to detect unsafe events using video data. The aim of this study was to develop and evaluate new computer vision methods for detecting close pass events for cyclists.

Methods

We investigate two problem formulations for close passing near-miss detection from video scenes: scene-level and instance-level detection. Scene-level detection is a classification task that asks algorithms to estimate whether a given video clip contains a cycling near miss event or not. As opposed to scene-level detection, instance-level detection allows algorithms to solve this problem in an interpretable way by identifying the object that causes the near miss event. For the scene-level detection, we adopt two video action recognition models including Inflated 3D ConvNets (I3D) and convolutional neural networks (CNN) and long-short term memory (LSTM) model (CNN+LSTM). For instance-level detection, we adopt a state-of-the-art monocular 3D detection framework, FCOS3D, to detect objects in a given video clip.

To train and validate our approach, we leverage three datasets:

1. NuScenes (Caesar, et al., 2020)
    - NuScenes is a publicly available multimodal dataset for autonomous driving
    - NuScenes was used for pre-training the model
2. CARLA synthetic dataset (Dosovitskiy, Ros, Codevilla, Lopez, & Koltun, 2017)
    - CARLA is a high-fidelity simulator that was used to generate a synthetic cycling near-miss dataset
    - CARLA was used for finetuning the models
3. Real-world cycling dataset (Beck, et al., 2019)
    - Existing Victorian real-world cycling dataset with forward-facing video data and rightward-facing ultrasonic distance sensor (with speed limit data)
    - The real-world dataset was used for training and testing

Close pass events were defined as according to Victorian legislation whereby a close pass was defined as an event where a motor vehicle passed a cyclist with a distance of less than 1.0m in speed limits of 60km/h or less, or less than 1.5m in speed limits of greater than 60km/h. We quantify the performance of these models with standard classification metrics (accuracy, F1-score and AUC).

Results

For scene-level detection, the CNN+LSTM approach achieved a near-miss detection accuracy of 88.1%, and the I3D approach achieved an accuracy of 85.1%. For the instance-level detection, the FCO3SD approach achieved an accuracy of 84.1%. An example of the output of FCO3SD at the instance-level is shown in Figure 1, where the detected objects are converted to birds-eye view.

Figure 1: Example of the detection of passing vehicles using on-bike video data

Conclusions

Detecting close pass events is challenging for two main reasons: 1) the quality of video data can be influenced by a myriad of factors, including lighting and weather conditions; and 2) the limited field of view of forward-facing video cameras means that you are detecting vehicles well after the passing event has occurred. Despite this, we achieve high accuracy, demonstrating the potential of computer vision approaches to detect near-miss events. We are currently expanding these algorithms to be able to detect other types of near-miss events and improving the performance of the models investigated.

Acknowledgements

This project was funded by a Road Safety Innovation Fund grant from the Australian Government Office of Road Safety. Ben Beck (FT210102089) and Dana Kulic (FT200100761) were supported by Australian Research Council Future Fellowships.

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Detecting stressful events while cycling using physiological and biometric measures

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Abstract

The key barrier to getting more people riding bikes is how unsafe people feel in the presence of motor vehicle traffic. However, we have lacked tools to be able to measure user experiences as people ride. In this study, we pilot the use of physiological and biometric measures and compare these against people's narrations of their experiences as they ride. Preliminary analyses demonstrated that 6 participants collectively completed 1,581 km of bike riding across more than 80 hours of riding time. Participants narrated a total of 503 events, of which 100 events (20%) were emotionally positive (positive valence), 217 events (43%) were negatively valenced and 186 events (37%) were neutral. Preliminary analyses are currently underway with final results to be presented at the conference.

Background

The key barrier to getting more people riding bikes is how unsafe people feel in the presence of motor vehicle traffic (Pearson et al., 2023; Pearson et al., 2022). Despite the critical importance of this issue, prior research has been limited primarily to survey methods, and we have lacked tools to be able to measure user experiences as people ride. There is, however, emerging interest in the use of physiological and biometric measures to quantify user experiences, but they lack real-world validation (Kalra et al., 2022; Lim et al., 2022). In this study, we pilot the use of physiological and biometric measures and compare these against people's narrations of their experiences as they ride.

Methods

We conducted a naturalistic experiment in Melbourne with 10 participants who rode their usual routes over a period of 2 weeks. Participants installed and utilised a variety of technology as they rode:

- Microphone
    - An audio recorder was used to capture participant's narrations of their experiences
- Forward-facing video camera
    - A GoPro Sessions camera was used to capture the environment in front of the bike
- Video camera to capture facial expressions
    - A GoPro Sessions camera was used to record participant's facial expressions, and these were matched to emotions using OpenFace and DeepFace libraries
- Heart rate chest strap
    - A Polar H10 chest strap was used to capture heart rate variability data
- Smartwatch
    - An Empatica E4 smartwatch was used to record galvanic skin response, as a measure of stress response
- Bike computer
    - A Polar M460 bike computer was used to record GPS, speed and distance

Participants were asked to narrate their experiences as they rode according to a predefined guide. Events were subjectively classified by the authors as emotionally positive (positive valence), neutral

(neutral valence) or negative (negative valence). Ethical approval was provided by the Monash University Human Research Ethics Committee (Project ID: 30992).

Results

At the time of writing, 6 participants collectively completed 1,581 km of bike riding across more than 80 hours of riding time. Participants narrated a total of 503 events, which were defined as self-narrated affective and/or cognitive responses to stimuli in the external environment. One-hundred events (20%) were emotionally positive (positive valence), 217 events (43%) were negatively valenced and 186 events (37%) were neutral. Preliminary analyses are currently underway with final results to be presented at the conference.

Conclusions

Developing valid methods for capturing user experiences as people ride is critical to advance our ability to understand when people feel unsafe and/or uncomfortable, and the role that different forms of street and path infrastructure play in meeting the needs of people of all ages and abilities. Results presented at the conference will highlight the potential role of physiological and biometric measures in measuring user experiences as people ride.

Acknowledgements

This project was funded by a Monash Data Futures Institute Seed Grant. Ben Beck (FT210102089) and Dana Kulic (FT200100761) were supported by Australian Research Council Future Fellowships.

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Trial of VMS and TMS Messaging to improve speed compliance

David Beck[a] and Thomas Burke[b]

[a]Transurban, [b]NorthWestern Roads

Abstract

Due to a high number of speeding infringements incurred by drivers on the NorthConnex network, Transurban formed a working group with NorthWestern Roads[1] and Transport for NSW to improve speed compliance through the tunnel. This was to address both the road safety concerns associated with speeding in the tunnel, and to ensure that the speed cameras retained community acceptance. The group trialed Variable Message and Tunnel Message Signs (VMS and TMS) warning drivers of speed cameras and directing them to slow down. The trial was conducted over a 6-month period, during which infringements decreased by 38-54% depending on the direction of travel. Additionally, speed variability reduced, with the overwhelming majority of vehicles now travelling within the speed limit. This trial demonstrated the impact of VMS messaging when linked directly to enforcement and including a call-to-action.

Background

Due to an increase in speeding infringements issued for drivers on NorthConnex, Transurban initiated a working group with Transport for NSW to improve speed compliance through the tunnel. Standard practice in Australia is to speed limit tunnels to 80km/h, in accordance with Austroads guidance (Louis et al., 2021). The NorthConnex tunnel has therefore been speed limited to 80km/h. The group recognised that drivers may be travelling at higher speeds unintentionally due to environmental factors, including the downhill incline into the tunnel, and that many drivers on the network are entering from higher speed environments.
The following issues were identified:

- People travelling at speeds higher than the posted limit are at increased risk of casualty crashes.
- Connected vehicle data indicated a large differential between the median and 85th percentile speeds for traffic travelling through NorthConnex. Such speed differentials have been identified by the Australasian College of Road Safety as a concern (Australasian College of Road Safety, 2022), and risk potential conflicts in traffic from lane changes and braking.
- Public acceptance of speed cameras are contingent upon public trust in the system. If there is a risk that cameras are infringing people inadvertently speeding, efforts should be made to improve compliance, and ensure that infringements remain a method of last resort to address speeding issues.

Trial

To address this issue, the group trialed messaging through VMS and TMS on NorthConnex to encourage drivers to remain under the speed limit.

The VMS message was drawn from the Transport for NSW library of potential messages and specifically identified speed camera enforcement and told drivers to slow down. Figure 1 shows the messaging used in situ. TMS messaging stated “SPEEDING ENFORCED”. This targeted messaging was based on research that Transurban had conducted previously, identifying the most effective forms of messaging, which found that messages warning of enforcement and directing

[1] NorthWestern Roads Group owns and operates NorthConnex, and consists of Transurban (50%), Queensland Investment Corporation (25%) and CPP Investment Board (25%).

drivers to take specific action were most likely to elicit the appropriate response by drivers (Barragan & Spissu, 2023).

Figure 1. Images of VMS messaging used on approach to NorthConnex tunnel

Messaging was displayed over a six-month continuous period (September 2022 – February 2023), and the travel speed patterns were compared against those for the six-month period prior.

Evaluation and Implications

The trial demonstrated a significant improvement in speed compliance once drivers were reminded of speed cameras in the tunnel. Over a six-month period, speeding infringements decreased 54% for northbound traffic (compared to the six-month period prior) and by 38% for southbound traffic.

Furthermore, comparing the six-month trial period to the six-month comparison period, the differential between the 85^{th} and median speeds reduced from 10km/h to 4km/h for northbound traffic, and from 21km/h to 8/km for southbound traffic.

Factors associated with the difference in impact between northbound and southbound traffic will be explored further in the presentation.

Based on the success of the trial, messaging in the tunnel will continue to be displayed to warn drivers of speed enforcement and encourage safer behaviour through the network. Driver behaviour will continue to be monitored to ensure the messaging remains effective.
This case study serves as a good demonstration of the impact that messaging utilising VMS with TMS may have when linked directly to enforcement and including a direct call-to-action.

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Using AusRAP, surveying and focus groups to understand the road safety impacts of variable message signs with re-routing messages

Kenn Beer [a], Catherine Deady [a], Ash Mani [a] and Georgia Phillips [b]

Safe System Solutions Pty Ltd [a], Luma Pty Ltd [b]

Abstract

This practitioner paper details an assessment of Variable Message Signs (VMS) with message displays including destination travel time, emergency warnings, road safety messages and re-routing messages. The study investigated the impact of the VMS on route choices on and around the Great Ocean Road (GOR) and surrounding routes. The study then assessed the impact of the VMS on road safety; via re-routing (e.g. "Road Closed | Use Princes Highway") or encouraging drivers onto alternate routes (e.g. "Lorne Via Princes Highway 20 min". The assessment included site reviews, surveys (n=394), focus groups, predictive modelling, and an assessment of road safety risk of different routes using the Australian Road Assessment Program (AusRAP). The study found that the deployment of additional VMS will improve road safety as road users will re-route to inland roads with lower infrastructure risk ratings (i.e. safer routes). The study provides insights into the impact of VMS on road user behaviour and can help inform future road safety infrastructure decisions.

Introduction

The Victorian Government is investigating the value of additional permanent VMS on the GOR and several inland routes. Currently, there are five VMS along the GOR, providing roadway and travel time messages to road users. This study gathered community and stakeholder opinions on the benefits, reliability, effectiveness, future use, and potential locations of VMS on the GOR and several inland routes. The study also used the AusRAP Methodology (iRAP, 2021) and origin destination modelling to predict the road safety impacts of encouraging different travel routes using VMS messaging such as time-to-location information (see Figure 1 below for example messages).

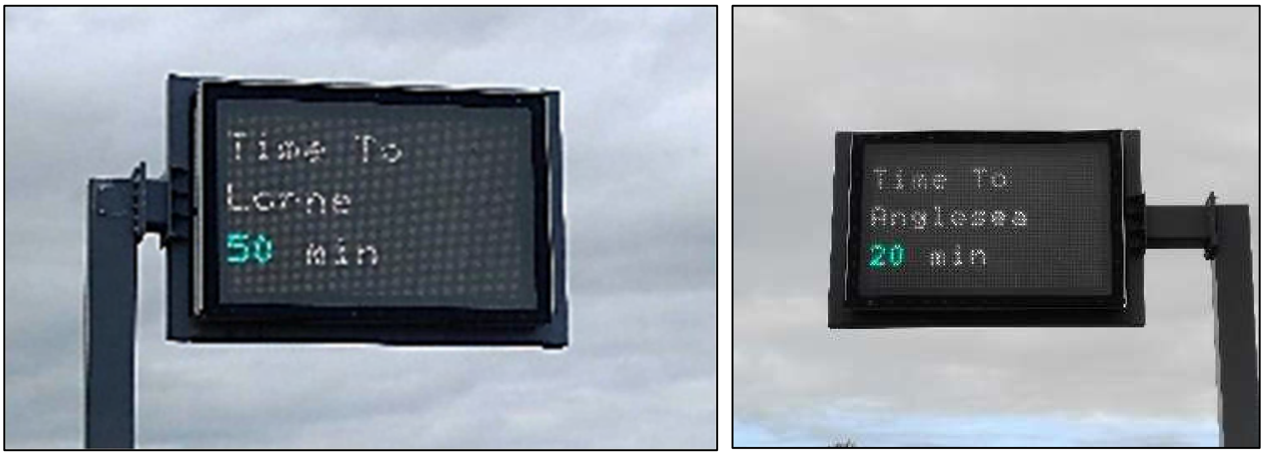

Figure 1. Example travel time messages on VMS on the Great Ocean Road

Method

The assessment was undertaken through a five-step process:

1. Performed systematic observation by conducting drive-through assessments of Anglesea Road, GOR, and six inland routes. Detailed observations were made regarding the prevailing conditions of existing VMS, signage, and overall road conditions.
2. Engaged in focused group discussions with organisations directly involved in the management of the GOR and surrounding routes. The purpose was to gather insights, but also to prepare appropriate survey questions to use to gather comprehensive data from the public.
3. Executed an online survey (n=394) targeting a diverse range of individuals who have utilised the aforementioned roads within the past 12 months. This method aimed to capture extensive information from a wide spectrum of road users. Survey respondents were selected from a pool of 400,000 Victorians. Filtering questions were used to ensure participants had travelled the GOR, then 394 participants were randomly selected to gather their input.
4. Assessed the predicted road safety impacts of alternate routes using the AusRAP methodology.
5. Undertook a thorough examination of the existing VMS messaging, recommending optimal locations and messaging for future VMS deployment. Furthermore, analysis was conducted to evaluate the reliability and cost considerations associated with both current and proposed VMS systems.

Results

The participants surveyed comprised individuals who have driven along the GOR and/or surrounding inland routes in south west Victoria in the past 12 months. A wide variety of people were surveyed across age ranges and including locals/tourists.

The figures below (Figures 2-5) show the outputs of the survey comparing people that had seen the VMS with displays versus those that had not seen those displays. For those that had not seen the display, they were shown images of the displays and asked if they believe they would be helpful. Examples of the displays include:

- **Travel Time:** 'Time To Lorne 50 min'
- **Re-Routing:** 'Great Ocean Road Closed | Use Prince Highway'
- **Emergency Messages:** 'Fire Protection Works Anglesea'
- **Road Safety Messages:** 'Drive On Left' (note: targeting tourists on the GOR)

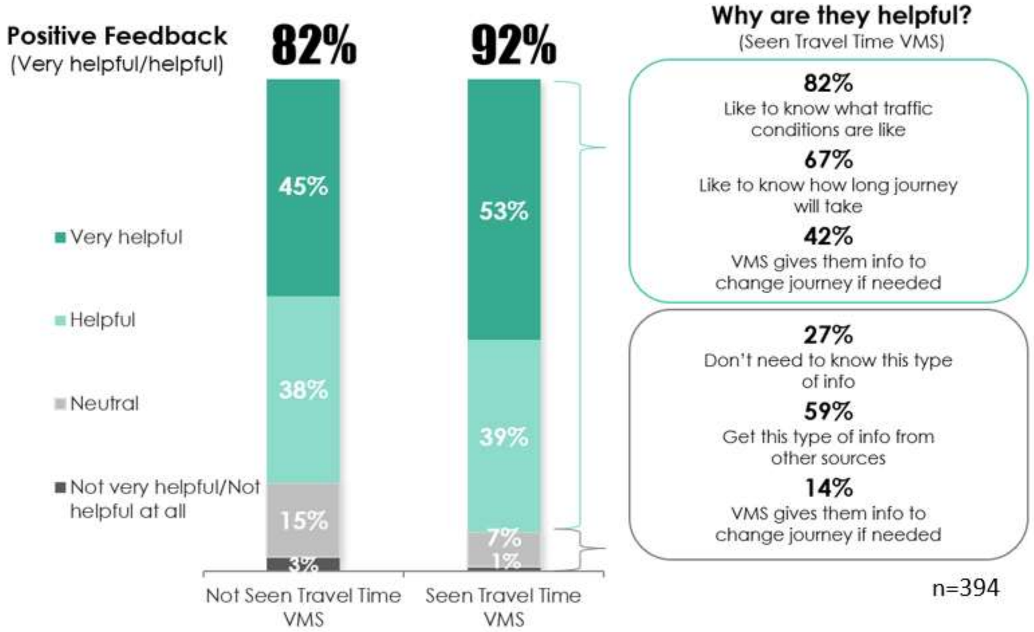

Figure 2. Survey respondents' answers to VMS Travel Time messages[2]

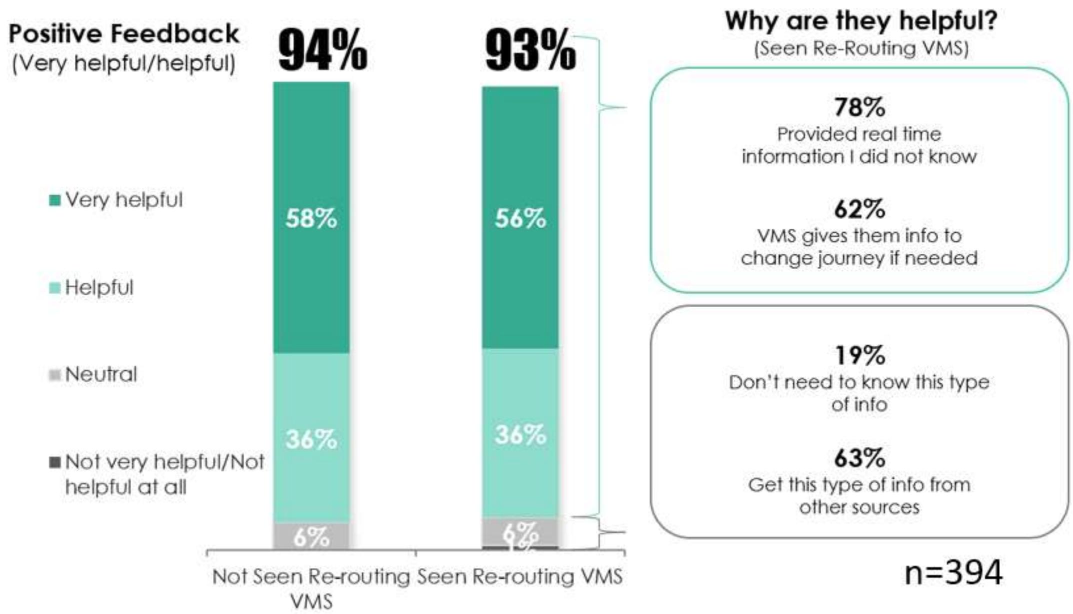

Figure 3. Survey respondents' answers to VMS Re-Routing messages

[2] Percentages rounded in all figures.

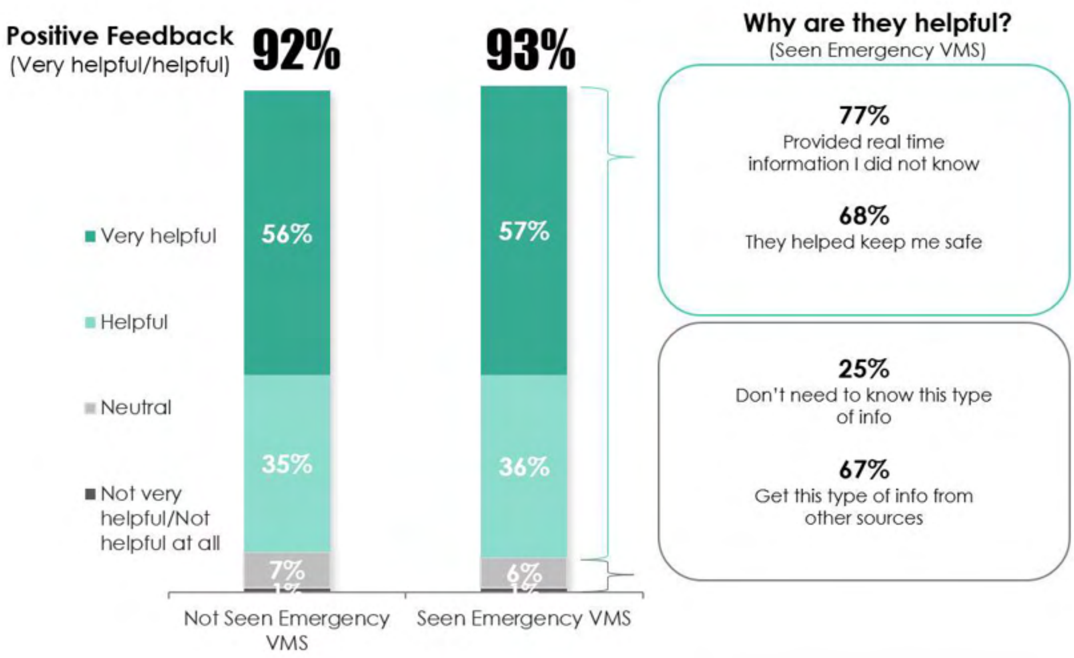

Figure 4. Survey respondents' answers to VMS emergency messages

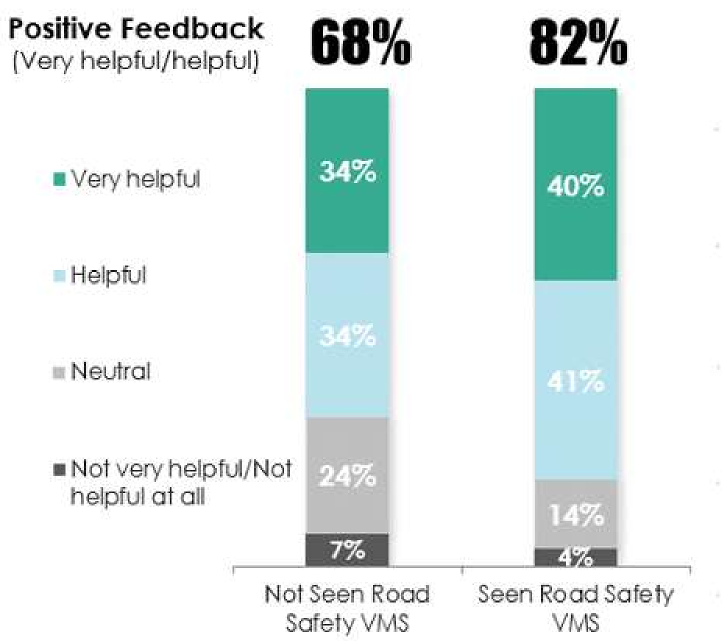

Figure 5. Survey respondents' answers to VMS safety messages

The International Road Assessment Program (iRAP) provides a methodology for assessing road safety risk based on star ratings, with 1 being the highest risk and 5 being the lowest (iRAP 2021). The Australian Road Assessment Program (AusRAP) is a member organisation that provides a similar methodology for Australia. The Victorian arterial road network was surveyed and star rated in 2014, with validation checks carried out manually (VicRoads 2014). Star ratings are calculated for four road user types: vehicle occupants, motorcyclists, cyclists, and pedestrians. The methodology is used to compare the road safety risk of traveling along the GOR and inland routes, with two journeys assessed from Melbourne and Geelong, respectively (Table 1). Common start and end points are adopted for accuracy.

Figure 6. AusRAP Ratings for the inland routes

Star Rating Scores (risk scores) were determined for the route including their difference in Star Rating Scores to produce differences in risk for different journeys as per the method used by Jameel and Endorides (2016).

Table 1. Difference in star ratings between Great Ocean Road and inland routes from Geelong

Route number	GOR routes	Inland routes	Difference
1	2.8	3.3	16%
2	2.7	3.3	20%
3	2.5	3.6	45%
4	2.5	3.4	37%
5	2.5	3.4	37%

Conclusion

VMS are considered helpful by the public, especially when displaying re-routing information or emergency messages (over 90% of respondents found these helpful or very helpful) and travel time messages (over 80% found these helpful or very helpful). It was concluded that people altered their route selection based on the messages displayed.

An analysis of the road infrastructure risk on the GOR and inland routes found that the GOR had higher road safety risk (lower star ratings) than the inland routes, and thus there is improved road safety outcomes by re-routing or encouraging more people to travel the inland routes than the GOR.

Acknowledgements

This study was funded by the Victorian Department of Transport who engaged Safe System Solutions Pty Ltd and Luma Pty Ltd to assess the impact of Variable Message Signs on road user route selection, road safety risk, and emergency services management on the Great Ocean Road. Victorian Department of Transport – Madeline Lobb, Alistair Robinson, Michael Peel

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Raised intersections – changing community perception

Kenn Beer [a] and Zac Elliman [b]

Safe System Solutions Pty Ltd [a], Wellington Shire Council [b]

Abstract

Wellington Shire Council (WSC) is committed to providing a Safe System for its community, which includes deploying raised intersections to slow vehicles at conflict points. However, during the development and public consultation phase for specific raised intersections in one of the council managed townships, there were concerns about the treatment. To address these concerns, WSC worked with Safe System Solutions to develop evidence-based engagement information such as factsheets and presentations that highlighted the benefits, design, and safety features of raised intersections. The messages also aimed to counter myths about raised intersections using research and evidence. The information was compiled from a comprehensive review of literature and consultation with experts in road design and safety. This practitioner paper details the efforts to communicate these messages to the community and the results of these efforts.

Introduction

Road safety is a crucial concern for local councils, and one strategy to improve safety for road users is through the deployment of raised intersections. However, community members may have concerns or misconceptions about this solution, which can hinder their acceptance and adoption. To address these concerns and increase community understanding, WSC worked with Safe System Solutions to develop an evidence-based information campaign for community engagement.

Method

The project team conducted a comprehensive literature review of studies on raised intersections and consulted with experts in road design and safety. They developed factsheets, photographs, and presentations that highlighted the benefits, design, and safety features of raised intersections. The team also debunked common myths surrounding raised intersections, such as the idea that they increase noise levels (Blewden et. al. 2020), impact emergency services (Blewden et. al. 2020 and FHWA 2022), and cause damage to vehicles (Blewden et. al. 2020).

The information was disseminated through a variety of channels such as the council's website, social media, local events, and an online engagement website on Your Wellington Your Say. The council also met with community groups regarding the proposal and completed broader engagement, encouraging community members to visit the online website and provide feedback. Council kept records of the community feedback and logged the support or opposition.

Results

While the engagement process was thorough, the proposal to install raised intersections was met with mixed support from the community (over 50 per cent opposition from submissions). Despite some positive feedback received from residents, community groups, and road safety experts, many community members (majority) preferred a reduced speed limit rather than an infrastructure solution. Council officers summarised the feedback for Councillors, and given the large amount of non-support, it was determined to halt the project at this time.

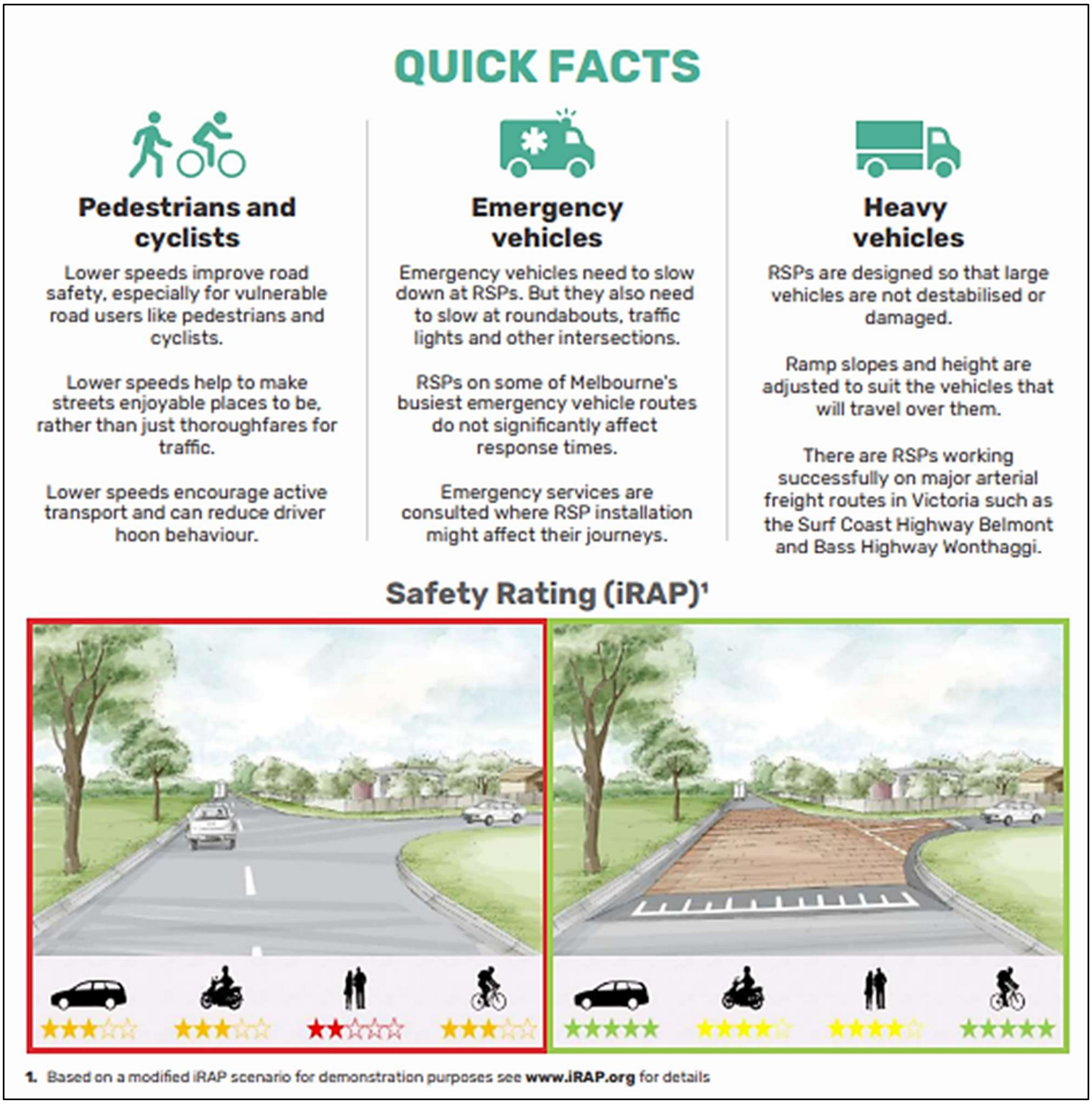

Figure 1: Example extract from a Raised Safety Platform Fact Sheet

Key research used to dispel myths: Blewden et. al., 2020; Makwasha and Turner, 2017

Conclusion

Although Wellington Shire Council's project to increase community understanding of raised intersections did not result in the adoption of this road safety infrastructure, the engagement process provided valuable insights for the council. The project team learned the importance of further conversations and written support from key community groups before investing officer time in project preparations and design.

Another key learning in this practitioner led exercise is the need for random sampling rather than a call for opinion. This is because a call for opinion brings forth the extreme views rather than the general popular view.

WSC is currently in discussions with another township regarding a similar proposal on a smaller scale, where the key community groups are supportive of further traffic calming infrastructure. The findings of this project demonstrate that by addressing community concerns and providing evidence-based information, local councils can increase community acceptance and adoption of road safety infrastructure. The project provides a blueprint for future engagement efforts, and the council's ongoing commitment to community engagement and collaboration is a vital step towards improving road safety for all.

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Trail bike safety project evaluation

Kenn Beer[a], Katherine Hill[b], Tana Tan[a] and Justin Lu[c]

[a] Safe System Solutions Pty Ltd, [b] Department of Energy, Environment and Climate Action, [c] Real Time Traffic

Abstract

The Victorian Department of Transport and Department of Energy, Environment and Climate Action have commissioned the Gippsland Trail Bike Safety project to reduce off-road motorcycle rider trauma, illegal riding, and environmental damage, and to improve off-road riding skills and emergency responder access. Safe System Solutions Pty Ltd is evaluating the project's effectiveness in improving rider safety, behaviour, crash severity, emergency services response, noise pollution, and environmental impact. Pre-implementation phase findings indicate that most riders are aged 25 to 54, over 60% are unaware of the project, and most prefer a mix of trail types with technical trails preferred over fast trails. Rider speed data shows that average speeds range from 6.78km/h to 20.34km/h for enduro motorcycles and 32.3km/h to 34.3km/h for adventure motorcycles. Maximum speeds were 104.1km/h for enduro motorcycles and 115.7km/h for adventure motorcycles. This paper presents the pre-implementation evaluation results, including rider surveys, speed data, GIS data, and behavioural insights.

Introduction

The Victorian Government has commissioned the development and implementation of a world first dedicated trail bike track which aims to attract and meet the needs of trail bike riders as well as reduce serious and fatal injury. The Neerim East Trail Bike Safety (NETBS) project, aims to:

- Decrease riding on illegal and unmaintained network by encouraging riders to use the newly constructed trails.
- Improve rider off-road riding skills.
- Reduce the number of crashes.
- Reduce crash severity.
- Improve emergency responder access to crash site.
- Reduce noise pollution for the residents in the area.
- Reduce environmental damage.

Safe System Solutions Pty Ltd has been engaged by the Victorian Government to evaluate a number of aspects of NETBS.

Method

The following items were evaluated as part of the pre-construction of trails phase of the project.

- New trail awareness & rider safety and skills. This was perfomed via a rider survey.
- Riding area and speed changes. This was performed via GPS tracking.
- Rider crash and crash severity changes. This was performed via crash data analysis.
- Emergency services response and access. This was performed via a focus group discussion and survey.

Figure 1: Trail bike riders with GPS attachments to monitor their locations and speed in the Neerim East area

Results

The key findings from the pre-construction phase are:

- From the review of TAC crash data, the authors identified 9 serious injury crashes that occurred between 2015 to 2019, inclusive, and no fatal crashes. There was also a total of 124 crashes that resulted in no to moderate injuries in the same period.
- Most riders are between the ages of 25 and 54 years.
- Over 60% are unaware of the NETBS but only 10% wanted to receive project updates.
- Most riders are supportive of this project.
- Most riders prefer a mix of trail types with technical trails preferred over fast trails. They also indicated that technical challenges were more important to them than being able to travel at speed.
- From the rider speed data collection part of the project, it was found that the average rider speed is between 6.78 km/h and 20.34 km/h for enduro motorcycles and 32.3 km/h and 34.3 km/h for adventure motorcycles. It is noted that the adventure motorcycle riders did ride on some sealed roads thus allowing them to achieve average speeds above 30 km/h.
- The maximum speed was 104.1 km/h for enduro motorcycles and 115.7 km/h for adventure motorcycles. It is noted that the adventure motorcycle riders did ride on some sealed roads thus allowing them to achieve maximum speeds above 110 km/h.
- From the emergency services workshop and survey, it was found that locating a crash victim is currently difficult and can take up to 2 hours to locate a victim. Accessing the crash victim is moderately difficult to somewhat difficult taking up to 1 hour. Extracting crash victims has also been identified as difficult and can take up to 1 hour.
- Noise pollution survey and environmental impact survey key findings will be added to this report by DEWLP once their data collection is complete.

The above findings will be compared the post-construction survey and data analysis results in the 12 months to 48 months post-implementation to determine if the aims, as mentioned above, have been achieved.

Conclusion

The NETBS project aims to reduce serious and fatal injuries, improve rider skills, reduce environmental damage, and noise pollution, among others. The pre-construction evaluation found that most riders support the project, prefer a mix of trail types with technical trails being more important than speed, and travel with average speeds ranging from 6.78 km/h to 34.3 km/h.

Understanding factors contributing to crashes in Recreational Vehicles (RVs)

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Abstract

Recreational vehicles (RVs) are vehicles or trailers that can be used for accommodation and travel. The demand for RVs in Australia has increased in recent years. Despite the increase in RV travel, there is little national or international research on the safety of RVs. This gap in knowledge is of concern given recent reports of RV crashes and improper usage (such as exceeding the vehicle weight limit). This study is part of an overall program of research that seeks to understand more about RV safety and the factors which contribute to crashes and near-misses. Ultimately, this research seeks to inform the development of a range of awareness raising initiatives that address RV safety. This presentation focuses upon the design and results of the first of three studies; a study based on analyses of secondary data.

Background

Whether it's the increased visibility of "van life" influencers promoting low-cost RV holidays or the need for a domestic alternative to international travel brought about by the pandemic, the demand for recreational vehicles (RVs) in Australia has increased in recent years (Cruisin' Motorhomes, 2020; IBISWorld, 2021). Despite the increasing interest in RV travel, there has been little research conducted on the safety of RVs (Wu, 2014). This lack of research has become increasingly noteworthy during recent years, as media coverage surrounding RV crashes and improper practices has increased (Mongolis et al, 2022; Murphy & Loney, 2022).

The project intends to address this lack of research on RV safety by exploring which factors may increase the likelihood of RV crashes and near-misses. The findings will be used to help inform and develop an educational intervention intended to improve RV safety outcomes. RV in this context refers to both driven vehicles (such as motorhomes and campervans) and towed vehicles (such as caravans and camper trailers).

Method

In Study 1, analyses of three secondary data sources were conducted. First, crash data obtained for the period 01 October 2011 to 31 December 2020 from Queensland's Department of Transport and Main Roads were analysed. Data were also obtained and analysed from an online survey of 2,880 club members in 2020 and 2021, and interviews of 357 club members who had experienced a crash or near-miss in 2020 conducted by the Campervan and Motorhome Club of Australia (CMCA). The purpose of this study was to determine the crash rate of RVs, as well as the factors associated with RV crashes and near-misses.

Results

Overall, the findings revealed that the crash rate of RVs was unable to be determined from the crash data. This was due to issues with the classification and recording of RVs in these data. The CMCA survey data offered some insight into crash rates of their members, revealing that approximately 5 percent of the 2,880 participants had experienced a crash in their RV. Although only a few participants reported having experienced a crash in their RV, a large proportion (n = 1, 990, 66%) indicated that they had experienced poor or risky behaviour from other drivers. Several factors associated with RV crashes were identified from the CMCA interviews about crashes and near-misses, with animal hits, road hazards and overtaking being the factors proportionally most likely to result in a crash or near-miss when they occurred. The interview data also indicated that while these factors were proportionally more likely to result in RV crashes, participants perceived them to be of lower risk compared to other factors.

Conclusion

While Study 1 was unable to provide the sought-after clarification regarding the extent and nature of crashes and contributing factors, the results were able to offer some insights. Within this overall program of research, a further two studies are proposed including a large-scale survey of RV users, the findings of which will help inform an educational intervention regarding RV safety.

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kiThe age of digital media to influence young drivers

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Abstract

In response to the overrepresentation of young people involved in crashes on Queensland roads, the Department of Transport and Main Roads (TMR) road safety education program, StreetSmarts, developed a digital strategy to reach young people through the language and social media channels they use every day. StreetSmarts still employs traditional social media, such as Facebook, however, this channel is now used to reach Generation X and Baby Boomers. StreetSmarts develops messaging for young people through TikTok, Reddit, Snapchat and programmatic audio channel, Spotify. StreetSmarts undertakes market research surveys and focus groups to ensure the behaviour change messages are delivered in a way young people find engaging, using humour and music to get important road safety messages across. In six months, the StreetSmarts digital strategy has recorded nearly 8.5 million views across TikTok, Reddit and Snapchat, while messages have been heard by more than half a million young people on Spotify.

Background

Road safety education is an important element of TMR's Queensland Road Safety Strategy which, based on best practice, recognises that education forms part of a holistic integrated approach to tackle road trauma that includes policy, regulation, enforcement and engineering.

In 2022, after a spike in Queensland road deaths, with 275 lives lost in 2021 and 278 in 2020, StreetSmarts developed a digital communications strategy to help deliver behaviour change messaging. The strategy targets Queenslanders with a special focus on young drivers aged 17-24. TMR crash data shows that when a driver first goes from their L-plates to their P-plates, they're six times more likely to be involved in a serious crash (TMR, n.d. a). In 2021-22, young adult road users aged 17-24 represented 19.2% of road fatalities and 21.7% of road casualties. Yet TMR data shows that young drivers only make up 11% of the population (TMR, n.d. b).

Reaching young audiences has always been difficult and it's increasingly challenging with ever-evolving social media platforms. Generation Z are at the forefront of engaging with the internet across all facets of their lives, switching off from traditional media in favour of a range of digital platforms and environments.

StreetSmarts digital strategy

Since its inception, StreetSmarts has been delivering road safety messaging through inspirational and entertaining content to elicit road safety behaviour change. The digital strategy is a new 24/7 approach, designed to talk to young people through TikTok, Reddit, Snapchat and Spotify. Content is developed bespoke to each channel to ensure it resonates well with the younger audience. Focus groups were held with young people to develop the new approach, ensuring the right messages were being presented appropriately.

From mid-July 2022 StreetSmarts started delivering behaviour change messaging on the new channels, using humour and music to get important road safety messages across. Quarterly independent surveys of 1,000 social media users, demonstrates that this approach is resonating well with the younger audience, with recall of social media content higher amongst 17-24 year olds (Footprints Always On, n.d.). TMR holds online focus groups three times per year to gauge the effectiveness of posts and to develop future digital content.

Results of the strategy

TMR, through StreetSmarts, was one of the first Queensland Government departments to start using a mix of new channels to reach young people, and the strategy has proved very effective in engaging with young people about road safety to encourage positive behaviour change. In just six months, StreetSmarts recorded nearly 8.5 million views across TikTok, Reddit and Snapchat, while messages have been heard more than 1.7 million times by close to 700,000 young people on Spotify. Quarterly independent surveys of 1,000 social media users shows that messages resonate well with 17-24 year olds, with 73% recognising a post and 83% changing their behaviour after seeing a post (Footprints Always On, n.d.).

Next steps

StreetSmarts is looking to develop its digital strategy by expanding its programmatic audio messaging and engaging influencers and exploring new channels to further promote road safety messages to young people.

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Footprints Always On (n.d.) Market Research Report July-September 2022 – 1st Quarter of the New Always On Digital Strategy

Improving driver compliance with roadwork speed limits on the M1

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Abstract

The M1 Pacific Motorway connecting Sydney with Newcastle is a heavily trafficked high-speed road. Roadworks, incident response, and related activities place M1 workers at risk in a live traffic environment, often requiring reductions in posted speed limits. However, similar to other roads, poor compliance with reduced speed limits is a substantial and persistent problem on the M1. To address this important safety issue, this research identified the best practices across the globe in improving driver compliance with speed limits and provided specific recommendations for the M1. Utilising information from a range of sources, including the literature, documents related to the M1, interviews with 44 roadworkers, and consultations with 6 international roadwork safety experts, this paper presents recommendations for improving driver compliance on the M1. Compliance may be improved through a number of measures, including increased use of electronic, dynamic and variable message signs, camera-based enforcement and increased police presence, among others.

Background

The M1 Pacific Motorway between northern Sydney and Newcastle carries approximately 92,000 vehicles over a length of 129km in a high-speed environment. In this road section, 473 crashes were reported in 2019 – 2021 which resulted in 355 casualties, in which 31.5% were either killed (2.5%) or seriously injured (29.0%) (NSW Government, 2022). With regular activities happening on the M1 including maintenance, repairs, incident response, and road and roadside inspections, roadwork sites are often set up on the M1 with reductions in posted speed limits. Although previous research produced mixed findings on whether work zones influence crash rates (McClure et al., 2023), driver compliance with work zone speed limits is generally poor, resulting in high crash risks to workers (Blackman et al., 2020; Debnath et al., 2015). To investigate the best practices for improving driver compliance and to develop targeted recommendations for the M1, a research project was undertaken in partnerships among Deakin University, Transport for New South Wales (TfNSW), and iMOVE CRC. This paper presents findings specifically on driver-related hazards and associated solutions to improve safety outcomes.

Method

In a multi-stage methodological framework, the common hazards on the M1 were first identified through a review of documents specific to the M1 (both public and internal documents used by TfNSW) as well as interviews with 44 roadworkers. These interviews were transcribed and thematically analysed using NVivo. A review of the literature and consultations with 6 international roadwork safety experts were undertaken to identify the best practices. Subsequently, the recommendations for improving driver compliance on the M1 were developed by undertaking a gap analysis of the best practices and current practices on the M1.

Results

Poor compliance with work zone speed limits is a substantial and persistent problem on the M1 as elsewhere. This emerged as a major theme in the analysis of worker interviews and in at least some cases is related to other behavioural factors such as inattention, fatigue or sleepiness, and impairment (Figure 1).

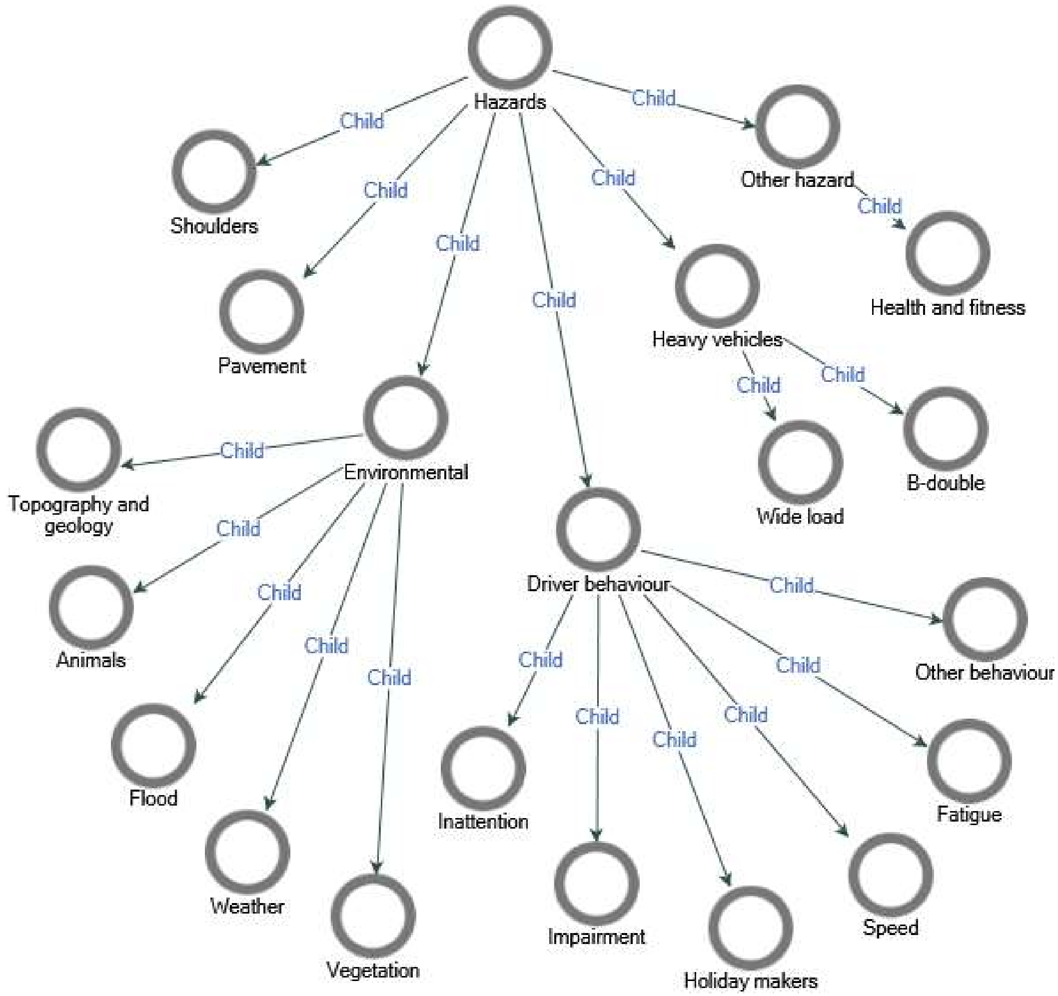

Figure 1. Coding structure for worker-perceived Hazards on the M1

Table 1. Potential solutions to improve work zone speed limit compliance

Solution	**Likely to improve driver compliance**
Increased use of variable message signs (VMS)	Yes
Variable speed limits (VSL)	Yes
Speed feedback signs	Yes
Vehicle-activated warning signs	Yes
Work zone speed cameras (automated enforcement)	Yes
Increased police presence	Yes
Queue warning systems (QWS)	Yes
Temporary portable rumble strips (TPRS)	Yes
Errant vehicle warning systems	Potential
Radio messages/alerts	Potential
GPS information (e.g. Waze, Google maps)	Potential
Awareness campaigns/driver education	Potential
CCTV monitoring	Potential

A summary of the recommendations for improving driver compliance on the M1 is presented in Table 1. These include the increased use of variable message signs (VMS), variable speed limits (VSL), speed feedback signs, camera-based enforcement, increased police presence, queue warning systems (QWS), and temporary portable rumble strips (TPRS). Some of these measures, such as VSL, QWS, and increased VMS may specifically help to increase perceived credibility of work zone speed limits, noted as a significant issue in expert consultations and the literature. Other measures to address inattention, impairment, fatigue and sleepiness may also assist in improving compliance. Results showed that many of these measures were implemented in some form on the M1.

Conclusions

The current research identified poor compliance with work zone speed limits as a prominent behavioural hazard, among a wider range of M1 hazards identified. Identified recommendations, along with those currently used on the M1, have the potential to improve driver compliance with reduced speed limits on the M1.

Acknowledgements

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Can telematics be used to improve young driver behaviours?

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Abstract

Road traffic deaths are increasing globally, reaching 1.35 million in 2016 in comparison to 1.3 million a decade ago (WHO, 2018). Young drivers are disproportionately killed in road traffic collisions in Australia. These drivers are more prone to exhibiting risky driving behaviours, highlighting the need for intervention. Evidence is emerging that in-vehicle telematics and the feedback that it provides can have a positive influence on driving behaviour. This study aims to determine whether behavioural changes in young drivers measured by in-vehicle telematics are reflected in changes in road safety attitudes measured by the Driving Behaviour Questionnaire (DBQ). Drivers under the age of 30 with their own vehicle were recruited and had an in-vehicle telematics device installed into their vehicles. Driving data was collected over a 60-day period. It was expected that road safety attitudes would improve and that these improvements would be reflected in the driving behaviour of the participants.

Background

Drivers aged between 18 and 25 years old are among the most vulnerable drivers on Australian roads and accounted for 21 percent of road traffic fatalities in 2016. (TAC, 2017).

Telematics refers to a system with the ability of capturing real-time data about vehicle usage. The data collected from telematics can be used to better assess a driver's risk. It is typically used to measure acceleration, turning, braking and speed as well as providing locational information.

The study aims to determine whether immediate feedback from telematics regarding driving behaviour is related to improvements in road safety attitudes as measured by the Driving Behaviour Questionnaire (DBQ) and braking behaviour.

Methodology

20 females and 17 males aged between 19 and 28 (mean age: 23.84) were recruited and given a telematics device to insert into their vehicles for the duration of the study. Participants were randomly allocated into 2 groups; an intervention group (n=18) received feedback from a mobile application linked to the telematics device and instantaneous feedback from a light attached to the device while driving during the second month of the study, and a control group (n=19) that did not receive immediate feedback from the light, but did have access to the mobile application. The participant's driving behaviour during the first month was compared to their driving behaviour in the second month in which immediate feedback was given to the intervention group, to determine whether immediate feedback from telematics improves driving behaviour. Participants completed the DBQ, evaluated using a 6-point Likert scale (0 = never, 5 = nearly all the time) at the beginning, after the first month, and after the second month of the study. Preliminary generalised linear mixed models (GLMM) were conducted using a smaller sample size of 11 to determine whether braking behaviour and DBQ scores improved significantly.

Results

The DBQ has provided a reliable measure (alpha = .879) of driving behaviour based on the initial sample of 37 participants, with an average of 21.57 and a standard deviation of 14.97 and a range of 1 to 54, with higher scores indicating worse driving behaviours. An interaction effect between group and period was included in GLMMs for both DBQ scores and braking scores, while age, gender and trip distances were controlled for. There was no significant change in DBQ scores in either group in either month of the study ($F(1,2) = .546$, $p=.546$), while an interaction effect between group and month for braking scores indicated that the braking scores of the control group deteriorated in the second month of the study ($t(2045.54)=-3.1$, $p=.002$), with the intervention group showing no significant change ($t(2037.21)=.836$, $p=.403$).

Conclusions

Preliminary results suggested that there was no significant impact from feedback from telematics on DBQ responses in either study month, however, braking behaviour deteriorated for the control group suggesting that any benefit from standard telematics feedback, without immediate feedback from a light source, is not sustained. Further study including a larger sample is warranted to further ascertain the findings of this study.

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Health in gear: what the data is telling us

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Abstract

The disparity in physical and mental health outcomes between workers in the transport and logistics industry compared with other industries is well established (Lee et al., 2022). Research has found that drivers are more likely to be overweight or obese, experience multiple chronic health conditions and experience greater rates of psychological distress, leading to increased risk of accidents or near misses (van Vreden et al., 2022; Guest et al., 2020). Health in Gear (HiG) is an initiative of the OzHelp Foundation, a national suicide prevention organisation funded by the National Heavy Vehicle Regulator's (NHVR) Heavy Vehicle Safety Initiative (HVSI). HiG was introduced in 2021, with an aim to improve health and wellbeing and road safety outcomes within the transport and logistics industry. OzHelp has partnered with Monash University to evaluate HiG and provide evidence-based recommendations to further enhance the program. This paper will discuss the findings of the external evaluation and the next steps required to enhance the reach and impact of the program.

Background

The HiG program is a leading mental health and wellness program delivered by the OzHelp Foundation to workers in the transport and logistics industry. HiG has been co-designed with input from leading industry experts to address and target industry-specific challenges around mental and physical health. The program aims to improve driver health and wellbeing, increasing road safety outcomes through improved fitness to drive, consistent with key priorities of the *Heavy Vehicle Safety Strategy* (NHVR, 2021). The program has five key components which participants can flexibly access, which include:

- **Health and Wellbeing Screen:** Early intervention/prevention health checks led by a qualified Nurse and Wellbeing Support Officer to connect with workers and provide information, support, and facilitate connections to other services.
- **Support and Counselling:** A 24/7 telephone support line - 1800 IN GEAR, and access to free counselling and support from experienced clinicians.
- **Website:** Resources delivering "wellness in small chunks" to improve health literacy.
- **Ambassadors:** To promote the program and encourage help-seeking behaviours.
- **Podcast** series, "Share the Load" where key industry people share their stories.

Phase One of the program was launched in May 2021, delivering health checks to drivers at key roadside hubs across New South Wales, Australian Capital Territory and Queensland. During this phase, 85 truck drivers participated in health screens, with a further 583 conversations occurring.

Phase Two rolled out in 2022 further increasing the scope and reach of HiG to include all workers within the transport and logistics industry. HiG partnered with Coca-Cola Europacific and Coles to deliver the program across their warehouses and distribution centres nationally. Phase Two resulted in a considerable increase in the reach of the program with 1,008 health checks completed and an additional 600 conversations held.

Evaluation

OzHelp has partnered with Monash University to conduct an external evaluation of HiG using a mixed-methods design to evaluate health outcomes (surveys) and collect people's experience (interviews) of participating in the program. The interim data set of 910 participants was evaluated in December 2022, presenting findings of lower self-rated general health, larger waist circumference, higher levels of obesity and a greater percentage of smokers, compared to the Australian population. Feedback from interviewees valued the program for its accessibility, knowledge, and approach of HiG support staff and provided ideas for additional resources. Final evaluation report will be completed July 2023.

Next steps

Phase Three of HiG will incorporate outcomes from the external evaluation as well as expanding the reach and impact of the program to include:

- Extend the network of roadside hubs and explore further corporate partnerships.
- Increase social media presence and promotion of HiG.
- Review health outcomes measures and consider implementing one valid measure across all touch points from initial screen through to six-month follow-up.
- Increase the range of health information available to make it more diverse, inclusive, and accessible.

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Zebra crossings at T-intersections: changing the rules for improved walkability

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Abstract

Local governments in Melbourne are installing zebra crossings at prioritised T-intersections to increase certainty for road users and to create a more equitable and safer mobility environment for pedestrians. However, there is complexity in, and poor knowledge of the road rules with which the treatment interacts creating risk that the treatment may have systems level unintended negative consequences for walkability. This study used a survey and expert interviews to test this hypothesis. Results suggest that while these zebra crossings can eliminate the uncertainties at the sites where they are installed, there is also a very real risk that their use at some *but not all T-intersections* could undermine walkability in the neighbourhoods in which they are used. To avoid this we recommend, supported by a recent UK precedent, changing the Australian road rules to require car drivers to give way to pedestrians who are crossing the side roads of T-intersections.

Background

The ability to move between home and places of education, employment, leisure and culture, is an important determinant of health and wellbeing (Lucas, 2012). Active transport, enabled by walkable and cyclable neighbourhoods, is available to the broadest segment of the population and it enables incidental physical activity which provides additional health benefits (Rojas-Rueda et al., 2016). Local governments in Australia are installing zebra crossings at certain T-intersections to improve walkability, including for the elderly and people with disabilities (Figure 1).

Figure 1. Example zebra crossing at a neighbourhood T-intersection

The road rules (2017) state that,

(1) If a driver is turning from a road at an intersection—

(a) the driver is required to give way to a pedestrian who is crossing the road that the driver is entering … and

(b) the driver is not required to give way to a pedestrian who is crossing the road the driver is leaving.

The peculiarities of Rule 353(1), and the community's likely ignorance of it, mean that the treatment is likely to have unintended negative consequences for walkability at the level of neighbourhoods, suburbs and cities (Armson, 2017).

Method

We used a community survey (1162 respondents) to ascertain the community's awareness of the road rules pertaining to T-intersections with and without the zebra crossing treatment. We also used a series of expert interviews (14) to gather opinions of the treatment, the likelihood of unintended negative consequences, and possible responses to them.

Results

A high percentage of community respondents (about 38%) were not aware of the road rules pertaining to T-intersections when no zebra crossing was installed. This percentage reduced dramatically (to 1% and 3% respectively) when a zebra crossing was installed. This suggests that zebra crossings create certainty *at the sites where they are installed*. However, the results also support the hypothesis that the use of a zebra crossing at some but not all sites in a neighbourhood could undermine the existing road rule 353(1)(b) requiring drivers to give way to pedestrians who are crossing the street into which the driver is turning. When experts were asked whether the treatment "creates certainty at other similar sites without a zebra crossing" a majority answered in the negative. This sentiment was reinforced by 135 (of 158) respondents answering in the affirmative to the question, "could the treatment suggest that, at other T-intersections (i.e., without a zebra crossing) drivers do not have to give way to pedestrians crossing the road the driver is turning into". Finally, a clear majority agreed that the rule regarding stop signs should be changed, a finding that is consistent with Flower and Parkin's (2019) finding for the UK.

Conclusions

Consistent with previous research, zebra crossings at the side road of a T-intersection can eliminate the uncertainties implicated by the current version of the road rules at the sites in which they are installed. However, there is also a very real risk that, due to widespread ignorance of the rules and their counterintuitive nature, their use at some but not all T-intersections could undermine walkability more widely. We outline four possible responses to this and make the case for one: repeal Australian road rule 353(1)(b) and require drivers approaching a stop sign to give way to pedestrians crossing the street the driver is leaving. This change would create a 'generalised and unambiguous duty to give way on turning' (Flower & Parkin, 2019) and negate the need for the zebra crossing treatment. It is supported by walking advocates (Victoria Walks, 2020) and is precedented by the same change recently made in the UK (UK Government, 2022).

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Do seatbelts reduce death for pregnant females and their foetus?

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Abstract

This systematic review and meta-analysis examined the evidence on the effectiveness of seat belts to prevent deaths of pregnant females and their foetus following a motor vehicle crash. From the 656 papers identified, 18 studies of real-world crashes were included (n=41,921 pregnant females). A meta-analysis of data from seven studies (n=14,221 pregnant females) showed that wearing a seat belt was generally protective for both the pregnant female and their foetus in a motor vehicle crash. However, when the pregnant female died the foetus also died. Configuration of standard seat belts (three-point, lap belt) across the pregnant abdomen generates load bearing forces that can directly contribute to fatal injury of the foetus in a crash. While modified seat belts for pregnant females have been developed, the safety and acceptability of these devices has not been established through crash tests using a pregnant crash test dummy.

Background

This study is closely aligned with the conference theme of 'Safe travel for all'. Pregnancy is a time of increased vulnerability for injury but typically is not considered in road safety actions. Yet, after obstetric trauma, the leading cause of death for pregnant females and their foetus is motor vehicle crashes (Turner, Job & Mitra, 2021). However, seat belts, the primary device for vehicle occupant protection, are not designed nor tested for pregnant females and their foetus.

In even a moderate crash, a three-point seat belt applies pressure to the abdomen that may injure the foetus, cause pregnancy complications (e.g., placental abruption) or death of the foetus and/or pregnant female (Vivian-Taylor et al., 2012). This study sought to examine the existing evidence from primary studies on the effectiveness of seat belts in preventing deaths of pregnant females and their foetus following a motor vehicle crash. The results of this review has important international implications as currently six countries have seat belt exemptions during pregnancy (Greece, Iran, Italy, Japan, Poland, Spain) (Weiss et al., 2006, Usami et al., 2020).

Method

A systematic literature review and meta-analysis was performed in accordance with the Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) statement (Page et al., 2020). A search strategy was developed using the Population, Exposure/Intervention, Comparison, Outcome (PEICO) framework (Brown et al., 2006) and applied to eight electronic reference databases from the disciplines of biomedicine and transport.

Results

There were 656 studies identified in the initial search. After removing duplicates (n=148) and excluding irrelevant studies (n=318), 190 studies were assessed for eligibility. After the full text review, 18 studies involving real-world crashes were analysed (n=41,921 pregnant females). Most studies were conducted in the United States of America (n=13). Other included studies included one study from each of the following countries: Australia, Canada, Japan, Finland and Kuwait. Of the 41,921 pregnant females involved in crashes, seatbelt use was reported for 19,125 (45.6%). Of the known seatbelt use, most of the pregnant females wore a seat belt (n=15,597, 81.6%) with the remaining pregnant females reportedly unrestrained (n=3,528, 18.4%).In fatal crashes, the main causes of foetal death included placental abruption, direct foetal injury, stillborn and uterine rupture. Studies with fatal foetus outcomes reported that there was an association with incorrect seat belt use by the pregnant female (Bunai, Nagai & Nakamura, 2000) or the pressure associated with the abrupt deceleration force (Rowe et al., 1996).

Seven studies reported sufficiently disaggregated data on the pregnant female (n=14,221) and their foetus for a meta-analysis to be performed. Results showed that seat belts are generally protective for pregnant females and their foetus as when worn and in the event of a motor vehicle crash the restraint use is protective with a reduction in the odds of death for both the pregnant female (62% reduction) and the foetus (50% reduction). However, there is an interdependence between the outcome of the pregnant female and the foetus which means the probability of foetus death by restraint use cannot be separated.

While there are other elements of restraint systems in addition to the seatbelt that may provide a benefit to pregnant females (e.g., supplementary restraint systems (SRS), pre-tensioners, load limiters etc) the impact of these components were not reported in the literature. Further, there were gaps in the reported data of crash details (e.g., motor vehicle age, crash types) that could not be included in the analysis.

Conclusions

This systematic review and meta-analysis confirmed the evidence that correct seat belt use is generally protective for pregnant females and their foetus in the event of a motor vehicle crash. However, there were cases where a seat belt directly contributed to foetal death. While modified seat belt designs have been developed, no published study was identified on the results of their effectiveness in a crash test using a pregnant crash test dummy (e.g. MAMA-2B) (Kuwahara et al, 2022). Moreover, no standard has been developed specifying a crash test using any kind of crash test dummy to evaluate their safety effectiveness. Such testing is needed and results reported following expert peer-review to determine not only effectiveness, but user acceptability and implementation into the existing and future vehicle fleet. Development of safe restraint systems for pregnant females and other risk reduction strategies including greater education are needed.

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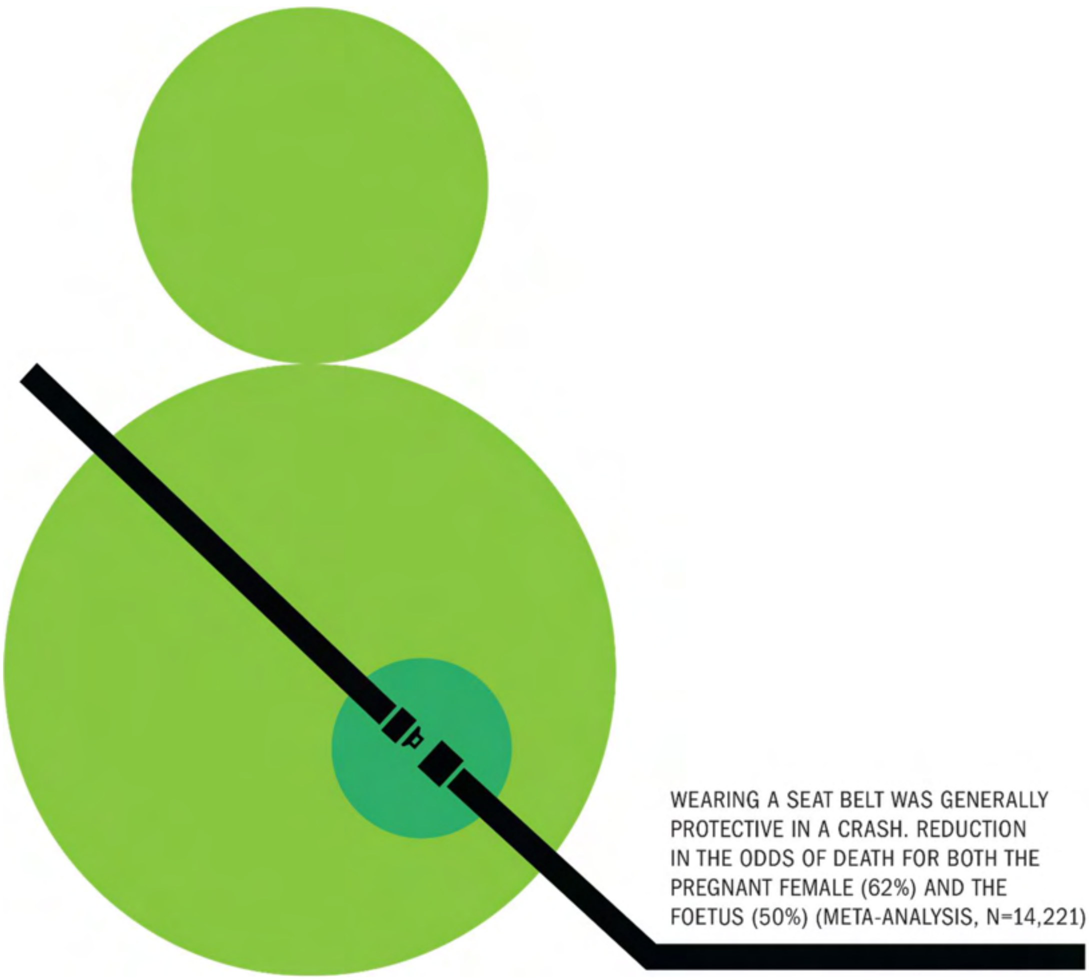

Achieving quality helmets access equity for children in Vietnam

Quyen Bui, Nhung Nguyen, Le Nguyen and Mirjam Sidik

AIP Foundation

Abstract

The situation of child helmet wearing in Vietnam, particularly national standard helmets, doesn't receive sufficient regard. This abstract discusses the development of AIP Foundation's work to increase children's equitable access to helmets and reveals the founding principles of a school-based helmet initiative. Since the first helmet program in 2007, AIP Foundation has used a 3-pronged approach incorporating helmet provision, education and communication campaigns to increase child helmet use and later adjusted to align with the new policy changes. The project's success was demonstrated when the rate of helmet-wearing among target students increased significantly, paving the way for the nationwide helmet distribution to all first-grade students by the government and the reinforcement of helmet regulations across Vietnam.

Background

In Vietnam, road crashes kill more than 2,290 children under 19 each year (IHME, 2019), with nearly half of them suffering head injuries due to low helmet use rates (Ministry of Health, 2009). Although adult helmet use has increased significantly since the introduction of Vietnam's helmet law in 2007 (Pervin et al., 2009), child helmet use remained low at 36 percent in 2014 (Nhan et al., 2017). The fear of neck injury is the primary reason parents do not let their children wear a helmet (Pervin et al., 2009). A study in 2019 revealed another alarming issue: nearly 90 percent of surveyed helmets did not meet national safety standards (AIP Foundation, 2020).

Objectives

AIP Foundation identified one big goal, which is improving children’s helmet use and equal access to quality helmets to prevent injuries and fatalities due to road crashes. Various helmet projects have been developed to address different priorities over time.

- From 2007 to 2017, the overall objective of helmet projects was to increase equity in access to helmets for children in Vietnam.
- From 2017 until now, the priority is to advocate for the use of national standardized helmets.

Program Description

In 2007, AIP Foundation initiated helmet distribution projects for underserved primary school-aged children, including those in less urban areas. The work gradually expanded to children with disabilities. AIP Foundation has worked directly with 925 schools across Vietnam to distribute 202,000 standardized helmets.

About 1.1 million children were educated through these projects. Teachers and parents were also equipped with knowledge of helmet safety to change their perceptions of child helmet use. Additionally, IEC campaigns promoting proper helmet usage and the importance of helmet quality were incorporated to the emphasis on helmet access for children to enhance public awareness.

In 2017, AIP Foundation assisted the Vietnam government in hosting a national review conference to evaluate the motorcycle helmet law’s accomplishments, challenges, and lessons learned after a decade in effect. The meeting outlined next actions and objectives for improving child helmet usage and ensuring compliance with the recently issued new helmet standard, TCVN 5756:2017.

Evaluation and Findings

To measure the program's effectiveness, unannounced filmed helmet observation was applied to capture students' behavior change. The rates of child helmet use increased significantly and varied among project schools, growing from 2-56 percent before intervention to at least 73 percent after interventions. From 2012 to 2021, these interventions potentially saved 938 students' lives across 173 schools that received quality helmet from fatal head injuries.

AIP Foundation's work prompted the government to boost the child standardized helmet use rates and contributed to the distribution of 6 million quality helmets to all first-grade students and the reinforcement of helmet regulations across Vietnam.

Conclusion

These achievements have proven the projects as successful live-saving interventions. In the coming time, AIP Foundation will concentrate on lobbying the government to strengthen laws related to quality helmets and helmet-wearing for children under 6 and further expand helmet programs, including piloting international standardized ECE helmets among high school students.

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Developing a road safety ratings tool for Local Governments

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Abstract

Over recent decades, diverse tools have been developed to support rating the safety of roads using different approaches. However, very few Local Governments in Western Australia use safety rating tools for their road networks. With funding from the Commonwealth Office of Road Safety, WALGA proposed to either adapt or develop a safety ratings tool specific to the Local Government sector. The project involved a literature review of existing tools, consultation with stakeholders, and pilot project and ultimately resulted in the adaptation of the International Road Assessment Program's Star Rating methodology (iRAP, 2014), using a checklist and cross-section-based approach. WALGA developed both a paper-based and electronic tool. This tool will support Local Governments in Western Australia to be proactive in addressing safety on their networks, prioritize their works programs to address roads with significant safety deficiencies, provide a benchmark for safety, and generate clear and concise information on road safety to decision-makers.

Background

Local Government roads account for 128,598 km of roadways in Western Australia, representing 87.2% of the total road network in the state (Main Roads WA, 2022). Of the 8,906 fatalities or serious injuries that occurred between 2016 and 2020, 5,089 or 57% occurred on the Local Road Network (Road Safety Commission, 2021). Local Government roads comprise a vital component of the network. However, evaluations or ratings of the relative safety of these roads based on the presence or lack of safety features are rare. While tools to evaluate the safety of roads do exist, none are tailored specifically to Local Government roads to assist in the identification of network-wide countermeasures and the prioritization of investment.

The aim of this project was to create a new tool or adapt an existing tool to support the assessment of the safety of Local Government roads, using a simple, clear, and effective methodology.

Description of Project

This project was undertaken over five phases.

Literature Review

The first step in the process was to review the existing tools and methods for rating the safety of roads to better understand the methodologies behind the tools and determine what, if any, barriers exist for the use of those safety ratings tools by Local Governments in Western Australia. The literature was reviewed for the International Road Assessment Program (iRAP) methods and tools, including EuroRAP and AusRAP; the Australian National Risk Assessment Model (ANRAM); the Infrastructure Risk Rating (IRR) tool; and the AustRoads Road Stereotypes approach, based on the Network Design for Road Safety (Stereotypes for Cross-sections and Intersections) User Guide and Road Cross-section Design for Road Stereotypes (including Network Safety Plans) and a Safe System document.

The literature review identified that all of the tools reviewed have at least some operational requirements that are likely to represent a barrier to their utilization by some WA Local Governments.

Consultation
In order to ensure that the adaptation of an existing tool or creation of a new tool is tailored to suit Local Government needs, the project team undertook a consultation process, which included the dissemination of a survey, five in-person workshops, and two virtual workshops. The consultation workshops involved a brief presentation to introduce the project, including a discussion of the goals of the project, the organizations conducting the project, and the philosophical underpinnings of the project, followed by a detailed summary of the existing road safety rating tools. The survey analysis provided a picture of the participants' personal experience with road safety and road safety tools, in addition to that provided in the consultation.

Overall, 45 attendees were present at the consultation sessions, with 14 attending online and 31 attending in person, representing 33 Local Governments. A total of 84 participants completed the survey.

The consultation provided excellent feedback regarding what Local Government officers and Elected Members would like to see out of the project. Highlights included: that the proposed tool should recommend treatments, be linked to funding sources, reflect the different road contexts, interface with other tools, provide useful information for Elected Members, and facilitate coordination between Local Governments. Regarding the functionality of the tool, the key emergent theme was that Local Government time, cost, level of expertise, and capacity should be kept to a minimum. Another theme that emerged during the consultation was the need for diverse outputs from the tool, including excel spreadsheets, maps, infographics, and reports, among others.

Tool Development
Based on the feedback from the consultation and literature review, the project team commenced work on a safety ratings tool for Local Government roads. The tool is underpinned by a proactive Systems thinking approach and facilitates the examination of existing infrastructure to understand what constitutes a safe facility. By using iRAP's Star Rating methodology, which is recognized as an internationally recommended standard, the tool is aligned with current best practice in road safety ratings and builds on work already undertaken in the iRAP methodology and AustRoads guides.

To tailor the tool to Local Governments and facilitate the assessment of the Local Government road network, the tool uses a cross-section and checklist-based approach, which can be completed with a minimum of time, expertise, and cost. The project team created both a paper-based and online tool to ensure that Local Governments with varying levels of capacity and staff time can be accommodated.

Ultimately, the tool should provide Local Governments with an understanding of their current road network with regard to safety and give guidance on what treatments can increase the safety of the network. Local Governments are encouraged to integrate the outputs of the tool into their investment prioritization and works program development processes.

Pilot Project
Seven Local Governments agreed to pilot the tool on diverse road segments within their jurisdictions. Each Local Government provided feedback on the usability of the tool, suitability of the cross-sections, and level of effort necessary to complete the assessment. Overall, most Local Governments with limited staff capacity found the tool easy-to-use and useful, while Local Governments with more capacity often wanted more detailed outputs. Rural segments were also easier to analyze versus urban segments, according to feedback.

Evaluation

Following the conclusion of the pilot project, the project team assessed all suggested changes and revisions and presented the final draft tool to the Panel of Expert Stakeholders for discussion. This group, brought together for this project, comprised experts in the field of road safety ratings with representation from iRAP, ARRB, and AustRoads along with representatives from Main Roads WA and the Local Government sector. During this phase, the app version of the tool was also developed.

Evaluation and Effectiveness (or Lessons Learned),
As a result of the tool development process, Local Governments will be able to rate their own local road networks and can use this data to inform investment decisions to work towards transforming roads to a safe system standard, ultimately contributing to the prevention of fatal and serious injury crashes.

Conclusions

The development of a safety ratings tool will support Local Governments to use their road funds to the greatest effect with respect to safety and will inform long-term work programs and investment planning processes. Once the road network has been assessed using the safety rating methodology, Local Governments can use the data to as a key safety input into their existing prioritization processes. This will shift the focus of construction and maintenance projects to those areas that are likely to have the highest impact on road safety. Also, such a methodology would provide a measure for benchmarking progress towards a network of safe roads with Local Governments able to repeat the road safety assessment on a fixed schedule to understand their progress. Having a baseline understanding of the network can help Local Governments to undertake strategic network-wide safety improvements and better advocate for funding.

Next Steps

WALGA will continue to refine the tool and market it to Local Governments. If the uptake of the tool allows, WALGA may aggregate the data to support advocacy efforts for road safety improvement funding at the State and National levels.

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Evidence based safety assessment applying UAV and exposure principles

Aaron Campion, Tony Harrison and Fiona Chapman

Urban Connection Limited

Abstract

This paper outlines an approach to quantify risk-based driving behavior observations using a tethered unmanned aerial vehicle (UAV). Video provided bidirectional operating speeds, through the site as well as vehicle lane positioning and near miss conflicts. Applying known biomechanical tolerances to the observed conflict types and speeds, weighted by the observed frequency of occurrence, enabled us to derive the overall safety priority and likely causation. The recorded crash type for all crashes at this site was loss of control on a curve. This approach demonstrated 12% of southbound vehicles left their lane when negotiating the curve. Potentially a major causation factor leading to a loss of control and or head on crash. The overall findings enabled robust recommendations for safety treatments that corresponded with the highest risks that had the greatest potential to result in death and serious injury crashes. Specific recommended interventions were only available through UAV technology.

Background

Urban Connection Limited (UCL) were engaged by Waka Kotahi NZ Transport Agency (NZTA) to undertake an assessment on a rural curve on SH1, Central North Island, New Zealand.
The sites' an out of context curve, with moderate safety concerns, experiencing 1 serious injury crash, 1 moderate injury and several minor injury crashes in recent years. All crashes were loss of control.

NZTA were concerned given the level of freight on this route and wanted to understand cause and appropriate safety interventions.

The remoteness of the area and narrow roadside environment meant immediate roadside observations through traditional methods (in person) were limited. In addition to reviewing recorded crash history, geometric alignment and pavement condition, the team developed a methodology to quantify risk-based driving behavior and speed analysis using video footage obtained using a tethered UAV.

Assessment overview

This assessment followed a normal approach of Conflict Type x Likelihood x Severity of crash. Recommendations were made to either reduce the likelihood or to reduce the severity.

Approach

The UAV survey provided the team with aerial video footage. This was analytically processed, providing bidirectional traffic volumes, speeds, and vehicle classifications. The video was further assessed to capture non routine movements, lane departures, high risk manoeuvres and potential near miss conflicts. Identified conflicts for the site included centreline crossing, running out of the edge line, and overtaking. An overview of the approach and typical outputs are presented in Figure 1.

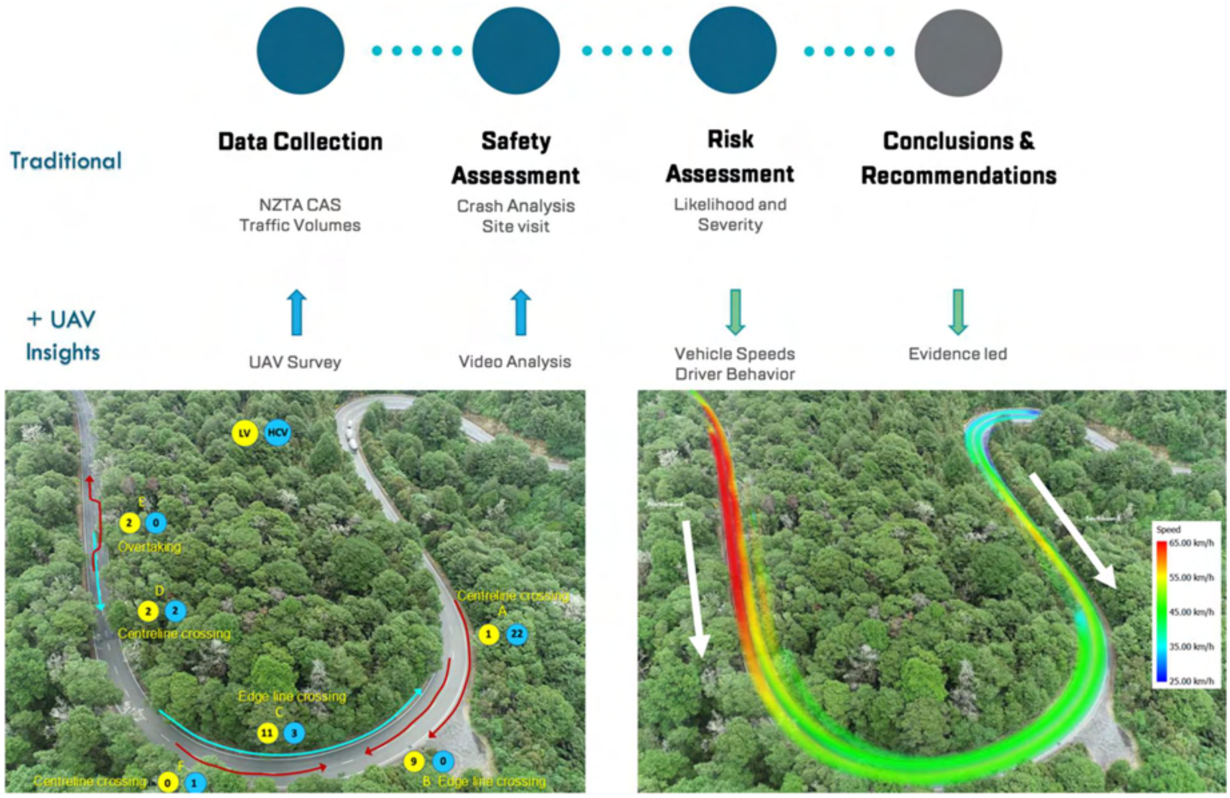

Figure 1. UAV Safety Assessment

The traffic observed during the 4hr survey was presented as a portion of the expected daily traffic. The observed frequency associated with each conflict was then able to be extrapolated to present an estimated daily frequency.

Frequency Ratings, consistent with those in NZ Road Safety Audit Procedures where applied. Ratings applied were infrequent, occasional, and common.

Observed speed profiles were applied to the conflict type, to determine the expected severity should a crash occur. Based on speeds and vehicle types involved, severity was considered likely or very likely.

Table 1. Frequency and Severity Assessment

Conflict	Potential Crash Type	Severity Likelihood (DSI)	Frequency	Rating
A	Loss of control crash due to narrow shoulder (single vehicle crash)	Likely	Common	Significant
B	Head-on crash due to centre line crossing	Very Likely	Common	Serious
B	Loss of Control crash (avoidance)	Likely	Common	Significant
C	Loss of control due to high lip (results in head-on)	Very Likely	Infrequent	Moderate
D	Head-on crash due to centre line crossing	Very Likely	Infrequent	Moderate
D	Loss of control crash (avoidance)	Likely	Infrequent	Moderate
E	Head-on crash	Very Likely	Infrequent	Moderate
F	Loss of control crash (avoidance)	Likely	Infrequent	Moderate

Evaluation and Effectiveness

This assessment demonstrated a significant portion of southbound vehicles were unable to stay within their lane, due to both high speed entry and tight curve radius. This is expected to be a material causation factor in loss of control and potential head on crashes. This enabled specific interventions, being;

- Position of roadside barrier must account for observed lane overrunning, otherwise can inadvertently increase loss of control and head on risk.
- Observed bidirectional approach speeds and comparison with curve design speed supported speed activated warning signs and additional permanent curve warning signage.
- Observed centreline crossing, supported centreline ATP.

Several other recommendations were made through traditional methods and supported with UAV.

UCL use this type of analysis to support a wide range of transport and road safety investigations. It's a very cost-effective method and reduces on site health and safety risks associated with people working in and around live traffic.

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How do you deliver a Programme with Scale and Pace

Aaron Campion[a], Fiona Chapman[a] and Ben Grapes[b]

[a]Urban Connection Limited, [b]Waka Kotahi NZ Transport Agency

Abstract

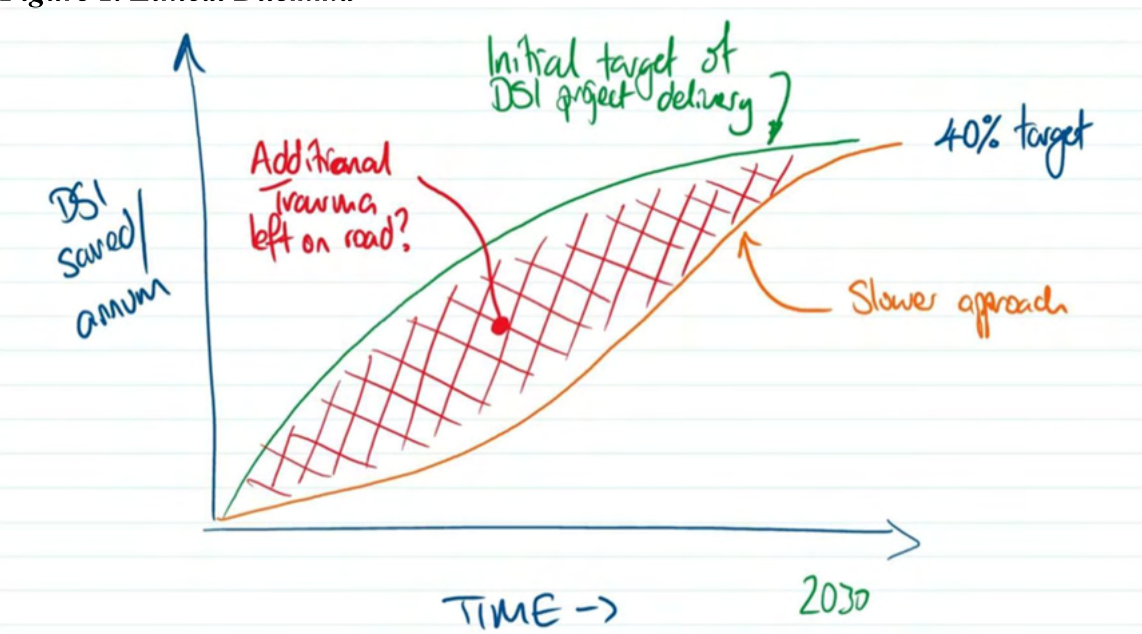
We have a vision of an Aotearoa where no one is killed or seriously injured in our transport system. Road to Zero (RtZ), is New Zealand's road safety strategy, that sets us on a path to achieve this vision. The strategy sets out five critical focus areas, which need to be delivered at scale and pace if NZ are to achieve the levels of harm elimination which are sought. The Speed and Infrastructure Programme (SIP) forms part of one critical focus area (out of five) and has an ambitious scale. Some of the programme's early infrastructure targets are lagging, in part due to underestimating the realistic pace of retrofitting safety interventions on existing transport corridors. This paper summarises the repercussions of delay and key responses that are underway to accelerate delivery and lift performance. While these are specific to this programme's practical challenges, they are transferable insights.

Background

SIP is underpinned by a strategic model which identified 1000's of infrastructure interventions across the network. This model forecasted the initial benefits and preliminary costs of implementing these interventions, ultimately preparing the 'first cut' of an investment package and an ambitious programme of works.

Figure 1 portrays an "ethical dilemma", emphasising the significance of delivering the necessary scale of established safety measures contained within the programme, promptly.

Figure 1. Ethical Dilemma



Median barrier on state highways and local roads formed a large part of this response and outlined a target of 1,000km by 2030. Delivering on this target is falling behind and contributing to the ethical dilemma presented.

Key issues impacting on this are:

- pace of retrofitting,
- utility impacts,
- property acquisition,
- consenting requirements,
- funding mechanisms
- procurement, and
- costs.

These factors where not fully appreciated at the earlier stage of the programme, but now weigh heavy on those responsible for delivery.

Waka Kotahi is executing a plan to recover time through accelerated delivery. Although the full extent of trauma will not be entirely recoverable by median barrier alone, ensuring other supporting treatments are rolled out in conjunction will be key (such as speed management).

Below, briefly describes key actions being implemented to assist accelerated delivery, lift performance, and close the trauma envelop.

Decoupling project elements

Projects have been delayed based on its most complex components which are slower to deliver, dictating the entire delivery pace.

Engineers are rapidly appraising treatment lengths and assessing their viability of construction. The purpose of this is to identify sections within projects that are relatively straight forward and less controversial, which could be progressed quicker.

Pragmatic Design

For the most part, the programme delivers standard safety interventions which are well understood and have been commonly constructed throughout NZ and overseas.

Engineers are identifying repeatable design elements which can be standardized. This includes design details, specifications, design philosophy and procedures. Freeing up limited design resources to focus on the elements which require tailored solution.

Over programming

Over scheduling more barrier sites on the network to allow;
- more non-controversial sites to be advanced if other more complex sites get held up.
- resilience against other external threats impacting on the programme.

Programme funding

Moving away from project-by-project funding to allow more flexibility and agility in delivery including better alignment with planned maintenance and renewal activities.

Long-term Partnerships with Industry

Specialised equipment such as barrier install and linemarking equipment is currently stretched supporting SIP as well as increasing network maintenance. Moving to a long-term partnership with the construction industry provides increased certainty and security to invest in resources to support delivery.

Monitoring Framework

This is a business alignment and change adoption exercise, recognising the challenge of motivating and mobilizing an entire industry and the organisational shifts required. Defining the measures which have the greatest effect on change, adapting and then normalizing this quickly is key to benefit realisation.

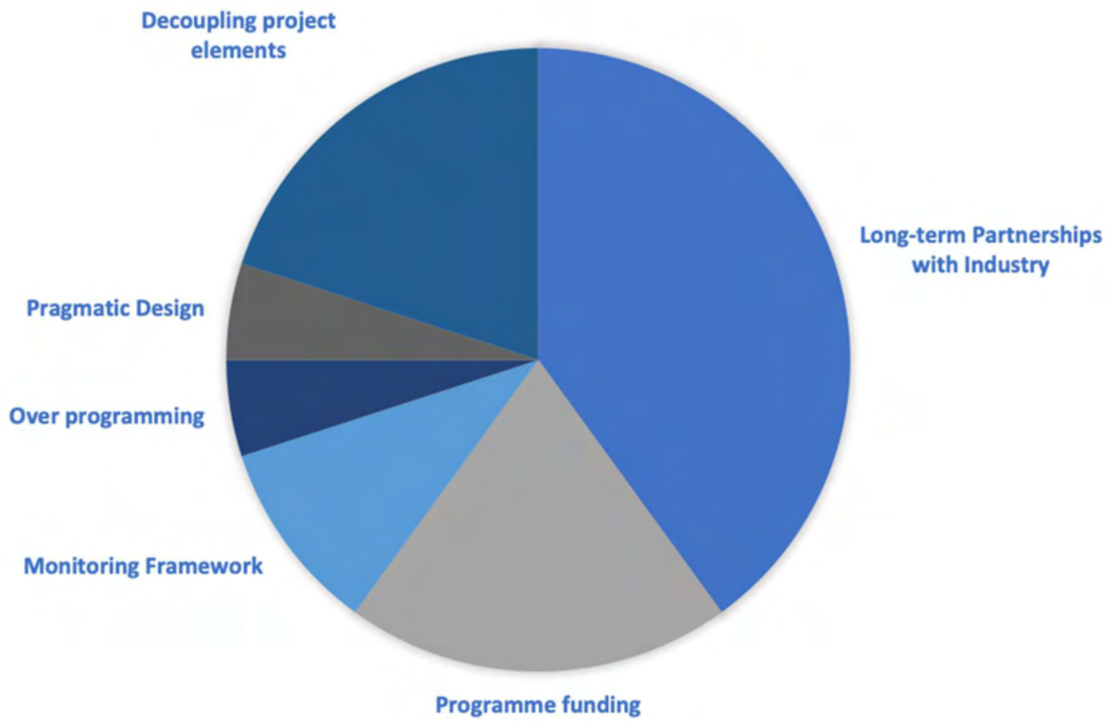


Figure 2. Estimated Performance Effect

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Creating safe road rules for bicycle riders at intersections

Rachel Carlisle and Elvira Lazar

Road SafetyVictoria, Victoria Department of Transport and Planning

Abstract

Road Safety Victoria, in The Department of Transport and Planning have investigated the current left hand turning vehicle and roundabout road rules in relation to bicycle riders. Following observation studies and workshops looking at the relationship between intersection design and road rules a number of road rule amendments were identified. These were then workshopped further with internal and external stakeholders. As a result policy papers have now been developed to propose consideration of road rule amendments to enable and support safer road user behaviours.

Introduction

A review of Cycling Road Rules was undertaken by VicRoads in 2015. Left hand turning vehicles when bicycle riders are going straight ahead and roundabout road rules were recommended for further investigation after being identified as causing confusion for some road users. Subsequent work was undertaken on left hand turning drivers, when bicycle riders are going straight ahead, and roundabout road rules during 2017 to 2022 to see if rules could be improved to aid bicycle rider safety.

As a result of this research and consultation, a number of possible amendments were identified. In addition, the need for improved community understanding of a number of rules became evident.

Method

A number of steps were undertaken to try to understand what improvements could be made to the Victorian road rules:

- A multi-stakeholder workshop bringing together a variety of key stakeholders to discuss what changes could be made
- A specific multi-stakeholder workshop on left hand turn (LHT) road rules
- Literature reviews (LHT and Roundabout)
- An initial observation study (LHT)
- A more extensive observation study (LHT)
- Workshops to examine innovative and future infrastructure design and how the road rules would need to be amended to work well together (LHT and roundabouts).
- A series of stakeholder workshops interrogating and validating the outcomes of the infrastructure design/road rule workshops suggested road rule amendments (LHT, roundabouts and sharrows)
- Development of policy considerations to explain the behaviours needed to improve safety, and the related road rule implications these have (LHT, roundabouts and sharrows).

Results

It was clearly identified that behaviours required to negotiate particular types of infrastructure design need more clarity and new design features such as pop-up bike lanes, bike lanes to a stop line, bike lanes through an intersection, require attention to detail regarding road rule application and the need to update descriptions to better reflect new infrastructure on the ground.
As a result of this process, a number of changes were identified relating to left hand turning vehicles, roundabouts and the use of sharrows. These involve the possible amendments to current

road rules, the creation of new road rules and the need for news communications so that road users understand the meaning of road rules that need to continue to exist but are poorly understood. Policy options were developed to provide consideration for road rule amendments based on the research findings. These options are currently being considered.

Conclusion

This process aimed to review and investigate whether certain road rule amendments could add clarity and safety to left hand turning vehicles, the use of sharrows[3] and roundabout scenarios, where drivers and riders can be in conflict. A number of proposed changes have been developed for review, the outcome is yet to be determined.
The potential road rule amendments identified could lead to better clarity and understanding of cycling behaviours required in different infrastructure scenarios, which in turn could lead to improved safety for bicycle riders and drivers alike.

[3] A sharrow is a bicycle symbol with a double chevron on top of it and it is applied to the pavement surface and has a number of meanings from an engineering perspective.

Keeping vulnerable road users safe during construction periods

Rachel Carlisle and Elvira Lazar

Road SafetyVictoria, Victoria Department of Transport and Planning

Abstract

Major Transport Construction in Melbourne, Australia has been at an all time high for the past 10 years, with over 100 level crossings removed, underground railway networks being extended and new freeways planned and under development. These construction projects result in a significant increase in haulage – whether removing spoil or carting other materials. The *Construction Truck and Community Safety* project was developed to address this change in fleet mix on Melbourne's roads in order to aid vulnerable road user safety during construction periods. A multi-stakeholder effort was made to develop suitable resources to address how increased truck movements could keep vulnerable road users safe. The mechanism of contract clauses was used to leverage the change needed. Implementation is ongoing with the help of a reference group supported by Road Safety Victoria within the Department of Transport and Planning (DTP).

Introduction

The need to protect vulnerable road user from truck movements is well accepted as any interaction between the two is likely to be catestrophic for the vulnerable road users, due to the size, weight and long braking distance of most trucks.

This project aimed to look at countermeasures that the construction industry could adopt to mitigate against the potential impacts of a fleet change on Melbourne's roads caused by significant increase in truck movements.

The expertise of a steering group that included the Directors of Safety for the Major Transport Construction Projects as well as other key stakeholders and multi-stakeholder working groups was harnessed to develop a number of resources to educate and encourage practise change. These were then echoed in the developemnt of model contract clauses that can be embedded in construction contracts.

Method

A steering group was set up and this was followed by a multi-stakeholder forum in late 2016. This led to the development of a number of multi-stakeholder working groups to push forward with an action plan developed at the forum. These groups met several times over a 3 year period and developed a number of key resources:

- Truck standards guidance
- Driver training
- Human Impact Route Assessment (HIRA)
- Safety Essentials: Accommodating Pedestrians and Bicycle Riders at Temporary Road Works.

All resources are available on the VicRoads website.[4]

Contract clauses embedded in construction contracts were used as a lever to increase the uptake of these new ways of working. The truck standards and truck driver training were the first clauses to

[4] Road Safety Victoria 'Construction Truck and Community Safety' available on VicRoads web site Construction Trucks and Community Safety : VicRoads accessed on 29/3/23

be implemented, and subsequently the other clauses have become requirements in major transport construction contract tender documents.

A number of major transport contracts have adopted the contract clauses and other transport related construction is now being targeted. This includes DTP regional construction teams and local government, utilities and developers.

Results

Embedding the clauses into model contract shells is a key way to enable the clauses to be automatically embedded into tender documents and ultimately into awarded contracts.

The model contract used in Victoria for commissioning major transport construction projects now includes all the contract clauses created during the development of this project.

The implementation of the clauses has been incremental but once the contract shell included them, they have become an automatic consideration. Local government is now showing an interest and public utilities and the developers are anticipated to follow.

Implementation has been slow in part due to low awareness of the project. DTP is in the process of conducting further industry outreach which will significantly hightened awareness of the project and its best practcse requirements.

Conclusion

This project aimed to create change in the construction industry by improving safety practice in various areas. Major projects have adopted these changes incrementally over time, and the clauses are now included in the model contract for all major projects to consider. This approach is a way of giving more prominance to the needs of pedestrians, bicycle riders and motorcyclists, and how best to keep them safe during construction periods.

Analysis of speeding mitigation through Dynamic Message Signs (DMS)

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Transurban

Abstract

Speeding is ubiquitous across roadways. Mitigation strategies have shown to be effective in reducing speeding, but less is known about Dynamic Message Signs (DMS) as a mitigation strategy. Given that DMS are already installed throughout highway networks, it is a relatively cost-effective mitigation strategy. The purpose of this study is to evaluate the prevalence of speeding along two corridors, Interstate 95 and Interstate 495, in Virginia, USA and test whether speeding related DMS messages, which were perceived as effective in a non-applied study, decrease speeding. Speed data obtained from Microwave Vehicle Detection System (MVDS) sensors along I-95 and I-495 showed that speeding is prevalent across both corridors and has increased in recent years. The preliminary results of this study provide evidence for the usefulness of DMS messages in reducing speeding and contributing to greater roadway safety.

Background

Speeding is the most common roadway violation (Chaurand et al., 2015) and accounts for 28 percent of all fatal crashes (National Center for Statistics and Analysis, 2022). Additionally, speed-related fatalities have increased by 17 percent from 2019 to 2020 (National Center for Statistics and Analysis, 2022). Mitigation strategies for speeding on highways include vehicle activated signs, speed-related messages posted on DMS, speed cameras, and vertical and horizontal reflections (Fontaine et al., 2000; Godavarthy et al., 2017; Sadeghi-Bazargani & Saadati, 2016). Research suggests that both speed display trailers (Fontaine et al., 2000; Godavarthy et al., 2017; Sadeghi-Bazargani & Saadati, 2016) and vertical reflections (Sadeghi-Bazargani & Saadati, 2016) decrease speeding behaviors, but less is understood about the effectiveness of using DMS. Though, Fontaine et al. (2000) found that speed-related messages on DMS decreased speeding in work zones.

Purpose of Project

Given that DMS are already deployed and posting messages is feasible, the purpose of this study is to evaluate the effectiveness of DMS messages on speed mitigation.

Evaluation and Effectiveness

This study evaluated the speeding behavior change on the I-95 and I-495 corridors in Virginia, USA using speed and volume data obtained from MVDS sensors along General Purpose (free) and Express (toll) Lanes before and after displaying a speed-related message on pre-selected DMS for two weeks in May 2023. Eight locations (four northbound and four southbound) were selected on the toll and free lanes based on roadway geometry and likelihood for major congestion. Half of the DMS showed the experimental message, while the other half were used as "control" locations. The message, "Watch out for speeders," was displayed in accordance with the Virginia Department of Transportation (VDOT) recommendations.

The displayed DMS message was intended to cause some cognitive dissonance. Studies show that psychological discomfort cause determination to resolve the conflict (Bran & Vaidis, 2020) and are therefore more effective than traditional messaging approaches. Specifically, messages refocused through the lens of other drivers such as, "be alert for others' unsafe behaviors" and "be ready to react to others' unsafe behaviors" were found to be more effective at promoting safer behaviors (Barragan & Spissu, 2023).

Linear regression models were used to evaluate whether an interaction between condition (control-no message vs. experimental-message) and time (before vs. during campaign) predicted speeding. Preliminary results show that the DMS message caused drivers to significantly decrease speeding on the 495 Express Lanes for the experimental condition, $p < .001$. On the 95 Express Lanes, while speeding increased in all analyzed locations during the campaign (for both control and experimental locations), there was a significantly smaller increase in speeding at the DMS message locations, $p < .001$.

Conclusions and Implications

Dynamic Message Signs are already installed and functional along the I-95 and I-495 corridors making this a cost-effective mitigation strategy for speeding. Reductions in speeding lead to reduced fatalities and serious injuries on the road (Johnston, 2004). This study evaluated the effectiveness of speeding related DMS messages along two corridors in Virginia, USA where speeding is prevalent. The preliminary results of this study suggest that DMS messages, when properly framed, can provide a suitable countermeasure to speeding.

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CLOCS-A – Road Safety Standard for Construction Infrastructure Projects

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Abstract

Construction Logistics and Community Safety-Australia (CLOCS-A) is a national voluntary Standard developed with the primary aim of better managing potential hazards created by the road transport and logistics activities associated with large construction projects. The standard has been collaboratively developed by representatives from industry, government, researchers and community associations. The aim of CLOCS-A is to reduce the risk of road trauma involving construction vehicles whilst improving the efficiency and productivity of logistics. With Australian governments committed to an expected $290 billion in public infrastructure investment over the next 10 years, most of which will be in urban highly populated areas these present hazards for the public — particularly Vulnerable Road Users. This paper outlines the process in developing the CLOCS-A standard, how its inclusion in construction contracts will promote safer heavy vehicles usage, improved driver standards, more effective logistics planning and greater community engagement on road safety initiatives.

Background

The National Road Safety Partnership Program (NRSPP) has been championing Transport for London (TfL)'s Construction Logistics and Community Safety (CLOCS) since 2016. The objective of the program is to ensure the safest construction vehicle journeys and improve the efficiency of their deliveries. Evaluation of CLOCS found a 47% reduction in casualty rate when implementing CLOCS (The Crown Estate, 2018). There are significant differences between Australia and the United Kingdom with regards to regulatory requirements which CLOCS would have to be adapted for to be applied in Australia.

Australia's largest infrastructure construction projects Sydney and Melbourne Metro have both adapted components of CLOCS to their projects to reduce the risk of construction trucks operating on their projects interacting with vulnerable road users (VRUs). Rather than an ad hoc project-by-project approach, the NRSPP established a Memorandum of Understanding and a diverse Steering Group (SG) to guide the adaption of CLOCS to Australia known as CLOCS-A. The standard will be integrated into infrastructure construction contracts providing certainty to industry on requirements and consistent messaging and engagement for communities. The delivery of the standard will be governed, managed and audited through a self-sustaining program.

CLOCS-A features in the National Road Safety Strategy Action Plan 2023-25 and in New South Wales, Queensland, and South Australian road safety action plans.

Method

For the establishment of CLOCS-A to be successful a collaborative, consultative and inclusive method was adopted by NRSPP and the SG. The MoU initially drew together Amy Gillett Foundation, ARTSA-I, Australian Truck Association, Major Transport Infrastructure Authority, Sydney Metro, Transport for NSW, Truck Industry Council and Victorian Department of Transport and Planning which expanded to currently include Acciona, CILTA, HSE Global and McConnell Dowell and a Supporting Partner. These members acted as the leadership and supporting base for making the business case for CLOCS-A and then the development of the standard and all of the supporting operational elements of the program which was made possible thanks to funding from

National Heavy Vehicle Regulator Heavy Vehicle Safety Initiative and the Commonwealth Government. The method for development and delivery involved:

1. CLOCS-A webinar on the business case for adapting CLOCS to Australia with Sydney Metro, Transport for London, Hanson and Amy Gillett Foundation (NRSPP, 2020)
2. SG confirm plan, design, MoU, outputs and required tools
3. Establishment of five technical groups, terms of reference, deliverables and appointment of Chairs.
    a. TG1 Safe Drivers
    b. TG2 Safe Vehicles
    c. TG3 Logistics
    d. TG4 Communications
    e. TG5 Consolidation
4. Planning workshop
5. Technical Group deliverables
6. Draft CLOCS-A Standard, Governance, Design, Auditing and Expression of Interest
7. Draft Standard Workshop and consultation
8. Refine Standard, finalise audit framework, tier assessment tool and supporting content
9. Closing Workshop
10. Hand over program to new host

The project is in the final stages of being developed. Presentation of this paper will provide an overview of the change management and consultative journey in developing the CLOCS-A standard and the sustainable model to underpin it.

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Respect Traffic Controllers Campaign

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Abstract

The NRSPP Respect Traffic Controllers campaign focuses on humanising traffic controllers to facilitate road users' empathy and safe interactions. Each year NRSPP releases a campaign addressing a neglected road safety topic, which is managed and designed by Swinburne University Strategic Communications Interns. The purpose of the campaign is to educate the public on the importance of road safety. Our goal is to minimise abuse directed at traffic controllers as they are here to make our roads safer. Evidence-based research was used to guide the campaign by compiling and reviewing relevant literature. Reviewing the literature revealed that road users disobey road work rules because they don't understand the danger. The campaign utilises these findings to encourage road users to respect traffic controllers.

Background

A key finding from our research surrounding traffic controllers reported that 54 percent of road workers received verbal or physical abuse from a member of the public while working (ARRB, 2023). We found drivers believe they're taking caution and slowing down enough when passing road works (Nilsson & Nyberg, 1997). However, in reality 49.4 percent of vehicles exceed the temporary speed limit of 20 km/h or more (Paolo, 2012).

This led to creating a campaign that brings the issue to light. To build respect for traffic controllers, their voices need to be heard. Sharing their stories about abuse and mistreatment from road users is the most effective way to accomplish this goal. This will allow road users to empathise with traffic controllers and will be a conversation starter to encourage change in the industry. To highlight their issues we interviewed traffic controllers to gain their insights. This demonstrates the road is their workplace and no workplace should be facing abuse. The campaign was launched during Road Safety Week on May 14.

Method

The development of the Respect Traffic Controllers campaign involved four stages:

1. Establishment of industry partner/stakeholder involvement
    a. Brief each partner/stakeholder about the campaign
    b. Agree that partners/stakeholders will provide collaborative feedback/research
2. Content development:
    a. Literature review by Monash University research assistants
    b. Draft fact sheets led by NRSPP's Monash University summer research intern
    c. Peer review of fact sheets
    d. Finalisation of fact sheet and package
    e. Graphic design by NRSPP's Swinburne University Communications Interns
    f. Traffic controllers interviewed for videos
    g. Finalisation by NRSPP steering committee

3. Promotion and release
    a. Respect Traffic Controllers campaign branding and marketing strategy developed by NRSPP's Swinburne University Strategic Communications Interns
    b. Release Respect Traffic Controllers campaign on May 14
4. Evaluation.
    a. Social media analytics and Google analytics

Stakeholder Management

TMAA has kindly contributed to the campaign by providing results from a survey conducted with their traffic controller members. 180 members were surveyed, we used this research in our fact sheets, posters and social media posts. Additionally, Roads Australia and Austroads provided surveys and reports that contributed to the development of our campaign.

Results

The development of the Respect Traffic Controllers campaign involved a package and promotional materials including:

1. Eight fact sheets
2. Ten posters
3. Ten social media posts
4. Eight videos
5. Facilitator guide
6. Promotional guide

Outcome

The Respect Traffic Controllers campaign launched on May 14, 2023 and was very successful on NRSPP's social media. On LinkedIn our 16 posts promoting the campaign had 10,891 impressions, 1,399 video views and 530 reactions. The main outcome was to humanise traffic controllers and highlight their struggles to the public. We encouraged road users to understand the dangers at road works and respect traffic controllers.

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Relationship between eco-driving on fuel consumption and carbon dioxide emissions

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Abstract

In Australia, about 18 percent of carbon dioxide (CO_2) emissions in 2021 were contributed by vehicles (National Transport Commission, 2021). While electric vehicles are options to addressing this problem, they were currently limited by affordability and availability. Existing literature demonstrated the benefits in adopting eco-driving in improving drivers' overall driving behaviour and road safety. This study examined the impact of driving performance feedback from the telematics device on the rate of fuel consumption and CO_2 emissions intensity over a 60-day period in a naturalistic setting. These main findings from this study demonstrated that this extended feedback feature available from telematics device was successful in improving eco-driving, resulting in a lower fuel consumption rate and lower CO_2 emissions intensity. This outcome suggests that in-vehicle driving behaviour feedback can help drivers to cope with the rising cost of living, while also helping the climate and improving road safety.

Background

In 2021, the New Australian Light Vehicles Report acknowledged that Australia is falling behind other advanced nations in implementing policies to drive down carbon dioxide (CO_2) emissions (NTC, 2021). Overall, about 18 percent of Australia's CO_2 emissions in 2021 were accounted by vehicles (NTC, 2021). Over the last decade, the use of in-vehicle telematics has gained popularity because of the improvements in this evolving information and communications technology (State Insurance Regulatory Authority, 2019). Furthermore, previous studies revealed the practice of smooth eco-driving has the potential to lower accident crash risk (Department of Infrastructure, Transport, Regional Development and Local Government, 2009; Naevested, 2022). This study aimed to incorporate this new car technology (telematics) into a naturalistic study setting, to compare the effects of a basic telematics device with an extended feedback telematics device on fuel consumption and CO_2 emissions intensity.

Method

Participants aged between 18 and 30 years with a valid Australian driver licence were invited to join this study between January and December 2022. The GOFAR in-car telematics devices which were adopted for this study have been shown to be effective in improving young drivers' driving behaviour (State Insurance Regulatory Authority, 2019). The basic features of the device comprised the adapter and the GOFAR app, while the extended features of the device included an additional GOFAR Ray, which supports participants with driving performance feedback. All participants were asked to drive with the basic features of the instrumented device for a period of 30 days (Period 1). After that, half of the participants were randomly assigned to experience the extended features of the device (intervention group), while the remaining half of the participants continued with the basic feature (control group). All participants continued to drive for an additional period of 30 days (Period 2) using their allocated devices.

A linear mixed model analysis was conducted to allow for the hierarchical structure of the telematics data, with trips nested within drivers. Separate analyses were performed using the fuel consumption and the CO_2 emissions intensity as the dependent variable, adjusted for age, gender, types of driver licence and residence location, while testing the significance of the Period by Group interaction effect.

Results

A total of 39 and 20 participants completed the first and second 30-day data collection periods. The average age for these participants was 24 years (standard deviation of 2.5 years). More than half of these participants were female (55%) with an unrestricted driver license (67%) and residing in a major city (69%). A total of 3,420 and 1,217 trips were captured for the first and the second 30-day periods, respectively.
The results of the linear mixed model analysis showed there was a significant Period by Group interaction effect for fuel consumption ($Z=-2.22$, $p=.026$) as well as CO_2 emissions intensity ($Z=-2.08$, $p=.037$). No significant main effect for Group as well as the main effect for Period were observed.

Conclusions

In conclusion, this study indicates that the combination of the in-vehicle telematics device and the extended feedback feature (GOFAR Ray) is likely to improve a driver's eco-driving performance, resulting in a lower fuel consumption rate and lower CO_2 emissions intensity. These improvements in eco-driving are expected to also translate into safer driving behaviours for young drivers. This suggests that the GOFAR Ray and similar devices should perhaps be considered for reducing the crash-risk of P-Plate drivers.

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Impact of roadway geometrics on fatal crashes - a retrospective study

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Abstract

Effectiveness of roadway geometric changes in reducing crashes has been fervently debatable. Thus, this study aims to explore the efficacy of geometric design inconsistency on the safety of two-lane road users using a case-control approach. For investigation, 594 km of rural road network was identified and required accident, geometric, pavement and traffic data were collected for five years (2016-2020). For investigation, five different models were developed total fatal, rear-end fatal, head-on fatal, daytime, and night-time fatal crashes and results were discussed based on odds ratio. Comparing with base category, the results indicated that lower curve radius (<200m) increased the odds of total, head-on, and temporal fatal crashes. Similarly, lane width (2.75m-3.00m) proved to be safer than other lane width categories all types of fatal crashes. Considering the impact of shoulder width, the odds of fatal crashes increased with increase in unpaved shoulder width and decrease with paved shoulder width.

Background

Road crashes are prominent causes of unnatural deaths in developing countries. In 2019, the Indian road network observed the third highest number of road traffic accidents (RTAs) in the world, in which about 0.15 million people died and millions more sustained severe and permanent injuries. In 2019, the socio-economic cost of these RTAs was about 1.35% of India's GDP (MORTH, 2019). In past years, road user safety has been significantly improved, but statistical figures reveal that the share of this amelioration is unevenly dispensed among road users. According to (MORTH, 2019) 86 % of crashes resulting from human-related errors, while the remaining 14 % result from erratic road geometrics, adverse weather condition and vehicle design variables. This background demonstrates the importance of the configuration of a road network in assessing safety performance, as these elements impact driver behavior and traffic flow concurrently (Elvik et al., 2009).Thus, in a an attempt to grow this growing body of knowledge and make comprehensive assessment simpler, this study examined the impact of roadway geometrics on fatal crashes on Indian roads using a case-control approach.

Method

Case-control techniques are typically used in an epidemiological sphere to link factors found in a population to a risk of an outcome or a disease. However, its application in the framework of highway safety analysis is restricted (Gross and Donnell, 2011). This method begins with determining the subject with an outcome, defined as a case, and then collating it with a subject without an outcome, known as control. In the case of highway safety performance analysis, a set of road sections is commonly selected to define cases and controls. This study describes cases as a road section where at least one fatal accident occurred during the study period. Similarly, controls are described as roadway sections that remained crash-free during the investigation. Further, cases and controls were randomly matched in 1:2 using AADT, and risk ratios were calculated in SPSS using the COXREG method and were estimated at a 95% CI.

Results and Discussion

The results are discussed on based on odds ratios. Comparing with base variable, value of odds ratio greater or lower than 1.0 might be a risk or protective factor against the crash. Similarly, a value equal/close to 1.0 indicates that odds exposure among cases is the same as the odds of exposure among controls. Thus, exposure is not associated with the crash.

The statistical outcomes of day and night-time fatal crashes, a unit increase in curve radius (>200m) decreases odds of fatal crashes by an average of 11.42% and 13.67%, respectively when compared with straight section. Similarly, lane width (2.75m-3.00m) proved to be safer than other lane width categories for all types of fatal crashes. Considering the impact shoulder width, decreased unpaved shoulder width acted as a protective factor. For instance, (0.00 m- 0.50 m) unpaved shoulder category reduced the odds of night-time fatal crashes by 86.4%, whereas (1.51 m- 2.00 m) category reduced the odds of subject crash by 14.5% only. However, in contrast, decreased paved shoulder width increased the odds of rear-end fatal collisions is 1.6 times more at (0.51m-1.00m) paved shoulder width in contrast to base category. From results it can be concluded that roadway geometrics have significant impact on fatal crash occurrence. Thus, this study may be helpful in standardizing warrants for roadway geometric design.

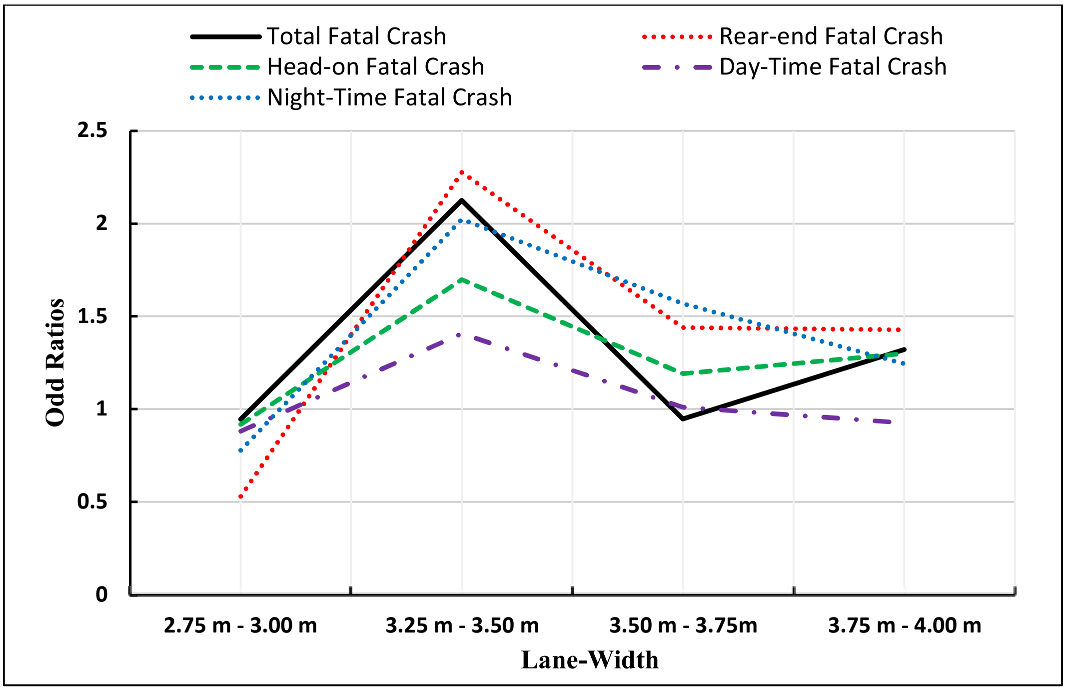

Figure 1. Graphical illustration of odds ratios for lane-width

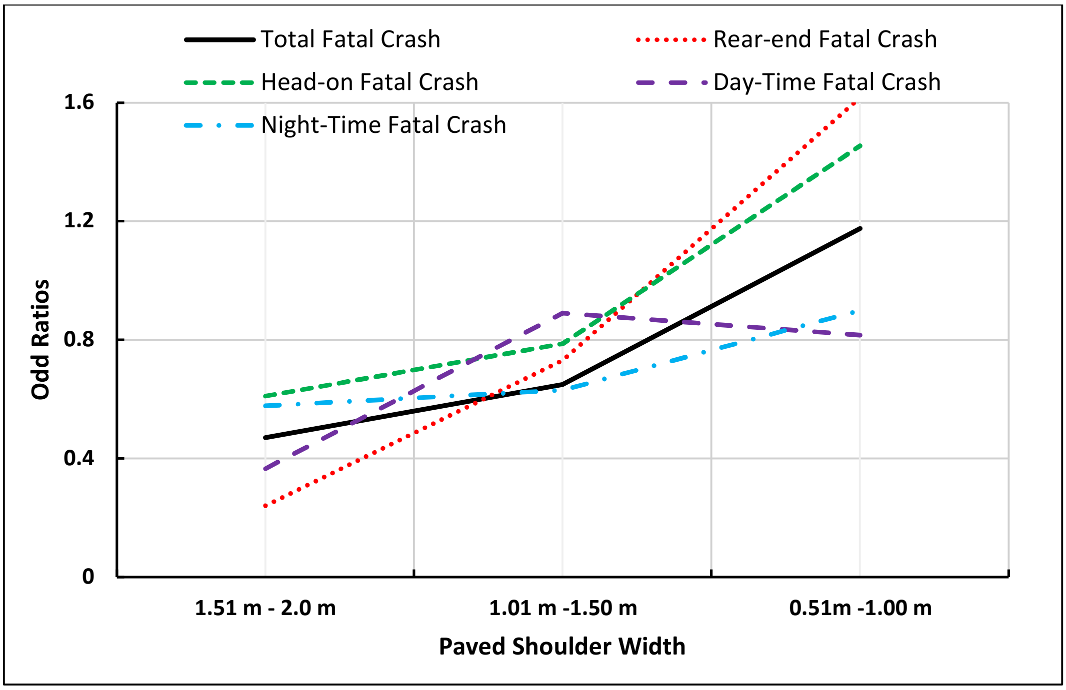

Figure 2. Graphical illustration of odds ratios for paved shoulder width

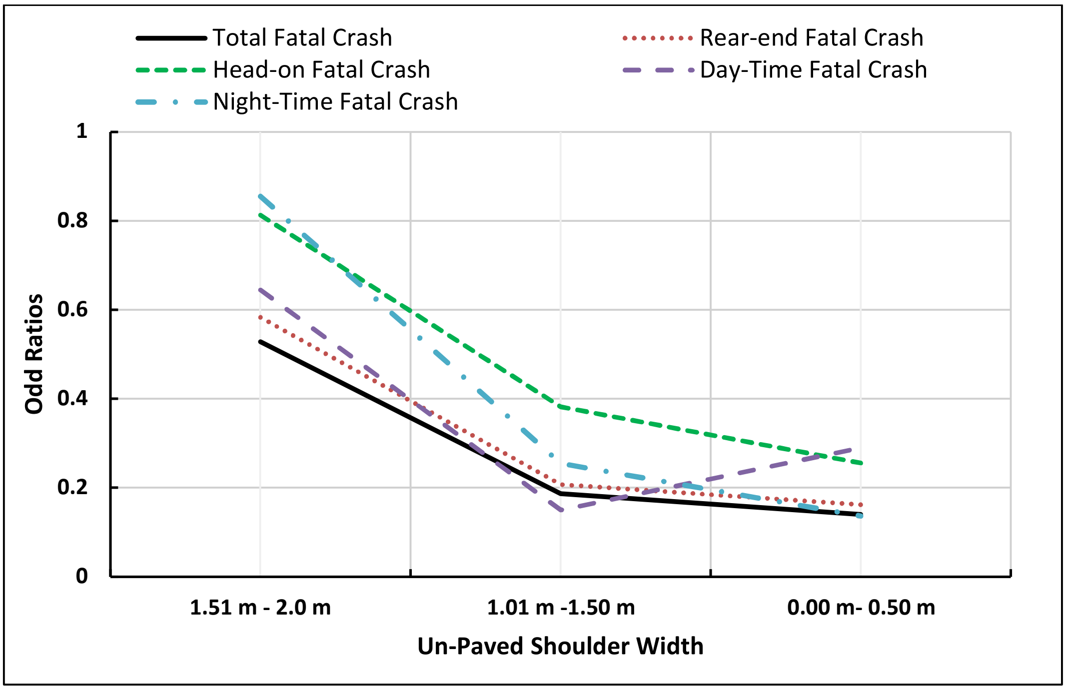

Figure 3. Graphical illustration of odds ratios for un-paved shoulder width

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Documenting a whole of service approach to road safety education

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Abstract

As part of Transport for New South Wales' (TfNSW) Road Safety Education Program, *Kids and Traffic* supports early childhood services in their work with children, families and communities to foster behaviour change to improve safety outcomes. A whole of service (school) approach is widely recognised as an effective framework for road safety education implementation (NSW Department of Education, 2023). This approach embeds road safety into multiple aspects of delivery and stakeholder engagement and results in more impactful and wide-ranging behaviour change interventions. To identify and explore the enablers and barriers to implementing a whole of service approach to road safety education, *Kids and Traffic* have partnered with seven early childhood services. Findings, to be collated and analysed in July 2023, will be shared with early childhood services through the *Kids and Traffic* Program to provide a sustainable framework for addressing local road safety issues in comprehensive, contextualised and effective ways.

Background

Transport related injuries continue to be a leading cause of death in children under 14 years of age in Australia (AIHW, 2022). *Kids and Traffic* is funded by TfNSW and delivered in partnership with Macquarie University. The Program is part of an enduring, shared-governance collaboration with TfNSW, NSW Department of Education, Association of Independent Schools NSW and Catholic Schools NSW. The *Kids and Traffic* Program provides professional learning workshops, educational resources, advice, support and advocacy to early childhood services. The Program supports collaborative grassroots action to prevent child road trauma. In 2022, the Program reached more than 4400 early childhood services across NSW.

Purpose of project

Kids and Traffic partners with early childhood services to drive action at local levels. Services are supported to take a whole of service approach to road safety issues and identify a comprehensive suite of solution-focused strategies suited to their location and community demographics. This approach embeds road safety into multiple aspects of service delivery to ensure ongoing and visible outcomes for children, families and the community. The approach focuses on three key areas:

- partnerships – with families, management, and other stakeholders
- policies and procedures – for example, safe arrival and departures, excursions, and road safety education
- planning and programming – cross-curriculum teaching and learning experiences.

A whole of service approach necessitates involvement of management, educators, families and children leading to a more embedded, impactful and wide-ranging culture of road safety. This project will explore the enablers and barriers to implementing a whole of service approach to road safety education.

Description of project

Seven long day care services are engaged in the project taking place between January and July 2023. Services completed an initial questionnaire, ascertaining the current road safety culture, frequency of inclusion in programs for children and families and existing barriers to implementation. Services identified specific road safety concerns, challenges and opportunities. A similar survey will be conducted at the conclusion of the project. Services have been offered the following *Kids and Traffic* interventions:

- professional development workshops
- policy and procedure consultation
- workshops for families
- workshops for children
- interactive driveway safety display
- resourcing for road safety teaching and learning experiences.

Uptake of interventions is at the discretion of each service and provides possible points of difference to be analysed in relation to enablers or barriers to implementing a whole of service approach. In addition, evidence of implementation is being collected through a *community of practice* portal whereby services share ideas, strategies and supports.

Next steps

Evidence collected will be analysed to determine enablers and barriers to implementing a whole of service approach to road safety. The findings from this small sample will inform more extensive future projects. Evidence and practice examples provide a stimulus for other services to successfully implement a whole of service approach to road safety. Outcomes of the project will be presented at the 2023 Australasian Road Safety Conference, shared widely with early childhood services through professional development workshops, consultations, publications and with TfNSW and education sector partners.

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A 12-month study of cyclist incidents in Australia

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Abstract

Cyclist incidents remain a persistent road safety issue. Existing data on cyclist incidents are limited; consequently, there is a knowledge gap around effective cyclist safety interventions. A mechanism for improved incident data collection—a cyclist incident reporting and learning system (Cyclist Reporting of Incidents Tool; CRIT)—was developed and trialed over a 12-month period across Australia. This study analysed the cyclist incidents submitted to CRIT during the trial. A total of 347 cyclists participated in the study, reporting 135 cyclist incidents from 1,962 hours cycled. The overall incident rate was 68.8 per 1,000 hours cycled, with a crash rate of 11.2 and near miss rate of 57.6 per 1,000 hours cycled. Factors relating to driver behaviour (e.g., non-compliance with road rules) and poor infrastructure (e.g., bicycle lane) were frequently reported to have contributed to cyclist incidents. The findings highlight the utility of self-reported cyclist incident data in understanding and enhancing cyclist safety.

Background

The benefits of cycling are well-recognised; however, to increase cycling participation, barriers to cycling, including cyclist safety, must be addressed. Compared with other road users, cyclists face an increased risk of serious or fatal injury (e.g., Pucher & Dijkstra, 2003; Scholes et al.,2018). In Australia, while there was a reduction of road fatalities in the last decade (2012–21), this reduction for cyclists is substantially lower compared with other road user groups (BITRE, 2022). Cyclist incidents remains a persistent road safety issue.

Existing data on cyclist incidents are limited. Most cyclist incidents resulting in minor or serious injuries are not reported to formal sources, such as police (Shinar et al., 2018; Meuleners et al., 2020). This underreporting means that cyclist incidents are not well understood, resulting in a knowledge gap around effective cyclist safety activities. To better understand cyclist safety and inform crash prevention activities, a mechanism to gather cyclist incident data is required.

Cyclist Reporting of Incidents Tool

A first-of-its-kind incident reporting app for cyclists—CRIT—was developed (McLean et al.,2022), enabling cyclists with a mechanism to report their cycling participation and details of crashes or near miss incidents (see Table 1 for definitions), including factors they perceived to have contributed to the incidents (Figure 1). CRIT was released in December 2021 as part of a 12-month trial This article presents an analysis of the cyclist incidents submitted to CRIT during the trial.

Table 1. Definitions of Crashes and Near Miss Incidents Used in the CRIT app

Incident type	Definition
Crash	A cyclist incident that results in injury or property damage. A crash may involve collisions (e.g., with other vehicles, cyclists, or infrastructure), falls from the bicycle, or animal encounters.
Near miss	A cyclist incident that the cyclist perceived could have resulted in injury, fatality, or property damage, but did not due to chance or an intervention.

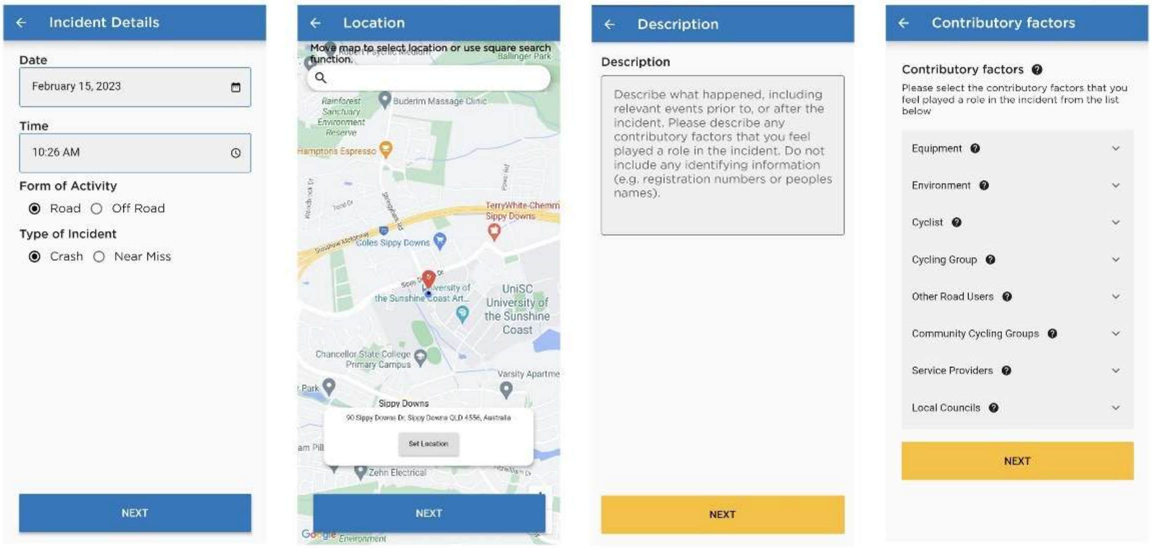

Figure 1. Screenshots from the CRIT app

Method

Cyclists aged 18 years or older, residing in Australia, and who participate in on- and off-road cycling activities, were invited to participate. Participation involved downloading the CRIT app and reporting hours cycled per week and details on any crashes or near misses experienced.

Results

In total, 347 cyclists participated in the study. 135 incidents were reported across 1,962 hours cycled, equating to an overall incident rate of 68.8 per 1000 hours cycled. Of the reported incidents, 22 were crashes (crash rate of 11.21) and 113 were near misses (near miss rate of 57.59). Factors relating to other road users (e.g., driver behaviour) and the surrounding environment (e.g., road infrastructure) were most frequently reported to have contributed to crashes and near misses (Table 2). Factors relating to the broader road transport system, such as local councils: *infrastructure maintenance and repairs* and service providers: *driver education and training* were also reported.

Table 2. Most Frequently Reported Contributory Factors

Crashes	Near misses
Driver behaviour: *Pulling out in front of cyclist* (4)	Driver behaviour: *Non-compliance with road rules* (37)
Driver behaviour: *Non-compliance with road rules* (3)	Driver behaviour: *Failing to give way* (34)
Road infrastructure: *Roundabouts* (3)	Driver behaviour: *Pulling out in front of cyclist* (28)
Surfaces, obstacles, and debris: *Muddy / puddles* (3)	Driver knowledge, skills, and experience: *Situation awareness* (25)
Surfaces, obstacles, and debris: *Slippery* (3)	Cyclist infrastructure: *Bicycle lane* (15)
Weather and climate: *Rain* (3)	Local councils: *Infrastructure maintenance and repairs* (14)
Animal and plant hazard (3)	Driver knowledge, skills and experience: *Knowledge of road rules* (12)
Local councils: *Infrastructure maintenance and repairs* (3)	Road rules: *Passing distance* (12)

Note. Numbers in parentheses indicate the absolute number of times the contributory factor was reported.

Conclusions

Employing a mechanism for data collection of cyclist incidents generated important insights. A key finding is that cyclists perceive drivers and poor infrastructure to have contributed to the majority of incidents. Additionally, similar contributory factors were found for crashes and near misses, supporting the notion that near misses are surrogate measure of safety and can be used to inform crash prevention. Study limitations include potential biases in self-reported data from cyclists only and not other road users. Nonetheless, the continued implementation of CRIT will provide valuable data on cycling incidents to inform safety interventions by various stakeholders across the road transport system. CRIT was evaluated following the 12-month trial, with preliminary analysis indicating that a large proportion of cyclists (including CRIT users) found CRIT to be very effective to extremely effective for identifying cyclist safety issues (67%) and improving cycling safety (53%).

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An evaluation of the effectiveness of user-centred child restraint instructions

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Abstract

Misuse of child restraints is a widespread problem, associated with a threefold increase in risk of serious injury in a crash. Clear and comprehensible instructions supplied with restraints at the point-of-sale is a potentially cost-effective countermeasure to misuse. However, manufacturer-supplied instructions are often difficult for users to understand. Using a randomised controlled trial design, we evaluated the effectiveness of user-centred instructions to promote correct restraint use (defined as no serious errors in use) among 372 parents. Participants were randomly assigned to receive additional user-driven designed instructions (intervention), or only manufacturer-supplied instructions (control) with their restraint. Restraint misuse was assessed six months after commencing use of the restraint. Participants in the intervention group were 1.87 times more likely to be correctly using the restraint than those in the control group (95%CI 1.19-2.93). These results indicate that rates of misuse can be reduced by improving instructions supplied with restraints using user-centred design.

Background

Child restraints are highly effective in reducing risk of death and injury in a crash. For optimal crash protection children must correctly use age-appropriate restraints. Most children in Greater Sydney aged 0-12 years are now using age-appropriate restraints, however, misuse of restraints remains widespread with <50 percent correctly using their restraint (Brown et al., 2022). This is placing many children at three times the risk of serious injury in a crash compared to those using restraints correctly (Du et al., 2008).

In a previous laboratory study, we demonstrated user-centred instructions could reduce restraint misuse compared to manufacturer-supplied instructions (Hall et al., 2020). However, the generalizability of this finding is unknown, as: 1) the laboratory study occurred in a controlled environment, 2) outcomes were measured immediately after exposure to the user-centred instructions, and 3) participants were not limited to parents.

The objective of this trial was to evaluate the effectiveness of user-centred instructions to promote correct restraint use in the real-world, six months after exposure.

Method

We recruited people from Greater Sydney as they purchased either a convertible rearward/forward facing restraint (Type A2/B) or a harnessed forward facing restraint (Type G). On recruitment, participants were randomly allocated to the control or intervention group. The intervention group received manufacturer-supplied instructions and redesigned user-centred instructions. The control group received manufacturer-supplied instructions and generic information on appropriate restraint. For both groups, instructions were delivered in the box with the restraint.

The primary outcome measure was correct use of the restraint as assessed during a home visit six months after the participant commenced using the restraint, with correct use defined in the same way as in our laboratory study (Hall et al., 2020).

We examined differences between groups with an intention-to-treat approach using a chi-squared test and logistic regression to estimate odds of correct use in the intervention group compared to the control group.

Results

In total, 427 participants were recruited and allocated to intervention (n=214) or control (n=213) groups. In-person visits were conducted for 372 participants, representing a 12.8% loss to follow-up. Primary outcome measures were available for 190 participants in the intervention group and 182 participants in the control group. Demographics and factors likely to influence correctness of restraint (e.g., restraint type and use of professional restraint fitting services) remained balanced between groups (see Table 1).

Serious errors were more common in the control group (75.8%) compared to the intervention group (62.6%, p=0.006). Participants in the intervention group were 1.87 times more likely to correctly use their restraint compared to control group (95%CI 1.19-2.93).

Conclusions

The results provide definitive evidence for the effectiveness of user-centred instructions as a countermeasure to misuse. However, the effect size observed in this pragmatic trial was smaller (13.2%) than in our laboratory study (27%). Regardless, a 13.2 percent improvement is a worthwhile effect given we expect a 1 percent reduction in injury for every 1.5 percent reduction in restraint misuse (Du et al., 2010), equating to >8 percent reduction in deaths and serious injury among restraint-aged children in Australia per year.

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Table 1. Participant characteristics

Characteristic	Control Group (n=182)	Intervention Group (n=190)	P
Adult age, N (%)			0.511
25-34 years	74 (40.7)	76 (40.0)	
35-44 years	98 (53.8)	108 (56.8)	
45 years and over	10 (5.5)	6 (3.2)	
Female/male, N (%)	131 (72.0)/51 (28.0)	132 (69.5)/58 (30.5)	0.596
Number of children, N (%)			0.536
1	66 (36.3)	77 (40.5)	
2	97 (53.3)	96 (50.5)	
3	11 (6.0)	13 (6.8)	
≥4	8 (4.4)	4 (2.1)	
Primary language normally spoken at home			0.949
English	148 (81.3)	155 (81.6)	
Other	34 (18.7)	35 (18.4)	
Participant reports prior experience installing a child restraint, N (%)	101 (55.5)	106 (55.8)	0.954
Participant reports partner had prior experience installing a child restraint, N (%)	99 (54.4)	101 (53.2)	0.811
Participant reports use of professional restraint fitting services, N (%)	94 (51.6)	96 (50.5)	0.829
Highest level of education, N (%)			0.761
Primary or Secondary school	8 (4.4)	10 (5.3)	
University undergraduate or TAFE diploma	111 (61.0)	109 (57.4)	
University postgraduate	63 (34.6)	71 (37.4)	
Employment status			0.173
Employed full-time	59 (32.4)	78 (41.1)	
Employed part-time/casual	57 (31.3)	52 (27.4)	
Employed on maternity leave	37 (20.3)	41 (21.6)	
Not employed	29 (15.9)	19 (10.0)	
Restraint type			0.401
Convertible rearward/forward facing restraint (Type A2/B)	61 (33.5)	56 (29.5)	
Harnessed forward facing restraint (Type G)	121 (66.5)	134 (70.5)	

Australia's most boring roundabout, 10-years without even a fender bender

Christopher I. Davis

Vision Zero Australia, Mildura Rural City Council

Abstract

At a gateway intersection leading to Mildura's CBD there's a roundabout that was constructed 10-years ago, built in just 2 days, and cost only $55,000. Its prior crash history reveals one pedestrian fatality, one serious injury, and one other injury, and was disliked by vulnerable road users. Ten years on there's nothing much to say about the intersection. Official data does not reveal any crashes, and locals say they have not seen or heard of any incidents. Adversary of all roundabouts, pedestrians, and bicyclists, also use the intersection with ease and without incident. Hence, if you visit Mildura to see our roundabout functioning, it is pretty boring actually, with nothing much going on except people going about their day safely. As the winner of the 3M ACRS Diamond Road Safety Award 2020, this engaging presentation will detail the innovative design and construction principles that made it Australia's most boring roundabout.

Background

Low Cost Implanted Compact Roundabouts (LCICR) have been constructed by the Mildura Rural City Council (MRCC) at Ninth Street and Pine Avenue (LCICRv1) in 2013 and at Eighth Street and Pine Avenue (LCICRv2) in 2017. Both roundabouts serve as a gateway entrance to Mildura's CBD, and observations from the earlier LCICRv1 design were incorporated into LCICRv2. Data collection also confirmed the operational speed findings of LCICRv1. The two projects combined were submitted for, and won, the 3M ACRS Diamond Road Safety Award 2020.

LCICRv2 does not have traditional kerb outstands for creating the required circulating path curvatures. Instead, carefully placed speed cushions in the intersection approach serve as the primary speed reduction treatment. The spike down concrete-filled roundabout of LCICRv1 was simple to install and allowed heavy vehicles to run their trailers over the structure. However, the spike down roundabout island in LCICRv1 failed four years after installation due to heavy vehicle damage. For LCICRv2, a new in-situ concrete roundabout with innovative construction methods was developed.

Project

The installation of spike down speed cushions was crucial to the project's success. The cushions have three primary functions: to reduce vehicle speed when entering and passing through the intersection, to increase pedestrian safety by slowing vehicles on the approach, and to eliminate the need for significant civil works. The carefully placed speed cushions and additional center segments increase their width to the full lane, serving as the speed reduction treatment, negating the requirement for kerb outstands in traditional retrofit designs.

Conclusion

A safety evaluation by Safe System Solutions Pty Ltd found that the LCIC roundabout's speed reduction measures validated the theory and provided the intended outcomes. The evaluation showed that the 85th percentile speed at the entry to the roundabout was 19.26km/h, significantly lower than the intended outcome of 25km/h. Depending on the entry angle of a standard roundabout, LCIC roundabouts may outperform them in terms of lateral force applied to an impacted vehicle. The evaluation also revealed that there were no crashes at the intersection after the installation of the LCIC roundabout, including minor non-injury crashes based on reports from surrounding retailers. Additional benefits of the LCIC roundabout include significant capital cost savings and fast implementation.

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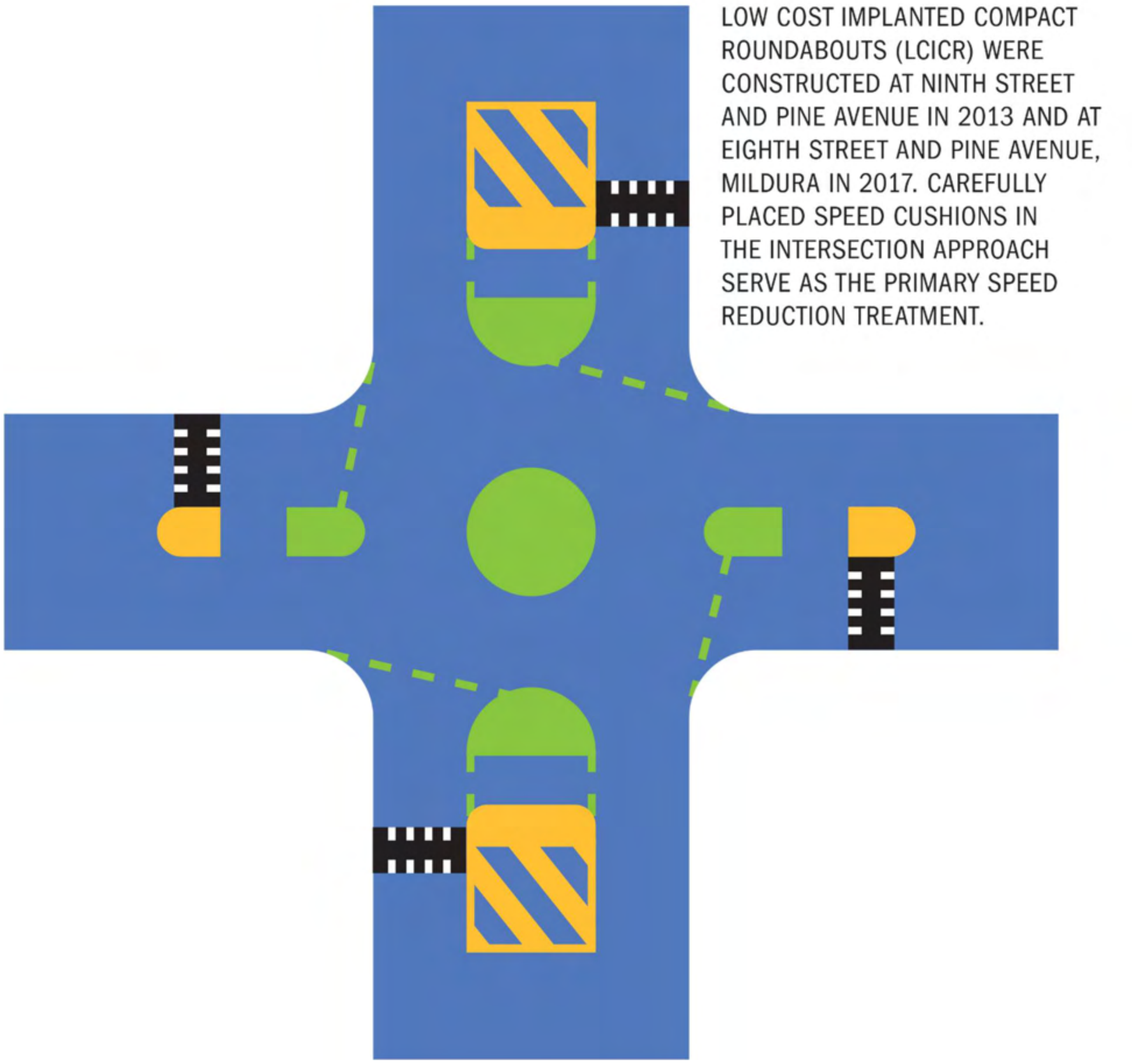


Light Insight Trial (LiT): cycling safety analysis using crowd-sourced data

Ashim Kumar Debnath[a*], Vu Le[a], Alexey Medvedev[a], Wonmongo Soro[a], Chee Peng Lim[a], Douglas Creighton[a], Arkady Zaslavsky[a], Zoran Najdovski[a], Michael Johnstone[a] and David Young[b]

[a]Deakin University, [b]Transport Accident Commission

Abstract

While the safety of cyclists is a key concern for many jurisdictions, unavailability of quality data often hinders generating useful road safety insights. To address this gap, an innovative method of cycling data collection and analysis was investigated in a year-long trial among 1,000 cyclists in Victoria. The trial gathered data from over 375,000 km of cumulative total road length and 19,000 riding hours. Participants reported over 3,000 incidents (crashes, near misses, obstruction) and infrastructure requests. Using a multi-tier privacy protection methodology, the collected data was privacy-protected and analysed in an online dashboard to investigate its ability to generate road safety insights while ensuring data anonymity and privacy. Results from data analysis and stakeholder feedback ascertained that this trial database and the data collection methodology could provide important insights for improving the safety of cyclists.

Background

Crashes involving cyclists pose significant challenges in achieving the 2030 targets of the National Road Safety Strategy. Cyclist crashes is a key safety concern for many jurisdictions across Australia (BITRE, 2015; Baharololoom et al., 2016; Haworth and Debnath, 2013) requiring innovative actions to tackle this important safety issue. A major obstacle in taking effective safety initiatives is the lack of quality data on cycling safety (Watson et al., 2015).

To address this important knowledge gap, an innovative crowd-sourced data collection and analysis methodology was developed and trialled in Victoria through partnerships among the Transport Accident Commission (TAC), Deakin University, See.Sense, and iMOVE CRC. This trial aimed to evaluate the methodology and trial data for developing road safety insights, investigating ways to ensure data privacy, and developing an interactive online dashboard for cyclist safety analysis.

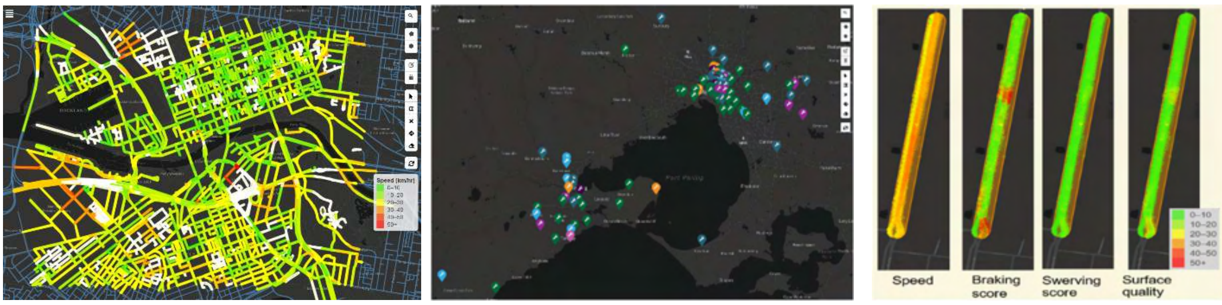
Method

The Light Insight Trial (LiT)—an Australia-first trial of See.Sense's smart bicycle light technology (See.Sense, 2023)—involved data collection from 1,000 cyclists from Melbourne and Geelong, Victoria over a year period. The cyclists were provided a smart light from See.Sense, which can automatically capture ride data using a smartphone app and allow users to provide additional information on their ride, such as incidents, and infrastructure requests.

The collected dataset was processed for de-identification, pseudonymisation, and privacy protection. Advanced privacy protection techniques, such as the application of privacy zones at the user level and the use of trajectory trimming and k-anonymisation processes at the data analysis level, were employed. The privacy-protected dataset was integrated with contextual data, such as the Principal Bicycle Network, Strategic Cycling Corridors, road networks, speed zones, clearways, road elevation, and police-reported crashes. The dataset was processed and presented in a purpose-built online dashboard, which allows users to generate ride and safety metrics (e.g., number of trips, trip timing, speed, braking, swerving, road surface quality, incidents, infrastructure requests etc.) by visualising on the dashboard as well as by exporting summarised data and results for further analysis.

Results

The trial gathered ride data from over 375,000 km of road length and 19,000 riding hours. Cyclists reported more than 2,500 incidents (e.g., crash, close pass, obstruction) and over 750 requests for improved infrastructure (e.g., need for separation, space, width, and calming measures). Analysis of the data via the dashboard (see examples in Figure 1) showed that the privacy protection methodology ensures anonymity and meets the requirements of the Australian De-identification and the Privacy Act (OAIC, 2023).



(a) Cyclists' speed in a selected area visualised on dashboard (b) User-reported infrastructure requests and near-misses (c) Safety metrics at a road section visualised on dashboard

Figure 1. Light Insights Trial Dashboard and functionality

Results indicated that the dashboard provides users flexibility in both spatial analysis (e.g., a road link/intersection, a cycling corridor, one/multiple local government areas) and temporal analysis (e.g., hours, days, months). A total of eight use-cases (see Table 1) were tested and results were presented to a group of road safety stakeholders and road safety experts, who acknowledged that the dashboard and the trial provide significant benefits in generating road safety insights.

Table 1. Example use cases of the LiT dashboard in cyclist safety analysis

Use case	Analysis focus (example analysis questions)
Network analysis	• Does cyclist safety performance vary by types of roads at network level? • Does the connectivity of road network influence cyclists' safety performance?
Infrastructure analysis	• Are there any noticeable differences or correlations between safety performance on separated cycling infrastructure vs. other types of infrastructure? • Are there any differences in safety performance on bike/pedestrian shared infrastructure vs. bicycle dedicated infrastructure?
Localised analysis	• Can the trial data identify high-risk intersections and road sections? • Can the dashboard and data analysis help identify current safety levels/issues at selected intersections and road sections?
Topography analysis	• Does topography make a difference in cyclists' safety performance?
Demographical analysis	• Do cyclists' demographic characteristics influence safety performance?
Efficiency analysis	• How do roads and cycling facilities compare in terms of travel delay experienced by cyclists?
Instantaneous attribute analysis	• What are the relationships between instantaneous attributes (e.g., clearway timing) and cyclist safety performance?
Engagement analysis	• Does riders' perception of safety correlate with observed/measured safety levels?

Conclusions

The LiT trial demonstrated that crowd-sourced data using the developed methodology could provide useful road safety insights without compromising privacy and security of cyclists. This research addresses a significant gap in cycling safety data collection, management, and analytics with consideration of user privacy.

Acknowledgements

This research was funded by iMOVE CRC, Transport Accident Commission, and Deakin University, and supported by See.Sense and the Cooperative Research Centres program, an Australian Government initiative.

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Complex task handover in SAE J3016 Level 3 automated vehicles

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Abstract

As conditionally automated vehicles (SAE J3016 "Level 3") are about to become more common on our roads, there is an urgent need to explore safety issues arising from the change in the driver's role from an active controller to a passive supervisor. In this paper we present early results from the first study where participants were seated in a real AV driver's seat and had to engage in non-driving tasks (NDT) to simulate how people will use conditional AV in the future. The study was conducted on test tracks using QUT's ZOE2, the only AV legally allowed to drive on open road in Australia as of mid-2023, in two sub-studies with 28 and 36 participants. We compared take-over performance depending on: (i) NDT workload and (ii) HMI transparency. We confirmed that higher NDT workload negatively affect take-over performance but found no significant difference for HMI transparency.

Background

Safety performance of fall-back operators in a "Level 3" automated vehicle (AV) is a controversial topic. Such vehicles are starting to be available on roads for the general public, such as with Mercedes' Drive Pilot, the first true "Level 3" commercial system to be approved for use anywhere in the World (currently available in Germany, France, Japan, and some limited US states). While AV are expected to have great benefits (Pettigrew, 2017), improper handling of *human-in-the-loop* factors may greatly diminish those (Cunningham & Regan, 2015) or even reduce safety (Goodall, 2023). Existing research generally points toward longer reaction times and worsened driving performance in the immediate aftermath of the take-over request (TOR).

Unfortunately, there is still a limited understanding of the real-world performance of fall-back operators. Most research has focused on simulators (such as Gold et al., 2013, or Bueno et al., 2018 who conducted a similar experiment to ours); only a few studies placed participants in actual AV (Walker, et al., 2018; Xu et al., 2018; Strauch, et al., 2019, Mühl et al., 2019), and none had the participant in the driver's seat. A decade ago, Waymo (Google) abandoned conditional AV after finding worrying results regarding operators' distraction but to our knowledge their data is not publicly available, nor published in scientific journals.

Our research aimed at closing this gap by using a real AV with participants in the driver's seat undertaking "normal" non-driving tasks (NDT), as we identified there was a lack of focus on such distracted fall-back supervisors as opposed to more vigilant drivers with "Level 2" systems.

Method

We had two sub-studies. Both used QUT's ZOE2 (fig 1a), a "Level 3/4" AV based on a Renault Zoe, and were conducted on the RACQ tracks in Mt Cotton, Queensland. Participants were seated in the driver's seat and drove for 30 minutes while watching a video on a tablet and answering questions about it. Up to five times per scenario, at pre-set locations, ZOE2 would trigger a TOR, forcing the participant to cease their NDT and retake control over the vehicle. Take-over time (TOT) was measured from the start of TOR to the moment the driver actioned any controls (brake, accelerator, or steering wheel).

Sub-study 1 (NDT workload)

The two conditions were: High & Low NDT. In Low-NDT the questionnaire was very short with only 2 questions, while in High-NDT there were 21 questions. 28 participants (Mean age = 41.5, SD = 9.36, 79% male) drove ZOE2, equally split between High-NDT and Low-NDT. The hypothesis (H1) was "*Participants in High-NDT will have slower TOT than participants in Low-NDT*".

Sub-study 2 (HMI transparency)

The two conditions were: High & Low HMI. In Low-HMI a GPS quality bar was shown on the screen, and the bar would provide a pre-TOR warning by flashing. In High-HMI the quality bar was augmented by colour bands and textual information. Participants were using the same NDT load as participants for the High-NDT condition in sub-study 1. 36 participants (Mean age = 48.5, SD = 15.39, 64% male) drove ZOE2, equally split between High-HMI and Low-HMI. The hypothesis (H2) was "*Participants in High-HMI will have faster TOT than participants in Low-HMI*".

Results

H1 was confirmed: TOT in High-NDT (M = 6.13 seconds; SD = 3.51) was statistically significantly higher ($t(116) = 2.09$; $p = 0.0192$) than in Low-NDT (M = 4.88 seconds; SD = 3.0).

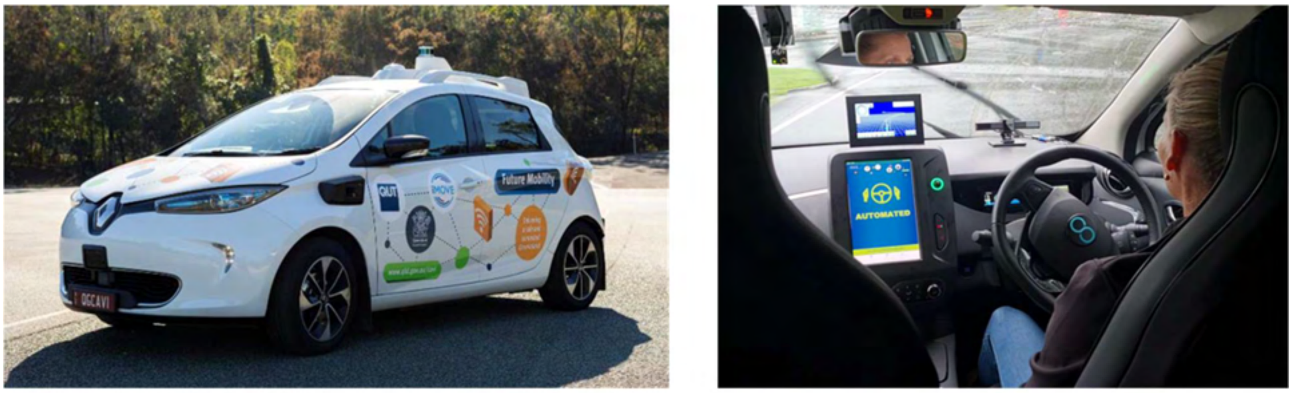
H2 was not confirmed. TOT in High-HMI (M = 5.06 seconds; SD = 2.79) was not found to be statistically significantly different than TOT in Low-HMI (M = 4.97 seconds; SD = 2.64), with $Pr(|T| > |t|) = 0.8673$.

Table 1. TOT statistics per sub-study

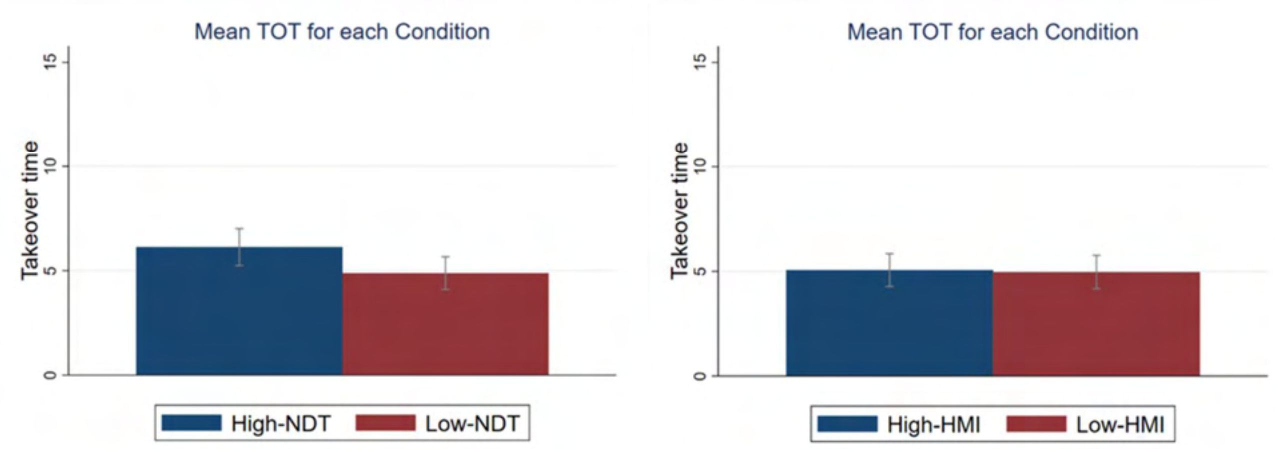
1.a Sub-study 1 TOT statistics					
Condition	**Mean (s)**	**SD (s)**	**Median (s)**	**Min (s)**	**Max (s)**
High-NDS	6.13	3.51	4.98	2.05	19.17
Low-NDS	4.88	3.00	3.80	2.30	19.37
Both	5.53	3.32	4.60	2.05	19.37
1.b Sub-study 2 TOT statistics					
Condition	**Mean (s)**	**SD (s)**	**Median (s)**	**Min (s)**	**Max (s)**
High-HMI	5.06	2.79	4.46	1.50	15.96
Low-HMI	4.97	2.64	4.10	1.62	12.20
Both	5.02	2.71	4.23	1.50	15.96

Conclusion

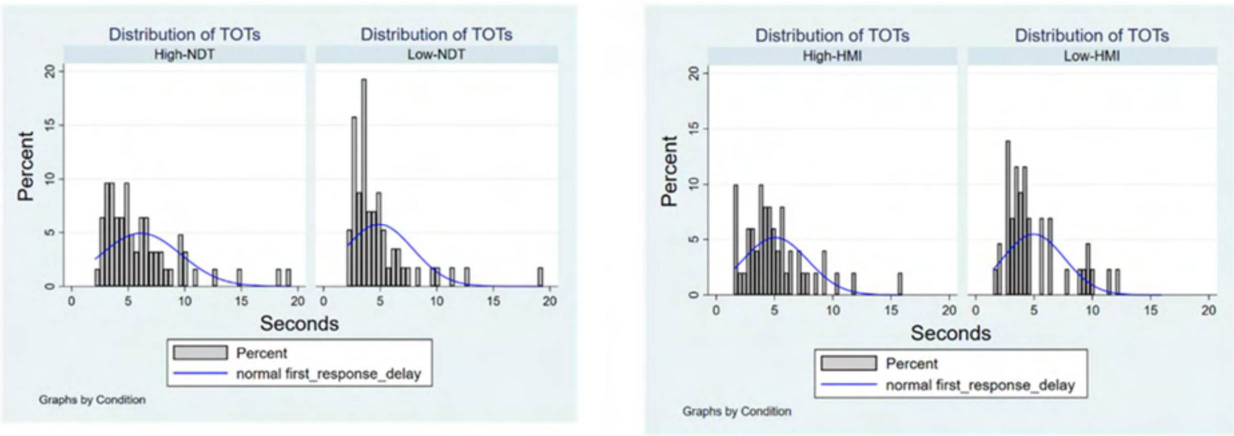
Our results suggest a similar trend to TOT measured in simulation studies, with TOT much longer than conventional reaction times; however, our results also suggest TOT in simulation are on average longer than those achieved in real vehicles. We further found that NDT workload negatively affected TOT, a worrying trend given that drivers are likely to engage in various NDTs, either for work or leisure, once conditional AV become more common. A visual-only mitigation strategy providing a warning before the TOR did not improve TOT. Future work includes a third sub-study with auditory HMI, and further analysis from the current sub-studies: inter-study comparisons, and eye-tracking data analysis to evaluate context awareness during TO.



1.a ZOE2 vehicle (left); ZOE2 dashboard & HMI (right)



1.b TOT by condition in sub-study 1 (left) and sub-study 2 (right)



1.c TOT distribution by condition in sub-study 1 (left) and sub-study 2 (right)

Figure 1. ZOE2 vehicle and TOT results by sub-study

Acknowledgements

This study was funded by a Road Safety Innovation Fund grant from the Federal Government. The authors wish to acknowledge the Queensland Department of Transports and Main Roads (TMR) for allowing the use of ZOE2 for this research, as well as TMR and iMOVE Australia for allowing methodologies and experimental procedures developed for the CHAD project (iMOVE 1-008) to be re-used and expanded upon for this study. The authors further wish to acknowledge the contribution of the following people that made this study possible: Amy Schramm, Peter Coughlan, Melinda McDonald, Razi Hasan, Sonali Nandavar, and Estelle Pretorius.

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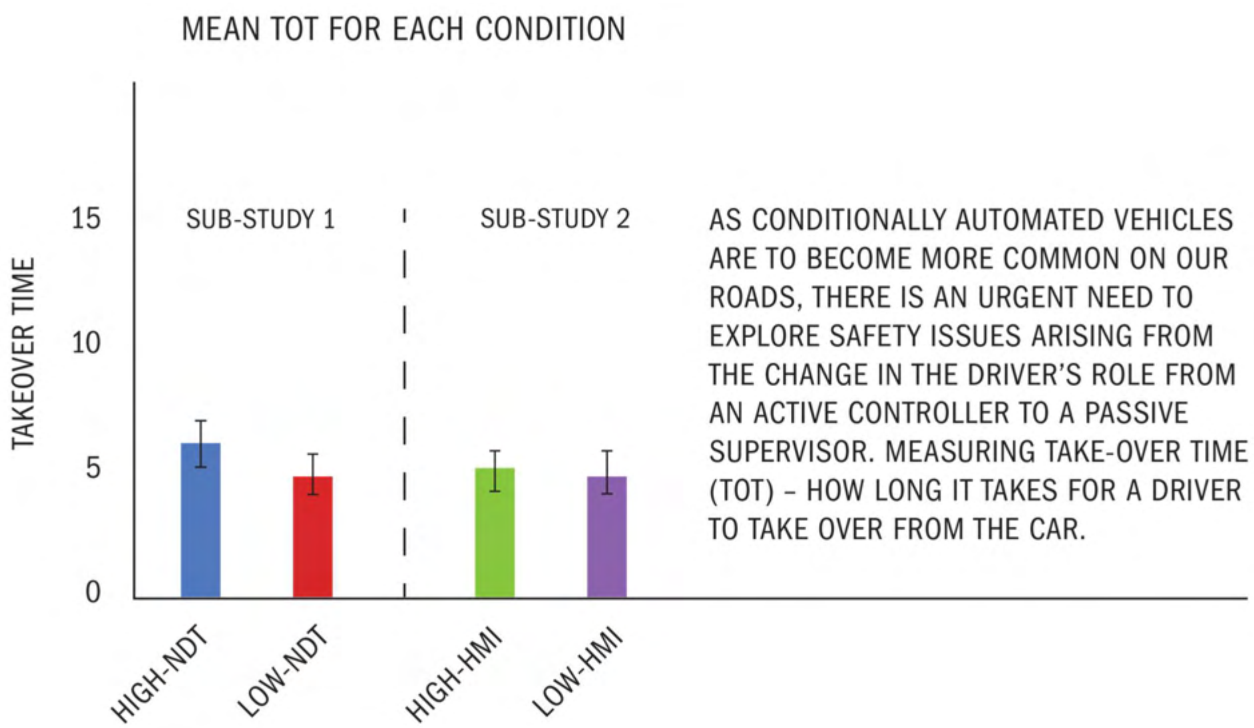

Axle-based vehicle classification using tracking radar

Victor Deville[a] and Alastair Wiggins[b]

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Abstract

Accurate vehicle classification is essential for road safety and traffic management policy implementation. This is especially true where heavy vehicles are concerned, as restrictions on their movement may be limited only to certain classes. Most heavy vehicle classification schemes rely on resolving their length, the number of axles, the axle groupings and spacing between these groups. In this paper, we describe a University of Melbourne PhD project (Deville et al., 2022) sponsored by Sensys Gatso Australia and iMOVE to research and develop a non-invasive axle-based vehicle classification system using tracking radar technology. The system can be pole mounted at the side of the road, without requiring any physical contact or modification to the road surface. This has the potential to improve road safety by easing installation and maintenance, whilst providing real-time traffic data (including speed and class) in situations where this was not previously viable using traditional invasive sensor technology.

Background

Road operators are increasingly demanding the use of non-invasive vehicle classification technology. Systems requiring in-road sensors or infrastructure are considered invasive, as they need to be installed under its surface. Typically, invasive vehicle sensors require road closures and extensive traffic management in order to be safely installed. They cannot reliably detect and classify over-size vehicles that need to straddle lanes to traverse the road network, nor can they be installed on unsealed roads, such as interstate routes or on mining sites, where significant road safety issues may exist.

Any new solution must be suitable for temporary or permanent pole mounting beside the road. As well as simplifying installation and maintenance access, it also enables use on over-size vehicle routes, where passage under gantries or bridges would be impossible. This arrangement will allow road authorities to monitor the passage of over-size vehicles at key points in the road network, e.g. bridges and flyovers, to ensure that they are traversing in the middle of the road and hence distributing their load in the safest fashion.

In this paper, we propose a novel non-invasive axle-based vehicle classification system using tracking radar that can overcome the limitations of existing technology.

Method

A test site was established on the Federal Highway in the ACT near the border with NSW. A Sensys Gatso RT4 Frequency Modulated Continuous Wave (FMCW) phased array tracking radar was installed on a pole in the median strip at a height of 450cm. A local embedded controller was used to capture and process the radar data.

Also installed at the same location is an existing ACT Roads heavy vehicle monitoring system, which is operated on behalf of the National Heavy Vehicle Regulator (NHVR). This system employs invasive sensor technology and provides classification data in accordance with the Austroads scheme (Austroads, 2020). It acts as a reference system to verify the accuracy of the tracking radar algorithms under development.

The existing RT4 solution provides enforcement grade speed measurement and length data for passing vehicles. In order to develop new radar algorithms, the raw RT4 radar detections are logged using the roadside controller. This data has been processed and analysed by taking advantage of the micro-Doppler generated by the rotational motion of the wheels on passing vehicles. By means of time and frequency analysis, we were able to extract the axle configuration and the length of a vehicle. These characteristics were then fed into a classifier to provide the vehicle classification. Figure 1 illustrates the whole process, from the collection of a vehicle’s radar detections through to its classification according to the AustRoads scheme.

Results

An initial version of the algorithm was developed using radar data collected under limited conditions. The algorithm excluded data from vehicles with a low signal to noise ratio micro-Doppler signal, resulting in a 9% reduction in capture rate. The accuracy of the classification was compromised by up to 15% due to miscounting of axles.

Improvements to the algorithms are continuing. This process has included the development of a radar data simulation, which helps cater for the presence of noise and interference in the captured signals. It is expected that these improvements will result in a significant increase in both capture rate and accuracy.

Conclusions

This project has demonstrated that side fired tracking radar can be used to accurately classify vehicles in accordance with the AUSTROADS scheme.

The new solution enables authorities to improve road safety through monitoring the movement of over-sized and heavy vehicles at locations where this was not previously possible with existing technology.

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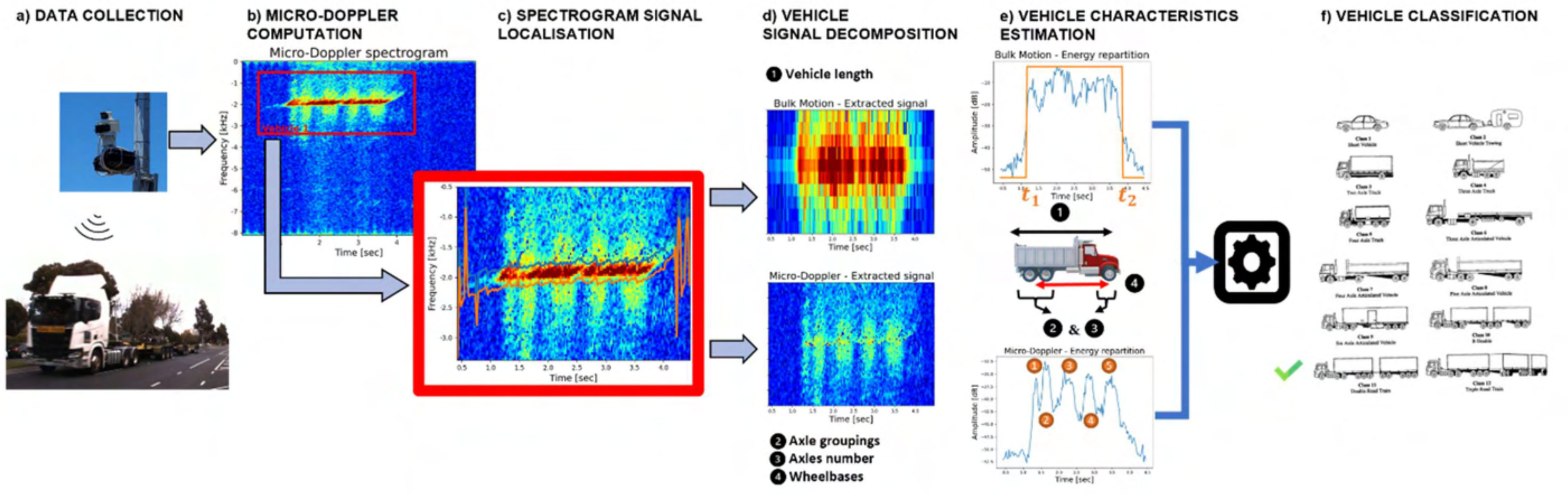

Figure 1. Radar Automatic Vehicle Classification Algorithm – Process Overview

The no-blame in-depth truck crash investigation study

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The University of Adelaide, Centre for Automotive Safety Research

Abstract

Crashes involving trucks are often severe due to the large amount of kinetic energy contained in a moving truck. In 2019, there were 188 fatalities involving a heavy truck in Australia, representing 15% of fatalities nationally. The purpose of this project was to produce the first substantial dataset of in-depth no-blame truck crash investigations in Australia, and to analyse these crashes to identify the common contributing factors and the interventions that show the most potential to prevent or mitigate these crashes. This was achieved by investigating 69 truck crashes within 150 km of Adelaide between June 2021 and February 2023 and combining these with 31 pre-existing investigations from the Centre for Automotive Safety Research's regular series of in-depth crash investigations to create a total sample of 100 truck crashes. At the time of writing the data is being finalised and reviewed. Full results will be presented at the conference.

Background

Crashes involving trucks are often severe due to the large amount of kinetic energy contained in a moving truck. In 2019, there were 188 fatalities involving a heavy truck in Australia, representing 15% of all fatalities nationally (BITRE, 2021).

While there have been various series of crash investigations conducted in Australia (e.g. Brown et al. 2015, Fitzharris et al., 2020, Doecke et al, 2020), no series of in-depth no-blame crash investigations in Australia have focused on heavy vehicles. The purpose of this project was to produce the first substantial dataset of in-depth no-blame truck crash investigations in Australia, and to analyse these crashes to identify the common contributing factors and the interventions that show the most potential to prevent or mitigate these crashes.

Method

A series of 69 truck crashes investigated between June 2021 and February 2023 within 150 km of Adelaide were combined with 31 truck crashes investigated between November 2014 and May 2021 within 100 km of Adelaide as part of CASR's regular series of in-depth crash investigations, to create a total sample of 100 crashes involving trucks.

Most crashes were investigated at-scene, with CASR crash investigators typically arriving between 5 to 90 minutes after the crash occurred. Fatal and life-threatening injury crashes which are attended by South Australia Police's Major Crash investigators were investigated in the following days. Non-injury crashes were not investigated unless they involved a truck rolling over, or they occurred on a road with a speed limit of 100 km/h or higher.

On arrival at the scene of a crash, CASR investigators undertook the following tasks: gathered information from emergency services' personnel, participants and witnesses; marked the scene evidence; photographed the scene, vehicles and road infrastructure; collected data on the vehicles, road and crash circumstances (see Figure 1); downloaded from Event Data Recorders and dashcams when available, digitally mapped the road environment and crash evidence; and recorded videos from each road user's direction of travel.

Figure 1. A CASR crash investigator examining a truck that has crashed into a tree

Further sources of information were obtained after the crash, including: the police report, injury information from the hospital and ambulance service, driver and witness interviews, Coroner's report (if fatal), alcohol and drug test results, the crash history of the location and drivers, and the offence history of the drivers. The speeds of the vehicles were also determined, if possible, by a crash reconstruction that utilised the scene evidence.

All cases are reviewed by a multidisciplinary panel comprised of experts in human, road and vehicle factors to identify factors that the evidence shows contributed to the crash occurring. Interventions (or treatments) that could have prevented the crash or mitigated its severity are nominated by the review panel.

Results

While the 100 crashes have been investigated at-scene, the data and the case reviews are in the process of being finalised. Table 1 shows the characteristics of the investigated crashes, in terms of crash type, area in which the crash occurred, speed zone, and the configuration of the trucks involved. There are more trucks than crashes as there were some crashes that involved multiple trucks. The majority of the crashes occurred in rural areas and the most common configurations of involved trucks were 2-axle rigid trucks and 6-axle semi-trailers. It is anticipated that the full results can be presented at the conference in September 2023.

Table 1. Characteristics of truck crashes investigated and the configuration of the trucks involved

	Number
Crash type	
Rear end	21
Right angle	16
Single vehicle not into object	16
Side swipe	8
Head-on	8
Right turn - opposite	8
Right turn - adjacent	5
U-turn in front	5
Single vehicle into object	4
Pedestrian	4
Other	5
Area	
Metropolitan	36
Rural	64
Speed zone (km/h)	
40	2
50	8
60	26
80	20
90	9
100	18
110	17
Truck configuration	
Prime mover only	1
2-Axle Rigid Truck	31
3-Axle Rigid Truck	13
4-Axle Twinsteer Truck	5
5-Axle Semi-trailer	4
6-Axle Semi-trailer	30
3-Axle Truck and 2-Axle Dog Trailer	1
3-Axle Truck and 3-Axle Dog Trailer	3
3-Axle Truck and 4-Axle Dog Trailer	3
7-Axle B-double	1
9-Axle B-double	11
11-Axle A-double	1
12-Axle B-triple	1
14-Axle AB-triple	1
Total trucks	**106**
Total truck crashes	**100**

Conclusions

The conclusions will be presented at the conference.

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Towards updated safe speeds using new speed-injury risk curves

Sam Doecke

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Abstract

Safe speeds are considered fundamental to achieving the goals of the Safe System. The concept of safe speeds, and some proposed values for these safe speeds, were published almost 25 years ago. New risk curves that show the relationship between speed (travel and impact), and the risk of serious injury for given impact types were published in 2020 and 2021. These recently published risk curves have the potential to provide updated values for the safe speeds. To do this the speed-injury risk curves for impact type must be combined to represent crash types. The other element to defining safe speeds is defining an acceptable risk. While the exact acceptable risk is unknown, example safe speeds were calculated based on an acceptable risk of between 2 and 5 percent. The examples provided showed that head-on crashes have a particularly low safe speed (either travel speed or impact speed).

Background

Safe speeds are considered fundamental to achieving the goals of the Safe System (Department of Infrastructure, Transport, Regional Development and Communications, 2021). The concept of safe speeds, and some proposed values for these safe speeds, were published almost 25 years ago (Tingvall & Haworth, 1999). Jurewicz et al. (2016) attempted to update the safe speeds proposed by Tingvall and Haworth with respect to serious injury and provide an empirical basis for them by using pre-existing risk curves for delta-v and applying these to certain crash configurations. While this work had various limitations, and the authors state their safe speed values should be used as indications only, their work did reveal that head-on crashes had a much lower safe speed than previously proposed. Recent papers published in 2020 and 2021 (Doecke et al., 2020; Doecke et al., 2021) sought to provide updated risk curves using accurate empirical data on impact speed, travel speed, and injury severity. However, due to data limitations, these risk curves could only be produced on a per-vehicle basis rather than a per-crash basis. This paper aims to provide some examples of how these per-vehicle serious injury risks can be combined to reflect the risk of serious injury in certain crash types. How this might be applied to produce safe speeds is also demonstrated.

Method

In order to calculate the serious injury risk for a given crash, the risk of serious injury in each vehicle provided by Doecke et al., (2020) and Doecke et al., (2021) must be summed following the addition rule of probability for events that are not mutually exclusive (Wesley and Kita, 1991). The general equation is given below.

$$P_{crash} = \left(P_{vehicle\ 1\ impact} + P_{vehicle\ 2\ impact}\right) - \left(P_{vehicle\ 1\ impact} \cap P_{vehic\quad 2\ impact}\right)$$

Where $P_{vehicle\ 1\ impact} \cap P_{vehicle\ 2\ impact} = P_{vehicle\ 1\ impact} \times P_{vehicle\ 2\ impact}$

This addition of the two probabilities must consider the type of impact for each of the two vehicles involved in the crash. Examples are shown below for right angle, head-on and rear end crashes, where P is the probability of serious injury.

$$P_{right\ angle\ cras} \quad = \left(P_{front\ impact} + P_{side\ impact}\right) - \left(P_{front\ impact} \times P_{side\ impact}\right)$$

$$P_{head-\quad crash} = \left(P_{head-on\ impact} + P_{head-\quad impact}\right) - \left(P_{head-on\ impact} \times P_{head-on\ impact}\right)$$

$$P_{rear\ end\ cra} \quad = \left(P_{front\ impact} + P_{rear\ impact}\right) - \left(P_{front\ impact} \times P_{rear\ impact}\right)$$

To calculate the safe speeds from these equations, the acceptable risk (or probability) must be defined. This is a difficult task where no single correct answer exists (Hunter and Fewtrell, 2001) and, in the context of road traffic, is virtually impossible to answer (Hakkert et al., 2002). Rather than suggest an acceptable risk, safe speeds have been calculated for acceptable risks of two and five percent.

Results

Table 1 shows what the safe speeds would be if a 2 percent or 5 percent risk of serious injury was used as the acceptable risk. The differences in the speed being considered should be noted as these are important when interpreting and applying these values. For detailed explanation and justification of these differences see Doecke et al. (2020 & 2021).

Table 1. Safe speeds based on risk curves from Doecke et al. (2020 & 2021), by crash type and acceptable risk

Crash type	Speed considered	Safe Speed for 2% risk of serious injury	Safe Speed for 5% risk of serious injury
Head-on	Average impact speed	29 km/h	38 km/h
Right angle	Striking vehicle’s impact speed	54 km/h	63 km/h
Rear end	Closing impact speed	66 km/h	77 km/h
Head-on	Travel speed of either vehicle	18 km/h	47 km/h
Right angle	Travel speed of striking vehicle	63 km/h	78 km/h
Rear end	Travel speed of striking vehicle	88 km/h	113 km/h

Conclusions

The risk curves provided by Doecke et al. (2020 & 2021) can be used to produce safe speeds for different crash types, provided that the type of impact that each vehicle involved experiences is understood, and an acceptable risk is defined. The examples provided showed that head-on crashes have a particularly low safe speed (either travel speed or impact speed).

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Using gaming to engage with young males about drink-driving

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Abstract

Drink driving continues to be a serious contributor to road trauma, and men under 40 years of age are over-represented in fatal crashes where alcohol was a factor in the crash (TMR, 2021). In consideration of this, the Department of Transport and Main Roads'(TMR) Community Road Safety team, StreetSmarts, used a unique gaming innovation, 'Lag kills' to extend the more traditional 'Drink driving. All Bad' road safety campaign to young men. 'Lag kills' showed popular Australian gaming influencer, TJBirrd, streaming gameplay of Minecraft to a live audience, while experiencing a time lag impacting his reflexes and reaction times, to simulate the effects of drink driving. 'Lag Kills' proved to be an innovative way to reach young men through gaming, actively engaging them in discussions about drink driving and encouraging them to share their personal experiences. All communication benchmarks were exceeded through this innovative approach.

Background

Drink driving continues to be one of the major contributors to road trauma on Queensland roads, and young men are one of the largest at-risk groups. Reaching and engaging young audiences has never been more challenging. In 2021, young people (17-24) spent 22.5+ hours per week on social, gaming and streaming channels compared with 6 hours watching television (Deloitte, 2021). In a time of fragmented media, short attention spans and an over-saturation of communication channels, the ability to reach and capture attention is challenging, and TMR were interested to understand if shifting engagement to gaming influencers increased engagement with young people.

'Lag kills' supplied a unique opportunity to test this idea. Australian gaming influencer, TJBirrd, plays Minecraft on popular gaming platform 'Twitch TV', with a subscribed following of 11,300 primarily young male viewers.

Project

This platform invites gamers to stream their gameplay to their live audience of devoted followers, providing comments, suggestions and involvement via the chat function in real-time. TJBirrd agreed to work with TMR on this project. He created a lag on his gameplay of 120 milliseconds, which is comparable to driving with a blood alcohol content of 0.05. This led to many close calls and 'game-overs'. It was obvious that 'lag' was a killer, even in a game and consequently drink driving was 'all bad'. Watching the drama unfurl in real-time, the online chat exceeded channel viewership and engagement expectations, as rallying messages and stories from viewers about their own drink driving experiences flooded in.

Results

The stream outperformed benchmarks across views, reach and total minutes watched. Total unique users were: 15,997 (+14% benchmark) with the total minutes watched 43,958 minutes (+26% benchmark) significantly above all expectations (Essence Mediacom and Publicis, 2022-2023). These results provided an innovative way to demonstrate drink-driving impacts to a young audience.

In addition, the digital advertising that accompanied TMR's partnership with Twitch, delivered a 330% increase in traffic to the StreetSmarts website, generated from the Twitch channel alone.

The Twitch channel was one component of a comprehensive campaign, however it contributed to 88% of campaign awareness of the 'All bad' drink driving campaign with the young male target audience (Footprints Market Research, 2022).

Further successful results included:

- 78% of young drivers believed that drink driving even 'when you feel fine' is not socially acceptable (compared to 74% in 2021).
- 75% of young males are more likely to listen to their friends / social influences to avoid drinking and driving (compared to 70% in 2021) (Footprints Market Research, 2022).

Through extensive desktop research, we believe that similar methods have not been done before, that is, using a gaming influencer to emulate risky behaviour in this way to directly influence behaviours and attitudes of a significant road safety problem.

'Lag kills' delivered the serious message of drink driving in a unique way to encourage a culture of peer accountability around drink driving and road safety in general.

Case study video (Twitch):
Twitch_AU_Queensland_Government_16.mp4 - Twitch_AU_Queensland_Government_16.mp4 - Frame.io

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LAG KILLS
Using gaming to engage with young males about drink driving
THE ISSUE:
Drink driving continues to be one of the major contributors to road trauma on Queensland roads, and young men under 40 are one of the largest at-risk groups.
Reaching and engaging young audiences has never been more challenging. In 2021, young people (17-24) spent 22.5+ hours per week on social, gaming and streaming channels compared with 6 hours watching television.
In a fragmented media landscape, capturing attention is challenging. We needed to find a unique solution.
THE IDEA:
Australian gaming influencer, TJBirrd, plays Minecraft on popular gaming platform 'Twitch TV', with a subscribed following of 11,300 primarily young male viewers. This platform invites gamers to stream their gameplay to their live audience of devoted followers, providing comments, suggestions and involvement via the chat function in real-time. This unique opportunity with TJBirrd activated a lag on his gameplay of 120 milliseconds, which is comparable to driving with a blood alcohol content of 0.05. This led to many close calls and 'game-overs'. It was obvious that 'lag' was a killer, even in a game and consequently drink driving was 'all bad'.
THE RESULTS:
The stream generated extensive viewership and engagement. With the drama unfurling in real-time, the online chat exceeded channel viewership and engagement expectations, as rallying messages and stories from viewers about their own drink driving experiences flooded in.
The stream outperformed benchmarks across views, reach and total minutes watched.
15,997
TOTAL UNIQUE USERS
43,958
TOTAL MINUTES WATCHED
330%
INCREASE IN WEBSITE TRAFFIC
88%
AWARENESS OF 'ALL BAD' DRINK DRIVING CAMPAIGN
FURTHER SUCCESSFUL RESULTS INCLUDED:
• 78% of young drivers believed that drink driving even 'when you feel fine' is not socially acceptable (compared to 74% in 2021).
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'Lag kills' delivered the serious message of drink driving in a unique way to encourage a culture of peer accountability around drink driving and road safety in general.
StreetSmartsQLD
Queensland Government

How would congestion pricing affect traffic safety? An analysis in Greater Melbourne

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Abstract

This research investigates the relationships between congestion pricing and traffic safety in Greater Melbourne, using an integrated modelling framework with activity-based travel demand and macroscopic crash prediction models. Modelling results highlight the significant impacts of congestion pricing on reducing both total and fatal and serious injury crashes in Greater Melbourne. Results also confirm that the implementation of congestion pricing could alleviate traffic congestion with reduced vehicle distance travelled, increased average speed, and mode shifts towards public transport.

Background

Previous research has indicated the potential of travel demand management strategies, e.g., congestion pricing, promoting public transport, and teleworking, in reducing traffic crashes (Litman, 2012; Litman, 2015; Singichetti et al., 2021). Several studies have developed macroscopic crash prediction models to demonstrate the positive impacts of increasing public transport usage (Moeinaddini et al., 2015; Phan et al., 2022; Truong & Currie, 2019) and teleworking (Pirdavani et al., 2014) on traffic safety. While there is substantial body of literature regarding the impacts of congestion pricing on traffic congestion and emission, limited research has been conducted to quantify the safety impacts of congestion pricing strategies. Most previous studies have focused on the congestion charge scheme in London (Ding et al., 2021; Green et al., 2016), reporting a decline in crashes within the charging zone. It is, however, unclear if the findings in London can be generalised to other cities. Studies in the US and Spain (Albalate, 2011; Fagnant & Kockelman, 2014), in contrast, reported that congestion charge could lead to increased injury crashes due to changes in traffic patterns outside of the charging zones. Given the scarcity of evidence, there is a need for research on the traffic safety impacts of congestion pricing. This study aims to investigate the impacts of congestion pricing on traffic safety using an integrated modelling framework with activity-based travel demand and macroscopic crash prediction models. Greater Melbourne was selected as the study area.

Method

Melbourne activity-based model (MABM) was employed to develop two scenarios: baseline (existing) scenario and congestion pricing scenario. MABM uses MATSim, an agent-based platform, to model activities and travel behaviour at the individual level. A simple distance-based strategy was implemented for the congestion pricing scenario, where all vehicles in Greater Melbourne are charged $0.155 per kilometre and vehicles entering a cordon area around Melbourne's CBD during the peaks are charged an additional $1.00 per kilometre travelled within the cordon area (Infrastructure Victoria, 2020). Modelling outputs (e.g., vehicle kilometres travelled, average speed, and mode shares) of the baseline scenario and historical crash data (July 2015 - June 2020) were aggregated into Traffic Analysis Zones (TAZ) and then used to develop two macroscopic crash prediction models (i.e., negative binomial regression) for the number of total crashes and the number of fatal and serious injury (FSI) crashes in TAZs. Traffic safety impacts were evaluated by comparing predicted total crashes and FSI crashes in the baseline and congestion pricing scenarios.

Results

Table 3 presents the estimation results of the two macroscopic TAZ-based crash prediction models using negative binomial regression for total crashes and FSI crashes. The models were statistically significant, and the variance inflation factors (VIF) confirmed no multicollinearity. The effects of predictors were expected. For example, vehicle kilometres travelled and population were positively correlated with total and FSI crashes. In addition, both total and FSI crashes were likely to increase with higher proportions of industrial and commercial land use, public transport stop density and intersection density. In contrast, fewer fatal and FSI crashes were associated with higher proportions of people aged 0-14, 15-24, and over 65 or a higher share of residential land use. Total and FSI crashes would be reduced with a higher mode share by public transport (including train, tram, and bus). Interestingly, increasing all-day average speeds would reduce total and FSI crashes, which suggested a lower level of congestion would improve traffic safety. Overall, the result confirmed the validity of these macroscopic crash prediction models, which were then used to predict crashes for the congestion pricing scenario using this scenario's MABM outputs.

Table 3. Results of negative binomial regression models for predicting total crashes and FSI crashes in TAZs

Variables	Total crashes			FSI crashes		
	Estimated	SE		Estimated	SE	
Intercept	-1.39	0.14	***	-2.37	0.16	***
Log of vehicle kilometres travelled	0.34	0.01	***	0.33	0.01	***
Log of population	0.23	0.01	***	0.24	0.01	***
Population density (person/km^2)	-0.00002	0.000005	***	-0.00001	0.000005	**
Proportion of people aged 0-14	-1.30	0.28	***	-1.63	0.32	***
Proportion of people aged 15-24	-0.74	0.20	***	-0.85	0.22	***
Proportion of people aged over 65	-0.51	0.19	**	-0.39	0.21	.
Public transport stop density (stops/ km^2)	0.005	0.001	***	0.004	0.001	**
Intersection density (intersections/ km^2)	0.002	0.0004	***	0.002	0.0004	***
Proportion of industrial land use	0.78	0.09	***	0.61	0.09	***
Proportion of commercial land use	0.48	0.11	***	0.27	0.11	*
Proportion of residential land use	-0.39	0.06	***	-0.47	0.07	***
Mode share by public transport	-0.61	0.28	*	-0.72	0.30	*
Average speed – all day (km/h)	-0.008	0.001	***	-0.005	0.001	***
Dispersion parameter (θ)	2.14	0.07	***	2.38	0.107	***
AIC	16739			12478		
MAE	11.36			4.19		
Pseudo R-squared	0.53			0.50		
Number of observations (TAZs)	2,195			2,195		

Note: . $p<0.1$; * $p<0.05$; ** $p<0.01$; *** $p<0.001$; SE = Standard error; AIC = Akaike information criterion; MAE = Mean absolute error; FSI = Fatal or serious injury crash. After removing TAZs with missing data, a total of 2,195 TAZs within Greater Melbourne were selected for modelling.

Table 4 summarises the traffic and safety impacts of the baseline and congestion pricing scenarios in Greater Melbourne while

Table ***5*** presents the impacts within the charging zone only. It can be observed that traffic performance in the charging zone as well as Greater Melbourne would be improved significantly in the congestion pricing scenario compared to the baseline scenario. Specifically, vehicle travel distance would decrease significantly by approximately 2.65 percent and 7.19 percent in Greater

Melbourne and the charging zone, respectively. The average speed would increase by 1.45 percent when considering the whole Greater Melbourne and by more than 13 percent when considering the charging zone only. An increase in public transport mode share in the congestion pricing scenario was also evident. Moreover, congestion pricing could reduce both the number of total crashes and FSI crashes by 0.63 percent and 5.51 percent, respectively, in Greater Melbourne. The safety impact would be more profound within the charging zone, with reductions of 31.62 percent and 28.59 percent in total and FSI crashes, respectively.

Table 4. Traffic and safety impacts of baseline and congestion pricing scenarios (Greater Melbourne)

Variables	Scenario		Percentage difference (%)
	Baseline	Congestion Pricing	
Number of total crashes	49,090	48,780	-0.63
Number of fatal or serious injury crashes	16,963	16,028	-5.51
Vehicle kilometres travelled (km)	94,029,098	91,541,770	-2.65
Average speed – all day (km/h)	41.463	42.064	1.45
Average speed (km/h) – AM peak	36.211	37.108	2.48
Average speed (km/h) – PM peak	43.318	43.804	1.12
Mode share by public transport	0.099	0.112	22.22
Mode share by car	0.753	0.739	-1.86

Note: AM peak = Peak hour (07:00 AM – 09:00 AM); PM peak = Peak hour (04:00 PM – 06:00 PM). This table was computed with 2,195 TAZs in Greater Melbourne. The number of crashes was estimated for a 5-year period.

Table 5. Traffic and safety impacts of baseline and congestion pricing scenarios (Within charging zone)

Variables	Scenario		Percentage difference (%)
	Baseline	Congestion Pricing	
Number of total crashes	3,634	2,485	-31.62
Number of fatal or serious injury crashes	1,039	742	-28.59
Vehicle kilometres travelled (km)	2,499,810	2,320,006	-7.19
Average speed – all day (km/h)	23.896	27.139	13.57
Average speed (km/h) – AM peak	25.135	26.698	6.22
Average speed (km/h) – PM peak	23.675	27.059	14.30
Mode share by public transport	0.330	0.350	5.92
Mode share by car	0.429	0.411	-4.24

Note: AM peak = Peak hour (07:00 AM – 09:00 AM); PM peak = Peak hour (04:00 PM – 06:00 PM)

Conclusions

This research has explored the traffic safety impacts of congestion pricing in Greater Melbourne. Results from an integrated modelling framework with activity-based travel demand and macroscopic crash prediction models revealed significant traffic safety benefits of congestion pricing in terms of reducing both total and FSI crashes. Future studies should explore other congestion pricing strategies and more advanced techniques to further improve prediction performance. For example, existing multiple road charges (Australian Automobile Association, 2017; Department of Infrastructure, 2019) should be carefully considered in the development of congestion pricing strategies. Future research should also investigate the effects of congestion pricing on certain crash types, e.g., pedestrian and cyclist crashes.

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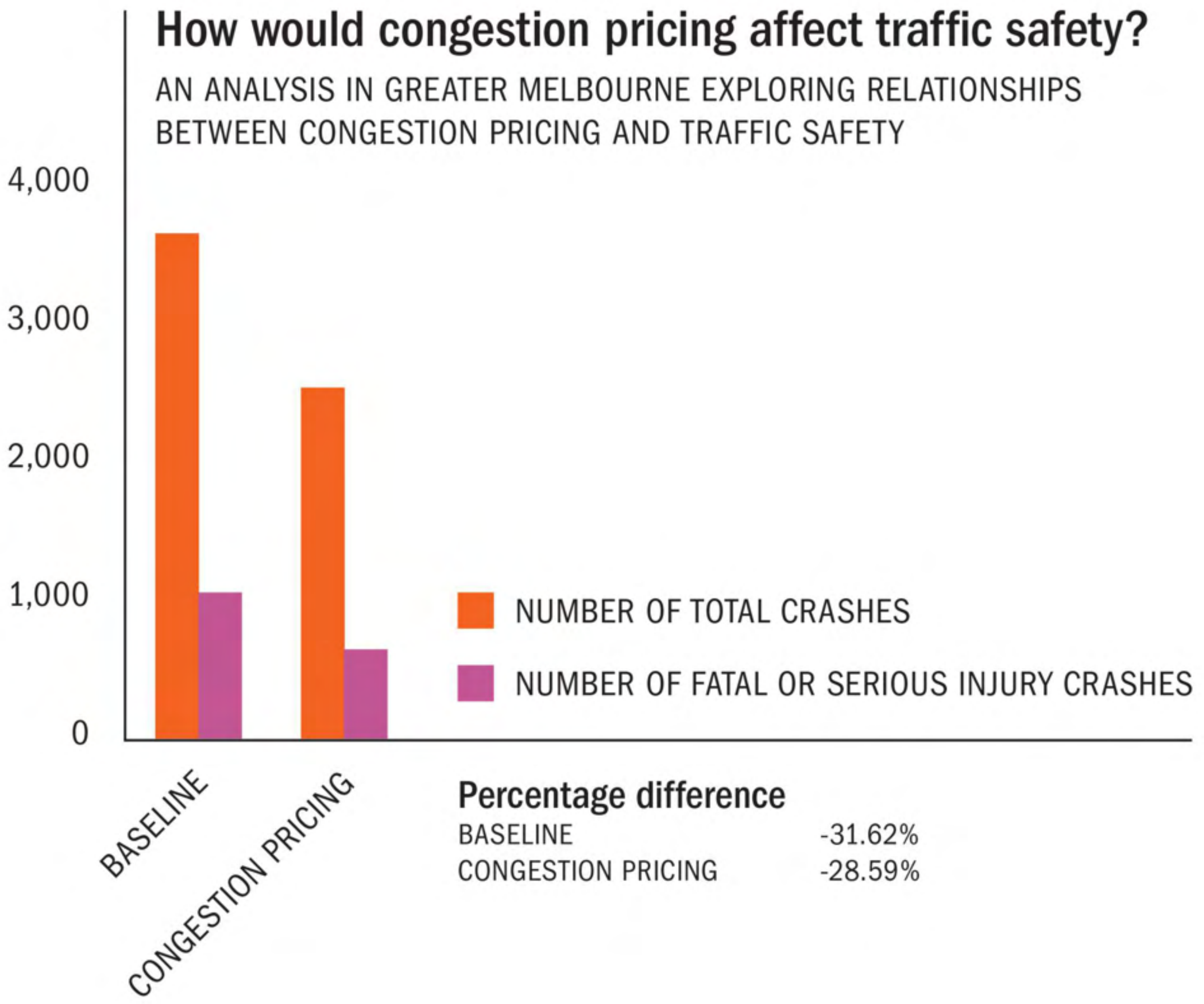
How would congestion pricing affect traffic safety?
AN ANALYSIS IN GREATER MELBOURNE EXPLORING RELATIONSHIPS BETWEEN CONGESTION PRICING AND TRAFFIC SAFETY
4,000
3,000
2,000
1,000
0
NUMBER OF TOTAL CRASHES
NUMBER OF FATAL OR SERIOUS INJURY CRASHES
BASELINE
CONGESTION PRICING
Percentage difference
BASELINE -31.62%
CONGESTION PRICING -28.59%

Incompatibility of traditional economic appraisal methods and Safe System outcomes

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Abstract

The Victoria Department of Transport and Planning (DTP) commissioned a quantitative and economic appraisal of the safety benefits and travel time impacts of a proposed policy to introduce fully controlled right turns (FCRT) at all new and upgraded signalised intersections. The appraisal demonstrated the policy could prevent 247 to 441 death and serious injury crashes if implemented at 200 intersections over a 5-year period and make a significant contribution to the objectives of Victoria's Road Safety Strategy. The appraisal found that FCRT treatments would:

- require signal cycle times to be extended to accommodate additional phases,
- increase average travel times by 12 to 25 seconds per user per intersection,
- not deteriorate key efficiency metrics to unacceptable levels.

Economic appraisal of travel time changes showed these costs outweighed safety benefits by a ratio of 5:1. The finding highlights the incompatibility of traditional economic appraisal approaches with the Safe System approach and suggests an alternative method be explored.

Background

The draft Victoria DTP Roads and Roadside Safety Policy aims for all new infrastructure projects built on state roads to meet minimum safety standards and have increased alignment with the Safe System principles to reduce the risk of fatal and serious injuries. The aim of the draft policy is to give effect to Victoria's Road Safety Strategy and specifically addresses Recommendation 4 of the Parliament of Victoria Economy and Infrastructure Committee Inquiry into the Increase in Victoria's Road Toll published in March 2021, that stipulates the *Victoria Government embed Safe System principles in all road transport decision-making.*

The draft policy includes treatments at intersections and mid-block locations in both urban and rural environments, as well as policies specifically targeted at cycling and motorcycling. It includes treatments that are accepted current practice and regularly funded in road safety retrofit programs, and emerging treatments.

This presentation covers the quantitative and economic appraisal of the safety benefits and travel time impacts of a proposed policy to introduce fully controlled right turns (FCRT) at all new and upgraded signalised intersections. As crashes involving right turning vehicles at signalised intersections account for 32 percent of all injury crashes, the FCRT treatment was expected to produce considerable safety benefits and stack up well from an economic perspective.

Method

A theoretical intersection configuration and three traffic volumes scenarios were developed for the appraisal. Traffic volumes in the High-volume scenario were determined using an iterative process to model the operation of an intersection where the critical movement(s) approached capacity in the peak period (approximately LoS E). Medium and Low volume scenarios were 75 percent and 50 percent of the High-volume scenario respectively.

Crash prediction models were used to forecast typical injury crash rates for each scenario. The models used were sourced from Research Report 483 *Crash prediction models for signalised intersections: signal phasing and geometry* (Waka Kotahi, 2012). Crash reduction factors of 52 percent and 69 percent were applied to all injury and severe casualty crashes respectively based on research presented at the Australasian Road Safety Conference 2017 (Jurewicz et al, 2017).

The impacts on travel time changes were assessed by modelling each scenario in SIDRA Intersection. Changes in travel time were determined based on the difference in delay between a simple two-phase cycle where filtered turns are permitted and a four-phase cycle where right turns are fully controlled.

Results

The appraisal demonstrated the proposed FCRT policy could prevent 327 death and serious injury crashes[5] if implemented at 200 intersections over a 5-year period. The appraisal also found that FCRT treatments would:

- require signal cycle times to be extended to accommodate additional phases,
- increase average travel times by 14 seconds per user per intersection[6],
- not deteriorate key efficiency metrics to unacceptable levels.

Economic appraisal found the monetised values of the travel time changes outweighed safety benefits by a ratio of 5:1 – indicating the policy position could not be supported from an economic perspective. This prompted an exploration of the suitability of the traditional economic appraisal method in a Safe System context.

Discussion and Conclusion

The results highlight a fundamental issue with using traditional economic appraisal methods for justifying road safety project. Despite the proposed FCRT policy having the potential to deliver considerable safety benefits, the economic value of these benefits is outweighed by minor increases in travel time for road users. For the Medium-volume scenario, the economic value of safety benefits is approximately the same as 3 seconds additional travel time per road user travelling through the intersection.

The issue of the monetised value of marginal increases in travel times outweighing the safety benefits of infrastructure projects is a perennial issue for the industry. It stems from a time when road user mobility was the primary outcome sought for the transport network. Under that paradigm, investment in new infrastructure was typically governed by economic analysis where time spent travelling on the road network was monetised and traded-off against a monetary value of fewer injuries and lives being lost from new or improved infrastructure.

Requiring full economic analysis (including travel time) is highly disadvantageous for justifying funding of road safety improvement projects, as many projects involve the slowing of vehicles, particularly at intersections and in urban environments. Unfortunately, retaining this approach means many worthy projects, including road safety infrastructure, may not be funded until the crash history exceeds a certain threshold, and the safety benefits outweigh additional travel time costs and implementation costs of the project.

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[5] For the Medium-volume scenario. The Low and High-volume scenarios are modelled to prevent 247 and 441 death and serious injury crashes respectively.

[6] For the Medium-volume scenario. The Low and High-volume scenarios are modelled to increase travel times by 13 and 25 seconds respectively.

An economic analysis approach where safety benefits are traded-off against “unusable” quantities of time is contrary to the principles of the Safe System approach and documents that follow that philosophy, including Victoria’s Road Safety Strategy. Under the Safe System approach, the primary objective for the transport network is the provision of safe journeys for all modes. This approach, commonly known as ‘Safe Mobility’, operates on the principle that safety outcomes are paramount and travel time efficiency is built into the system only to the point where it does not compromise safety outcomes. Under this ‘Safe Mobility’ paradigm, it is contrary to retain an economic analysis approach where safety benefits are traded-off against the monetised value of travel time. An alternative economic evaluation process that better aligns with the philosophy of the Safe System approach, such as that promoted in New Zealand (Waka Kotahi, 2021), is recommended.

The appraisal of the proposed FCRT policy position has demonstrated the current economic appraisal approach is no longer fit-for-purpose and directly works against achieving the targets set out in Victoria’s Road Safety Strategy.

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Safety Performance Indicators and measuring what we value

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Abstract

Road to Zero has an outcomes framework that covers programme delivery, system performance and outcomes across all five focus areas of the strategy. An Annual Monitoring Report details progress towards Road to Zero 2030 targets through monitoring of a series of output and outcome indicators. Critical to the success of the monitoring is the ability to quantitatively measure the indicators. This has required the establishment of new data collection and analysis systems, and a commitment to regularly update data based on interventions that have been implemented. A key innovation is spatial enablement of the data collection and analysis system. The key benefit of the new system is the ability to spatially identify where progress against indicators has been achieved and where it has not. This enables Waka Kotahi to initiate conversations at a regional and local level to understand and provide support overcome barriers to deliver.

Background

The Road to Zero Annual Monitoring Report tracks progress of a series of output and outcome indicators that cover all five focus areas of Road to Zero. The indicators align with international best practice set out by the International Transport Forum (2016) by including:

- Intervention Indicators – the outputs of what is delivered,
- Safety Performance Indicators (SPIs) – intermediate indicators based on relationships known to influence road trauma outcomes, and
- Safety Outcome Indicators – road trauma statistics

Traditionally, most transport authorities have relied on safety outcome indicators i.e., the number of deaths and serious injuries, to measure progress towards providing a safer road network. However, only measuring safety outcomes is limiting for two reasons. Firstly, there is a time lag between interventions being introduced and sufficient time passing to statistically evaluate the efficacy of treatments. Secondly, the factors that contribute to road trauma statistics are highly complex and span multiples areas of influence, some of which are beyond the direct control of transport authorities, such as economic factors, road user enforcement, vehicle standards and road safety related legislation.

Monitoring the implementation of interventions and measuring SPIs enables transport authorities to track their progress in delivering interventions and establish whether they are at the scale required to meet road trauma reduction targets. The best SPIs are those that have established causal relationships with final outcomes and have targets linked to safety outcome indicators.
Critical to the success of the monitoring is the ability to quantitatively measure the indicators. Even if indicators can be measured, having accurate and current data is essential to having confidence in the monitoring results.

A well-known saying is *“Measure what you value instead of valuing only what you can measure”*. This is true in most fields – none more so than road safety.

In New Zealand, the National Speed Limit Register (NSLR) provides the single source of truth for speed limits. All legal permanent variable, seasonal and emergency limits are in the register. The register is the legal instrument for the setting of speed limits – speed limits need to be in the register to be legally enforceable.

Unlike speed limits, there is no regulatory requirement to record the implementation of new or upgraded infrastructure in New Zealand. As such, it has been found that current processes for recording the implementation of new or upgraded infrastructure are not sufficiently robust to have confidence in the monitoring results. This has resulted in much of the key safety-related infrastructure delivered on New Zealand's roads having to be manually collated to monitor progress against output and outcome indicators. The unsustainability of this approach has resulted in Waka Kotahi investing in the development of a new spatial tool that captures the implementation of infrastructure delivered through the Speed and Infrastructure (SIP) program.

Proposed Data Collection System

Waka Kotahi has commissioned the development of spatial tool that facilitates the recording of current and new/upgraded road safety infrastructure at sufficient granularity to enable accurate measuring of infrastructure-based output and outcome indicators. Abley has developed a proof of concept that:

- spatially links national and local authority safety infrastructure delivery plans with central datasets used for monitoring, and
- uses geospatial and digital engineering processes to identify existing treatments, such as wide centreline, from line marking data.

Figure 1 shows a screenshot of the proof-of-concept Road to Zero Annual Monitoring dashboard that has been developed to track a range of indicators. A filter has been selected to show the results from the Auckland region only.

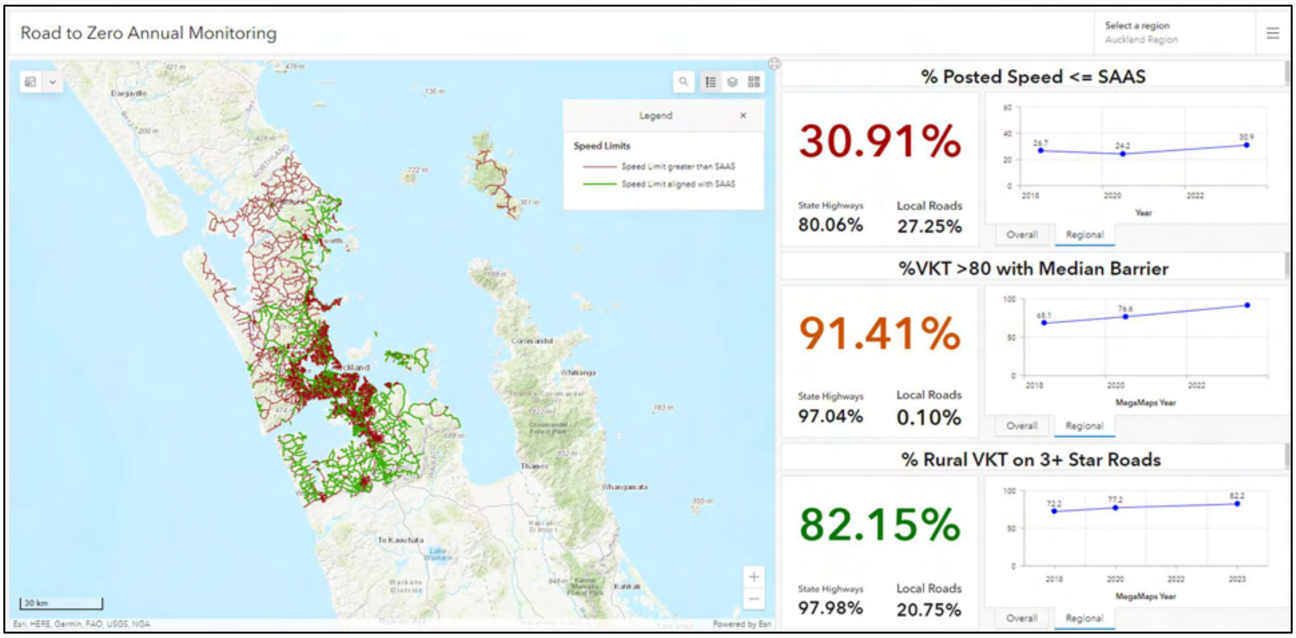

Figure 1. Road to Zero Annual Monitoring Results - Auckland

One of the Safety Performance Indicators monitored is the proportion of vehicle kilometres travelled (VKT) on roads with a speed limit above 80 km/h that are median divided. This indicator is aligned with safe system principles as head-on crashes on high-speed roads are outside of survivable boundary conditions. The indicator can be lifted either through the introduction of median barrier or by lowering of speed limits to 80 km/h or below.

Table 1 shows the annual monitoring results and targets established for this indicator.

Table 1. Annual Monitoring Results for High-Speed Roads SPI

	2019/20	2020/21	2021/22	Targets
%VKT on roads with speed limit above 80 km/h that are divided	21.4%	28.0%	29.7%	37% by 2024 52% by 2030

Table 1 shows the SPI is increasing and moving towards the 2024 and 2030 targets. However, it is evident that the rate of change has slowed and there is a risk of the 2024 target not being achieved unless the rate of median barrier installation or the rate of lowering speed limits on high-speed undivided roads increases.

Conclusion

The proof of concept has already demonstrated benefits in that:

- the quality of road safety infrastructure data is improving, which in turn is facilitating better informed investment decisions, and
- Waka Kotahi can spatially identify where progress against indicators is being achieved and where it is not. This is enabling conversations at a regional and local level to understand reasons behind progress or lack thereof, and to provide support overcome barriers to deliver.

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Mental health disorders in serious injury crashes

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Abstract

Mental health disorders have a serious impact on individual functioning and at times, on driving capacity and crash risk. This unique study examined the pre-existing mental health profile of 2,072 seriously injured road users who were admitted to hospital following involvement in a crash from 2014 to 2017. Medical conditions, injuries, crash characteristics, substance use and licensing history were examined by mental health status. The findings revealed that 24 percent of seriously injured road users had a pre-existing mental health disorder. The most commonly experienced mental health disorders were depressive disorders, substance-related and addictive disorders and anxiety disorders. Seriously injured road users with a pre-existing mental health disorder were more likely than those without to have co-occurring physical medical conditions, significant substance use and undertake risky behaviours. A number of measures concerning preventative support are suggested to enable safe travel for this vulnerable group of road users.

Background

The prevalence of mental health disorders in Australia, and globally, has increased in recent years. Consequently, more road users are likely to be using the road network while experiencing a mental health disorder. The literature documents the detrimental impact of mental health disorders on cognitive functioning and driving performance/capacity (e.g., Charlton et al., 2010), and the increased crash risk associated with some mental health disorders (e.g., Hill et al., 2017). However, limited methodologically sound research has explored the prevalence and contribution of mental health disorders to crash involvement (Charlton et al., 2022). This study examines the prevalence of mental health disorders in seriously injured road users involved in a crash and identifies the crash and individual characteristics of road users with a pre-existing mental health disorder.

Method

This study investigated a representative sample of 2,072 seriously injured participants admitted to a major trauma hospital following a road crash in South Australia (SA) from 2014 to 2017. Crash participants were allocated to either a mental health disorder (MHD) group or a no mental health disorder (NMHD) group. The coding of mental health status was undertaken by a clinical psychologist who matched hospital records of mental health functioning prior to a crash with diagnostic categories in the Diagnostic and Statistical Manual of Mental Disorders (APA, 2013). Medical records were linked to other data sources including forensic toxicology results (alcohol/drugs), police crash records and licensing history.

Results

The analysis indicated 24 percent (n=493) of those admitted to hospital following a road crash had a pre-existing mental health disorder, compared to 19.9 percent in the general SA population (ABS, 2018). Multiple mental health diagnoses (up to six comorbidities) were prevalent in 41.4 percent of the MHD group. The most commonly experienced mental health disorders were depressive disorders (52.1%), substance-related and addictive disorders (37.5%) and anxiety disorders (25.4%). Furthermore, 2.8 percent of the overall sample were attempting suicide by road crash.
The MHD group were compared to the NMHD group on a range of individual and crash characteristics. A summary of statistically significant findings is presented in Table 1. Notably, the

MHD group were 3.2 times more likely to have a BAC >0.05 and 4 times more likely to have a very high BAC (>0.150) at the time of the crash than the NMHD group.

Table 1. Summary of findings for seriously injured road users by mental health status

Summary of findings	Mental health disorder (n=493)	No mental health disorder (n=1579)
Culpable for the crash**	79.1%	64.3%
Live in regional/remote area**	24.3%	16.2%
Severely injured in the crash (MAIS3+)*	31.8%	25.1%
Pre-existing medical condition**	67.3%	48.2%
BAC ≥0.05 at the time of the crash**	21.9%	6.8%
Positive for an illicit drug**	24.5%	10.0%
Not wearing a seatbelt**	18.3%	4.2%
Not wearing a helmet (cyclist)**	13.6%	2.2%
Driving while disqualified/unlicensed**	11.6%	4.9%
Previous traffic offence**	65.3%	56.6%
Previous crash**	50.5%	36.1%

Chi-square analysis, *p<.05, **p<.001

Conclusions

These findings indicate mental health disorders are prevalent among road users involved in serious injury crashes, and co-occurring with medical conditions, significant substance use and risky driving behaviours. The observed co-morbidity with substance use is consistent with previous research reporting alcohol and drugs are used by individuals experiencing poor mental health as a means to alter their mental state (e.g., Cornah, 2006).

Preventative initiatives that can provide support in developing individualised insight relating to the early warning signs of mental health deterioration, enhance understanding of the impact of mental health functioning on driving, and educate the community about the potential crash risks posed by poor mental health will be important for supporting the safe travel of this vulnerable group.

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The unchallenged acceptance of road tanker accidents

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Abstract

The topic of “unchallenged acceptance of road tanker accidents” is controversial as “rationally / objectively” (bulk) liquid transportation in road tankers is safe and as people in general, emotionally / subjectively perceive such transportation to be safe. Despite this, accidents with liquid carrying road tankers happen. Some of these do not involve any other party, the so-called “one-sided” accidents, like “keeling-over” accidents. The cause of the accident is, often and (too) quickly, assumed to be a “driver error”, “everything else is after all “safe”. This (abstract / full) paper will identify the various details of the relevant but wrongly-assumed safety aspects which remain rather “unquestioned” in the widely “accepted” manner in which larger quantities of (dangerous) liquids are being transported in road tankers.

Dynamic behaviour of liquids

The dynamic behaviour of liquids in road tankers becomes increasingly the cause of often very serious accidents. This is due to a range of trends varying from modernizing road infrastructure designs and truck engine power increases to refraining the use of liquid load securing and incorrect legislation. The unawareness and, if aware, the perceived complexity of liquid dynamics have been and still are debit to this serious subject not being addressed, realized nor accepted as being serious. The lack of understanding unfortunately results in drivers of road tankers involved in keel-over, jack-knifing and other liquid dynamic related accidents being wrongfully accused of having caused the accident, or worse, of “reckless driving”. The scientifically supported, practical details contributing or possibly even causing these accidents will hereinafter be presented in a carriageable manner. Improved awareness and acceptance of these circumstances causing or contributing to accidents shall result in mitigation of both the number and the severity of liquid transportation related accidents. Furthermore, drivers of road tankers involved shall receive the appropriate justice.

The behaviour of bulk liquids during their transportation remains largely obscure for the public at large. This is to a large extent caused by the non-transparency of the mobile tanks these liquids are transported in. Besides drivers of road tankers, or of trailers loaded with a tank container, few people are aware that liquids “slosh” during their transportation and of the adverse safety effects thereof. Sloshing of a liquid cargo is often a factor being the cause of an accident with a road tanker and also often a factor contributing to the severity of such accidents. Sloshing, liquid dynamics, is not only a complex topic because of the ”invisibility” but also as it cannot be captured by a “snapshot” of a road tanker in its final, “keeled-over” or “jack-knifed” position. The liquid dynamic cause or contribution to a road tanker accident requires to be analysed both on (kinetic) energy and (centrifugal) forces and changes therein over the last kilometres and minutes prior to the road tanker trip ending prematurely. This is not, or at best seldom, realised even by professional accident investigating authorities.

Slosh mitigation

Sloshing of liquids being transported occurs as such liquid cargo’s are not secured. Load securing is covered worldwide by national legislation requiring such, while (bulk-) liquids are not explicitly exempted. Mostly, these laws are not enforced for liquid transportation. The “ADR”, the international law for transportation of dangerous goods including dangerous liquids recognizes sloshing as a safety hazard but makes the use of baffle plates, see figure 1, mandatory for liquid cargo’s only partially filling the tank these are transported in. Refer “ADR”, article 4.3.2.2.4. The mandatory load securing, as in “ADR”, article 7.5.7.1, remains obscure, multiple interpretable, as to its applicability for “unpackaged” liquids in road tankers.

Figure 1. Baffle plates inside a road tanker

Baffle plates do not secure loads, they mitigate sloshing by energy dissipation from the liquid, by forcing the liquid having to pass through holes in these plates. This increases the fuel consumption by road tankers. (By up to 12%, in the Netherlands). Load securing is not about “energy”, nor its dissipation, load securing is about “forces”, as is clear from for example the use of tension belts. Baffle plates, by their energy (into heat) conversion, in the driving direction only, do result in the liquid coming quicker to a stand still in case of the road tanker braking. However, baffles do not avoid keeling-over of the road tanker, as baffle plates do not have any sideway effects. Sadly all keeling-over of road tankers happening, are sideways.

Liquid load securing

Fortunately, the latest revisions of the ADR allow for load securing in accordance with the EN 12 195 alternative. This alternative is however not implemented nor enforced by law for bulk liquid cargoes yet. Liquid load securing is realized for example through new types of “dunnage bags”. The variable volume type of dunnage bag, called “Cairbag”, see figure 1, secures liquids at any liquid fill rate of the mobile tank. This version of liquid load securing is operated automatically without any human interference and avoids evaporation of the liquid, hence harmful emissions of such vapours.

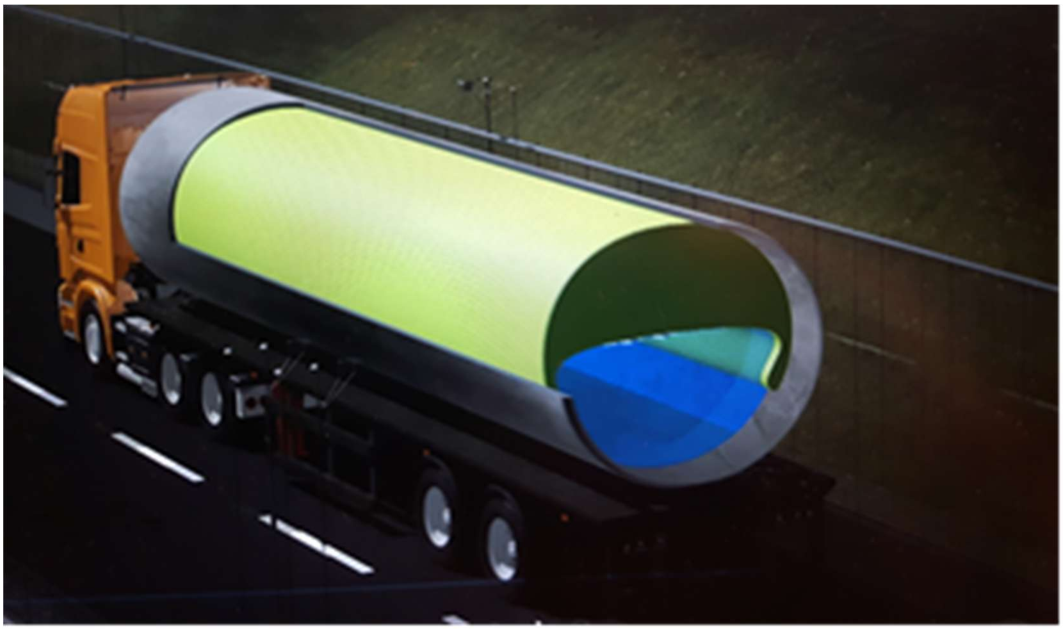

Figure 2. Liquid load securing by means of a “variable volume” type of “Cairbag”

Other safety delussions

Road infrastructures and truck technology developments play also an increasingly important role in the dwindling safety of liquid transportation. Road infrastructures become more and more “aesthetical pleasing” more round-abouts, more waving lanes, more curves, etc. All these add to the aggravation of dynamics of liquids during their transportation.

Truck technology developments including the “ABS” (brake-)system, the “Roll-over stability systems, steering rear axles and self-lifting axles of tank-trailers may appear to improve road safety aspects in general and presume to do so when applied in road tankers. This is however a delusion. Sloshing liquid cargo’s cause axle loads to vary. An “ABS” brake system responds by a pro-active reduction of the brake momentum prior to an axle load reduction and by a re-active increase of such momentum only after an axle load has increased. There is hence a loss of brake momentum, as compared to the normal safe maximum brake momentum due to sloshing, causing a considerable (3-5 meters) longer brake distance. A roll-over stability systems interferes with the prime controls of a driver of the driving conditions of the road tanker as such “RSS” may apply braking and change the radius of curvature through which the road tanker drives.

The total absence of liquid load securing in road tankers, the many new technology based components which are also applied in road tankers and the environment in which road tankers drive and drivers thereof do their job, are all aspects which require more awareness and a better understanding at large. Corrections in legislations are unavoidable while subsequential enforcement will be essential, if only to guarantee the justice for drivers of road tankers experiencing an accident.

The unchallenged acceptance of (too) many road tanker accidents has remained too long remarkable.

The working environment of drivers of road tankers

Erik Eenkhoorn

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Abstract

The environment in which drivers of a road tankers perform their work is becoming increasingly complex and thereby less safe. Almost inconspicuously and often without drivers being fully aware of this, every aspect in the working environment changes incrementally and progressively in complexity. Furthermore, drivers of road tankers are increasingly held responsible for coping with this while not receiving any dedicated training nor working instructions thereto.

Relevant topics of such working environment include:

- the increasingly higher safety and environmental standards of the (off-)loading locations,
- the expansion of automation, digitalization and communication being implemented,
- being subject to more legislation and liabilities,
- truck technology, tracking, tracing and planning,
- training of driving non-secured, dynamic liquid loads with increasing pay loads over total truck weight ratio's and increasing engine power of the trucks,
- Driving behaviour of other road users and the architecture of road infrastructures.

This paper reflects an on-going study being conducted in the Netherlands. The study focusses primarily on Dutch working environment conditions and changes therein. Initial observations allow for the intermediate conclusion that such conditions and changes therein occur similarly elsewhere in Europe and the World.

Drivers of trucks, including road tankers, work typically individually, on a stand-alone or rather "drive-alone" basis. They do not work in teams, nor at home. In cases of "dedicated" transportation, they may (off-)load at a few locations only. But even in these situations the drivers are faced with an increase of activities to be done by them. They have to hook-up the road tanker to the (off-)loading facilities, operate valves, connect the vapour return system and the overfill protection system, etc.

In "non-dedicated" cases, as occur for example with liquids being transported in tank containers on chassis-trailers, the variety of (off-)loading locations can be large. The driver hereby encounters different safety and environmental standards but also unique location operational, automation, digital and communication procedures, etc. to comply with. In some cases, watching a brief instruction film prior to entering the (off-) loading location, is assumed to provide the driver with sufficient information to enable him or her to fully understand all activities required by him or her and to execute these in a safe manner. The driver is assumed to be creative and decisive in non-standard situations, when these occur, while (off-) loading, driving on plot, or meeting administrative requirements.

The abolishment of drivers directly employed by oil and chemical companies, like "Shell" in the Netherlands, and the hiring of road tankers with drivers from dedicated liquid transportation companies, Like "Schenk" and "Nijhof-Wassink" is a "clear proof" of the risk and the (potential) cost of risk mitigation and safety assurance having become too unattractive for such oil and chemical companies. Contracting the transportation, preferably with inclusion of as many potentially risky (off-)loading operations is (economically) more attractive, especially at tariffs only

covering the base costs. This trend is also observed at the transportation of goods other than dangerous liquids.

"Companies with a high risk of serious accidents", as is the termination in the Netherlands, confirm hereby the use of two standards; the higher safety standard "on-plot", within the "ring-fence" and a lesser standard outside its location(s), i.e. the public road.

The on-going study (Netherlands) of the safety aspects of the working environment of drivers of road tankers analyses the aggravation of liquid dynamics due to higher engine powers, higher pay load to net road tanker weights, lack of liquid load securing in combination with more roundabouts and curved lanes being introduced in road infrastructures.

The paper and the originating study not only aims at creating awareness of the safety risks of the increasing complexity of the working environment of drivers of road tankers. The paper also addresses concrete solutions in several areas of concern like on liquid load securing, training, legislation, etc. On other topics, strong recommendations are suggested, for example on the architecture of road infrastructures and operational interfaces between drivers and (off-)loading management. Even though conditions and changes therein may be of "Dutch" origin, they generally occur similarly or comparably elsewhere. The paper will hence also address Australian (Asian) specific situations.

Intersections and injuries: insights from Event Data Recorders

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Centre for Automotive Safety Research

Abstract

Event Data Recorders (EDRs) objectively and accurately record pre-impact speeds for vehicles involved in a crash. Using CASR's EDR database, multi-vehicle crashes occurring at intersections with 50 and 60 km/h speed limits were isolated for analysis. Median travel and impact speeds of bullet vehicles (typically striking/higher-energy vehicles) were disaggregated by intersection type and traffic control methods, and the probability of serious injury based on the bullet vehicle impact speed was calculated. Roundabouts resulted in the lowest travel and impact speeds relative to speed limits, as well as the lowest probability of serious injury in the crash sample. T-junctions and crossroad intersections resulted in the highest probability of serious injury of the intersection types, while Stop signage and Give Way signage had the highest probability of serious injury of the traffic control methods.

Background

Event Data Recorders (EDRs) objectively and accurately record pre-impact speeds for vehicles involved in a crash (Bortles et al., 2016). Previous work (Elsegood et al., 2021) used a representative sample of EDR data to examine impact speeds, speeding, seatbelt usage and impact severities of crashes involving a light vehicle in South Australia. This paper describes further research being conducted on crashes that occurred specifically at intersections, with the aim to compare speeds of vehicles travelling through intersections, by intersection types and traffic controls with data from real crashes rather than theoretical assumptions.

Method

Since 2017, the Centre for Automotive Safety Research has been collecting EDR data from crashed vehicles from an auction yard for written-off vehicles. These data are matched with police reports and hospital injury data and form the CASR-EDR database. Details of the crash locations, road characteristics and infrastructure layouts, such as traffic control, intersection type and road speed limits are recorded in the CASR-EDR database.

As of early 2023, 692 CASR-EDR cases had a matching police report to the EDR file (one EDR vehicle per crash). Bullet vehicles (as described in detail in Elsegood et al., 2021 as a higher-energy/striking vehicle) were identified for all crashes. For this analysis, 113 cases were identified where the EDR vehicle was a bullet vehicle travelling through an intersection, recorded speed variables and was involved in a crash with at least one other vehicle.

The probability of serious injury (PSI) was calculated using equations based on frontal and side impacts as described in Doecke, Baldock, Kloeden and Dutschke (2021). For intersection crashes, the combination of probabilities for serious injury for each vehicle was calculated using the equation:

$$PSI_{intersection\ crash} = \left(PSI_{frontal\ impact} + PSI_{side\ impact}\right) - \left(PSI_{frontal\ impact} \times PSI_{side\ impact}\right)$$

where:

- $PSI_{frontal\ impact} = \frac{1}{1+e^{8.1231-\ .0548(closing\ impact\ speed\ of\ bullet\ vehicle)}}$
- $PSI_{side\ impact} = \frac{1}{1+e^{10.5583-\ .1161(closing\ impact\ speed\ of\ bullet\ vehicle)}}$

This equation assumes the crash configuration includes one side impact and one frontal impact, which occurred for the vast majority of the sample, however, there is the possibility of other configurations, such as a dual frontal offset crash.

Results

An initial analysis of intersection crashes by speed zones showed 85.8 percent (97 of 113) occurred in 50 and 60 km/h speed zones. To provide a meaningful combination of both speed zones, travel speeds (maximum speed recorded by the EDR) and impact speeds were expressed as speeds relative to the speed limit, rather than absolute speeds.

Table 1 shows the median and 85th percentile distributions of travel speed and impact speed (relative to speed limit), and the probability of serious injury for the crashes, by intersection type and traffic control type for multi-vehicle crashes occurring at intersections in 50 and 60 km/h zones.

Table 1. Travel and impact speeds relative to speed limit of bullet vehicles involved in multi-vehicle crashes through 50 and 60 km/h speed zone intersections, and the probability of serious injury for the crashes, by intersection type and traffic control

Intersection type	Count	Travel speed relative to speed limit (km/h)		Impact speed relative to speed limit (km/h)		Crash serious injury probability	
		Median	85th	Median	85th	Median	85th
T-junction	48	-4.0	0.9	-20.5	-7.0	0.51%	1.71%
Crossroads	39	-6.0	1.3	-21.0	-6.5	0.45%	1.39%
Driveway	5	-7.0	-0.6	-19.0	-12.0	0.27%	0.70%
Roundabout	5	-23.0	-12.8	-25.0	-19.2	0.26%	0.38%
Traffic control							
Uncontrolled	43	-4.0	1.0	-20.0	-7.0	0.45%	1.09%
Traffic signals	32	-11.0	-2.0	-24.0	-11.7	0.38%	1.12%
Give Way signs	10	-0.5	3.9	-12.5	-3.1	0.68%	1.92%
Stop signs	7	-1.0	3.3	-16.0	-12.4	0.76%	1.07%
Roundabout	5	-23.0	-12.8	-25.0	-19.2	0.26%	0.38%
Total	**97**	**-6.0**	**0.6**	**-21.0**	**-7.2**	**0.45%**	**1.26%**

Conclusions

Multi-vehicle crashes occurring at roundabouts, albeit a small sample size, showed the lowest travel and impact median speeds of bullet vehicles compared to crashes occurring at other intersections such as T-junctions, crossroads, as well as compared to other traffic controls such as traffic signals, Give Way signs, Stop signs and uncontrolled intersections. This suggests roundabouts provide a safer intersection for road users in light vehicles, however, data collection should be continued to provide a larger sample size for stronger evidence. The median probability of serious injury was greatest for T-junction and crossroad intersections, and intersections with Stop signs, Give Way signage and no traffic control.

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Use of back-casting as a framework for NSW strategy development

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Abstract

In April 2022 the NSW Government released the 2026 Road Safety Action Plan (the Plan) to set out priority road safety actions for delivery across five years from 2022 to 2026. The Plan was developed through extensive community and stakeholder consultation, trauma analysis, best practice approaches and research evidence. The Plan is underpinned by in-depth road trauma modelling, applying validated methods used in other best-performing countries, to estimate NSW trauma levels in the future. As a key input for road safety strategy development, back-casting was used to set a long-term vision for the transport system to achieve zero fatalities and serious injuries by 2050, to then work backwards to identify what the system needs to look like in 2030, and the changes and efforts needed to get there. This report outlines the general methodology as well as the learnings and key findings from the process in NSW.

Background

In April 2022 the NSW Government released the 2026 Road Safety Action Plan (the Plan) to set out priority road safety actions for delivery across five years from 2022 to 2026. The Plan includes targets for a 50 per cent reduction in fatalities and 30 per cent reduction in serious injuries in NSW by 2030 from a 2018-2020 average.

Approach

The Plan is underpinned by in-depth road trauma modelling, applying validated methods used in other best-performing countries, to estimate NSW trauma levels in the future (Fernandes et al., 2021).

As a key input for road safety strategy development, back-casting was used to set a long-term vision for the transport system to achieve zero by 2050, to then work backwards to identify what the system needs to look like in 2030, and the changes and efforts needed to get there. Overall, modelling results show the potential to reduce deaths by 90 per cent and serious injuries by 80 per cent by 2050. This highlights that a low trauma future is achievable, and that NSW can meet ambitious targets by delivering the right combination of high-benefit road safety measures across the NSW network.

Methods

In order to investigate what is needed to achieve a sustainable trauma reduction that reaches near term and interim targets, as well as creating a pathway towards zero trauma in 2050, a trauma modelling task was undertaken by Transport for NSW. This was then used as the basis for ongoing road safety strategy development including for the new Plan.

Many different approaches to modelling have been used in road safety strategy development. In this instance a key approach applied was a 'case-by-case' methodology, a validated analytical approach to inform strategy development that has been applied in the best performing countries in terms of road safety, including Sweden and Norway (Strandroth et al., 2012; Strandroth, 2015). The case-by-case methodology is not only statistical modelling, but rather a logical reduction of current crashes into future casualty outcomes based on what we know about delivery of future safety measures and system improvements at specific points in time.

In addition to the case-by-case analysis of NSW fatalities, a statistical dose-response model on serious injuries was developed to as close as possible mirror the analysis for the large number of serious injuries given it was not practical to analyse case-by-case.

The detailed approach undertaken throughout the trauma modelling process underpinning the Plan will be discussed at the conference.

Conclusions

This report provides an overview of the framework for strategy development in NSW, highlighting the use of in-depth road trauma modelling to estimate NSW trauma levels in the future, and guide strategic priorities and key actions to be delivered. Safety Performance Indicators (SPIs) will be used to drive continuous improvement of road safety performance in NSW and monitor progress of the Plan.

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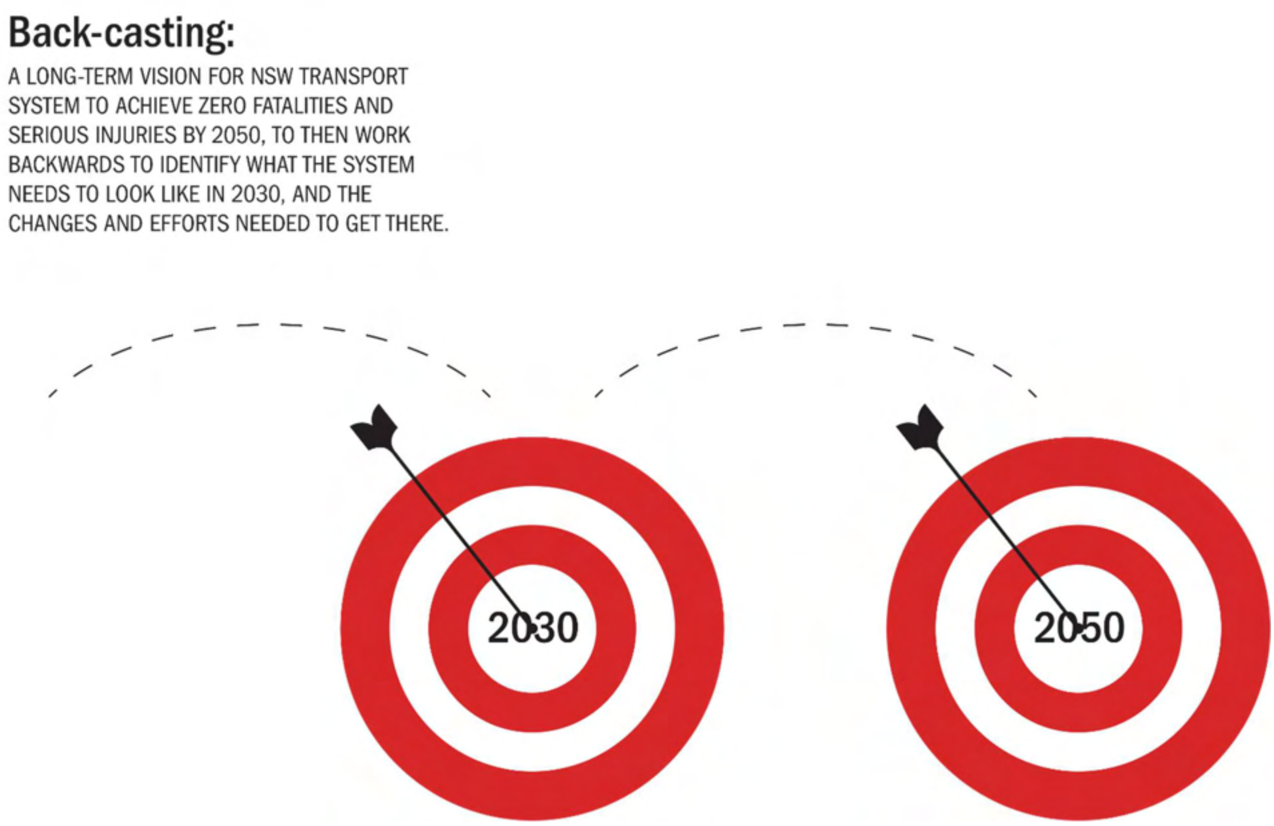

Doing things differently – road transport safe system champions of Aotearoa

Jeanine Foster and Junine Stewart

Waka Kotahi

Abstract

In New Zealand, 377 people were killed (Ministry of Transport, n.d. a) and 2469 seriously injured in road crashes in 2022 (CAS, 2023) approximately 64% of those are on local roads (CAS, 2023). In 2019, as part of the Road to Zero Speed and Infrastructure Programme, the role of an Area Programme Manager (APM) was created. Their job brings new ways of thinking to delivering road safety outputs and outcomes. This team is committed to superseding established road safety funding silos that have traditionally led investment conversations. By fully embedding safe-system-thinking, it removes personal blame and shifts the dial to the management of kinetic energy in crashes when a mistake happens. APMs lead the process for codesigning speed and infrastructure programmes with Local Authorities, putting road user safety at the heart of the conversation and using evidence to transcend political complexity. Three years on, with system changes now embedded, the results speak for themselves – but there's much more to do.

Background

New Zealand is addressing an unattractive status - one of the highest fatal and serious injury rates in the OECD (ITF, n.d.).

It's time for a new, safe system-led approach and revitalised leadership.

In 2019, as part of the Speed and Infrastructure Programme, the role of an Area Programme Manager (APM) was created. Their job, to bring a new way of thinking to the delivery of road safety outputs and outcomes.

This team is committed to superseding the established road safety funding silos that have traditionally led investment conversations. By fully embedding safe-system-thinking into all conversations the team has with our partners, it has shifted the dial from reactive, blaming road users, to the proactive management of kinetic energy when mistakes inevitably occur.

The APMs are a conduit into the co-funding of Local Council road safety programmes but are also supported by local technical and investment teams. Together, with their council partners, they co-design targeted road safety programmes for local roads and monitor how they contribute to Death and Serious Injury (DSI) reduction. In 2022, the remit of the APM expanded to include new guidance around speed management and enforcement through an expanded safety camera programme.

Councils and their communities have a huge weight on their shoulders. Local road networks span more than 83,000km across the country, that's 88 percent (Ministry of Transport, n.d. b) of the road network, and account for 64 percent of New Zealand's DSIs in 2022 (CAS, 2023).

APMs have a unique position of influence, selling a safe-system and data-led pathway to a desired outcome. Putting tangible road user safety outcomes at the heart of the conversation has made it possible to have the hard discussions up front, which has helped to transcend political complexity and resistance to change within communities.

Following a full business case approved by the Waka Kotahi Board, a geospatial model was created to represent the speed and infrastructure changes that needed to be built to achieve the Road to Zero 10-year target.

This model maps out the highest-risk intersections and corridors on all New Zealand roads. It also suggests appropriate safe system treatments and investment levels based on the potential harm at that intersection or corridor. Providing councils with a visual evidence-base has been a gamechanger. For the first-time councils can see a full picture of their road safety programme, demonstrating the level of benefit achievable through targeted investment. This has also been pivotal in communicating their programmes to elected members and communities.

Another innovation was the creation of a new streamlined investment pathway providing a standardised approach to calculating the economics for safe system treatments, enabling faster decision-making and investment confidence.

The APM-Council partnership approach presents scalable opportunities to integrate coordinated investment into environmental and other transport outcomes, while ensuring that all road users can move about safely as a do-minimum.

Three years on, these system changes are being embedded in the decision-making process, construction is underway, and benefits are beginning to be realised. This will directly impact the lives of more than 2600 people using the local road network within 10 years, by 2030 (NZTA, 2020.[7]

The future looks bright, but there's much more to do.

Figure 1. Role of Area Programme Managers

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[7] 40% of modelled DSI by 2030

Table 1. Speed and Infrastructure Programme Business Case (2020) (NTZA, 2020)

Table 3 Deaths and Serious Injuries (DSIs) Across the New Zealand Network (2014-2018)

Factor	State Highway	Local Road	New Zealand Total
Length of Network	11,000 km (12%)	83,000 km (88%)	94,000 km
Vehicle Kilometres Travelled (VKT)	23,543 million VKT (51%)	23,010 million VKT (49%)	46,554 million VKT
Deaths	51%	49%	100%
Serious Injuries	36%	64%	100%
DSIs	38%	62%	100%
Urban and Rural DSIs	16% urban 84% rural	63% urban 37% rural	45% urban 55% rural
Intersections and Midblock DSIs	21% at intersections 79% midblock	34% at intersections 66% midblock	29% at intersections 71% midblock
Active Road Users (e.g. pedestrians and cyclists) and Motorcyclists DSIs	7% active road users 16% motorcyclists	23% active road users 21% motorcyclists	19% active road users 17% motorcyclists
DSIs by crash type: Rural Head On, Run off road, Intersection, Other	31% Rural head-on 40% Run off road 13% at intersection 16% Other	16% Rural head-on 59% Run off road 14% Intersection 11% Other	25% Rural head-on 48% Run off road 13% Intersection 14% Other

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How the Local Government Road Safety Program delivers to NSW

Fiona Frost, Chantal Ensbey, Lucy Filardo and Jacqueline Anderson

Transport for NSW

Abstract

For 30 years the NSW government has partnered with local government to deliver behavioural road safety initiatives to communities across the state. This partnership, known as the Local Government Road Safety Program (LGRSP), co-funds dedicated Road Safety Officer (RSO) positions within councils to deliver road safety education directly to the community through targeted projects and engagement opportunities. The key benefits of the program include delivery of targeted localized programs that would not be delivered by statewide programs and the agility to address emerging issues, as well as contributing to reducing road trauma.
Here we explore how local communities benefit through this partnership program.

History

In 1992, Fairfield Council and the then Roads and Traffic Authority launched a pilot project aimed at addressing road safety issues in an area, which had one of the worst crash records in the state. The role of "Road Traffic Safety Officer" was to develop activities that would improve road safety in the community.

Current Approach

RSOs use their local knowledge and contacts to help in educating the community and raising the profile of specific road safety issues.

One example of how RSOs work within their community is child carseat fitting projects which have been part of the LGRSP since its inception and have been adapted across the state, to educate families to use an age-appropriate car seat that been installed correctly. Research shows nearly half of Australian parents using restraints are using them incorrectly, increasing the risk of serious injury to children by up to three times (University of NSW, 2018) and this program proactively addresses this issue.

One western Sydney RSO leveraged an existing car seat program, funded through the LGRSP to improve car seat use in the area and address the high levels of fines for car seat infringements. The area has a large urban Aboriginal population and high numbers of recent migrants as well as a high proportion of lower income families. The RSO worked with NSW Police Highway Patrol, local health providers and community support groups. As a result of the program the local Highway Patrol issued 30 percent fewer car seat penalty notices in 2019 compared to the same period in 2018 with no change in policing strategy.

More generally, child carseat education and awareness programs, including this one, have led to consistent reductions in road trauma for young children in NSW over the past decade. From 2017-2021, there were 929 children aged 0-7 years who were hospitalised in NSW with a serious injury from a road crash, which is a 20 percent reduction compared to the previous five-year period.

Another way of engaging with the local community is through large-scale community events. Local agricultural field days and annual council events attract large numbers of people and create the opportunity to "talk road safety" to people from a wide variety of backgrounds and ages, often with

the support of local police or other sections of council. The levels of engagement and the range of questions posed by attendees show the need for this community-based engagement.
The ability to work with multiple agencies and local stakeholders is one of the strengths of the LGRSP which now involves 84 councils employing 75 RSOs across NSW (as of February 2023).

Looking forward

Encouraging other councils to participate in the program remains a consistent goal to ensure that as many communities as possible can benefit from the program.
Under the NSW Road Safety Action Plan 2026, the LGRSP will be reviewed to enhance the program to better deliver local road safety priorities and ensure every council has access to the program.

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Understanding the limitations of telematics for evaluating collisions: systematic comparison of telematic and crash event data

Tia Gaffney[a], David McTiernan[b], Christopher Keramidas[a] and William Keramidas[a]

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Abstract

Many telematic providers claim these systems can record crash data or data related to other so-called 'near miss' events such as 'harsh braking' or 'harsh cornering'. The authors have investigated the viability of telematics to accurately predict crash and 'near miss' events. The authors' review of serious collisions wherein crash event data was recorded has highlighted limitations of telematic systems in recording crash data; including necessary frequency to capture crash pulse data and observed latency effects. Based on evaluation of emergency braking and swerving events, the authors propose a set of criteria to define 'critical' events wherein a vehicle is likely to be out of control

Observations

In collisions evaluated by the authors where both telematic data and EDR data are available, the latency of telematic systems has been identified to be commonly on the order of 3 to 3.5 seconds (Figure 1). In collisions where acceleration precedes a crash event, the telematic data will **underreport** the true crash speed and where deceleration precedes a crash event, the telematic data will **overreport** the true crash speed.

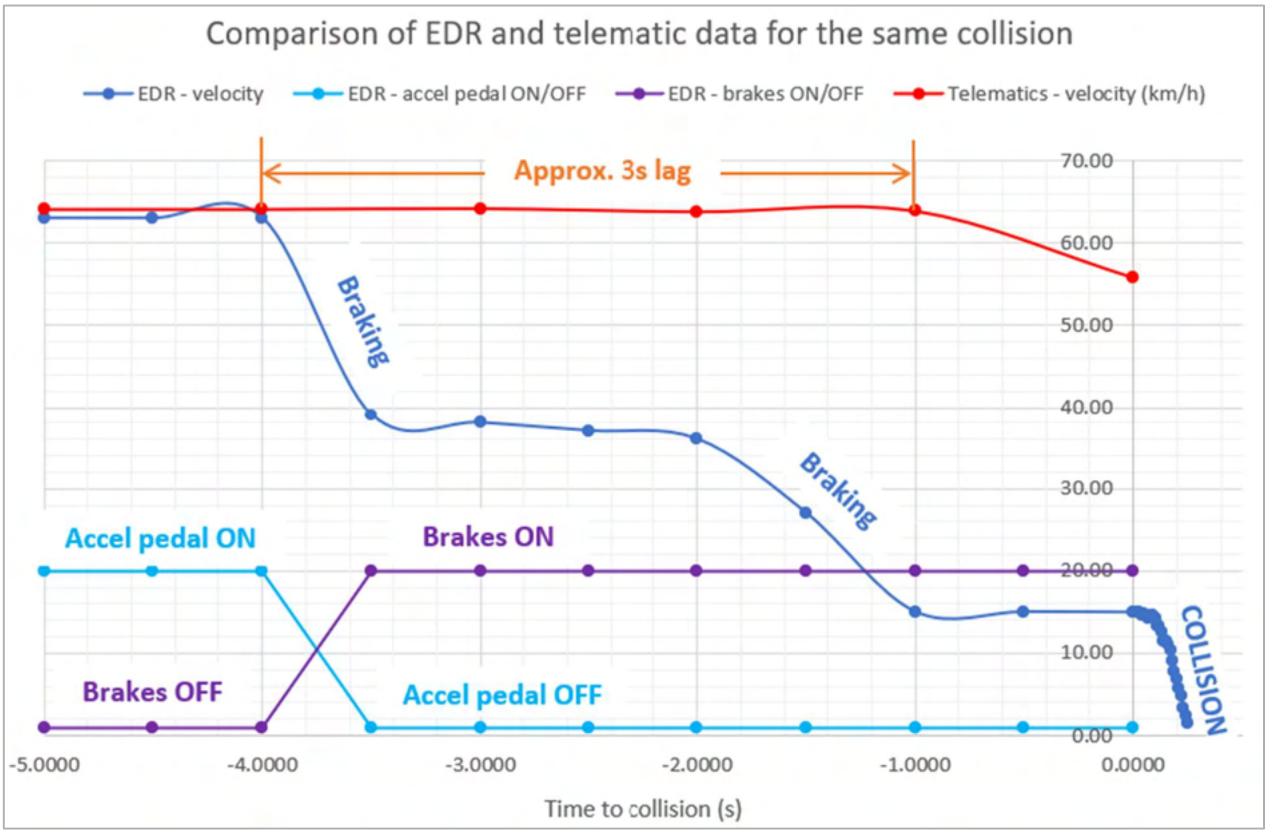

Figure 1: Lag in telematic data compared to EDR unit for the same example collision

Given GPS systems typically require network reception, there are also many areas throughout Australia, including central business districts where buildings can also block reception, where significant gaps in data occur. These gaps or truncation of critical data can hamper the understanding of the sequence of events and actions leading to the crash and, in a worst case, give a false narrative to what occurred.

Harsh acceleration events

Telematic systems capture ‘harsh acceleration’ including ‘harsh braking’ or ‘harsh cornering’ events. It is noted that in the example shown in Figure 1, the time lag and sampling frequency prevented the telematic unit from recording the emergency braking event which preceded the collision. The tolerance for harsh braking for most systems is set at between 0.3 to 0.5g. While this tolerance represents a relatively quick stop, the tolerance is not near to a true critical event (Gaffney & Winter, 2022, Hartman & Alam, 2014).

Based on evaluation of real critical events, the authors recommend the tolerance values in **Error! Reference source not found.** for paved roads.

Table 6: Recommended values for evaluating critical telematic events on paved roads

Event Type	Passenger vehicle (ABS)	Heavy truck
Critical (near emergency) braking	0.6	0.4
Full emergency braking	0.8	0.5
Critical (near yaw or roll) cornering	0.5	0.3

Policy Considerations

Policy makers and practitioners should be aware of the limitations of telematics in portraying crash and near miss events accurately. The speed reported by a telematic system may be a good indicator of steady state travel speed but telematic data may not provide a good estimate of a vehicle’s speed preceding a crash event. Use of telematic systems to define near miss events should be met with caution. Many events being categorized as ‘near miss’ or ‘wheel slip’ events may in fact be simple controlled steady state maneuvers.

When policy makers use telematic data to identify concerning areas of the road network, it is important to consider whether ‘harsh braking’ events are occurring due to predictable stopping traffic (i.e., during peak hour on a freeway) or if the events signify a more sinister road design issue. In evaluating near miss events, it is important to select a higher harsh braking tolerance, which will reveal critical events, rather than the upper limits of normal, everyday driving. In the alternative, utilizing **safety event triggers** (i.e., activation log for trigger events involving airbags, ABS, traction control, etc.) are likely better indicators of critical events.

Access to EDR data provides road safety practitioners with reliable data about crashes, particularly relating to approach speeds and other pre-impact behavior including seatbelt use, headlight operation, and braking performance. Obtaining robust crash event data is good scientific policy that will no doubt benefit any autonomous future in Australia (Gaffney et al., 2021, Hardiman & Hardiman, 2019).

Key Definitions

Crash event data is obtained from the vehicle's OEM Event Data Recorder (EDR). As a planar crash has a pulse of about 100ms, EDR data is recorded every 5 to 10ms, with 5 to 15s of pre-crash data recorded each second. This rate of collection ensures the crash event, and the events immediately leading up to it, are captured in their entirety.
Event data recorder (EDR) is a unit which sits near the vehicle's center of gravity that contains accelerometers and other sensors which record crash pulse and pre-crash data. The crash event data is hard written to the EDR and remains physically with the vehicle. Access to the vehicle's EDR record is obtained via the on-board OBD-II (diagnostic) port or directly from the EDR unit. To obtain access, one must have tangible access to the vehicle, ensuring the chain of evidence is maintained.
Latency is the lag or delay in network communication. In some cases, speed and acceleration data recorded by the telematic unit will be truncated (the recording and reporting will be cut off before there is an opportunity to send data to the cloud). A crash in a low- or non-coverage network area can also return heavily distorted or inaccurate crash data.
Telematics is increasingly used in the transport industry to track the movements of vehicles, drivers, and goods. Telematics uses either GPS or CAN-BUS data, or both, to report (over a time scale) vehicle and driver related data. The recording frequency of a telematic unit varies based on the events observed. Most units record continuous data at a rate of either one sample per minute (0.017 Hz) or one sample every 10 seconds (0.1 Hz). When an 'event' is recognized, some systems will temporarily record data at a rate of 1 sample per second (1 Hz).

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Can normative messages reduce smartphone use among young drivers?

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Abstract

According to the Social Norms Approach, normative messages which correct misperceptions about the prevalence of a risky behaviour can reduce engagement in that behaviour. The current survey study (*N* = 168) was guided by Step 4 of the Step Approach to Message Design and Testing (SatMDT) and investigated the effectiveness of three newly developed normative messages to reduce smartphone use among young drivers. The messages each focused on one of injunctive norm, subjective norm, or descriptive norm. Gender, licence type, and behavioural identity were included in the analyses. Two 4 (3 messages + control) X 2 (gender or licence type) ANCOVAs with behavioural identity as the covariate were conducted. Results showed a significant gender X message interaction effect (p = .03) and a significant licence type main effect (p = .03). Normative messages could form an effective component of future public education campaigns targeting smartphone use among young drivers.

Background

Normative influence refers to the way we look to referent others for guidance on how to act (Shulman et al., 2017). Examples include descriptive norm (i.e., perception of what others do), injunctive norm (i.e., perception of society's approval), and subjective norm (i.e., perception of important others' approval). Research shows that norms influence young drivers' smartphone use (Gauld & Reeves, 2023).

Norms are differentially influential depending on the person and the situation. Those who identify as high engagers in the risky behaviour (i.e., have a high level of behavioural identity) perceive others as high engagers which influences their own behaviour. Norms are more effective in new situations, for example, a provisional licence holder may look to others for guidance on whether to use their smartphone while driving (Berkowitz, 2004).

Normative perceptions, however, are often misperceptions where people overestimate the degree to which important others approve of, or engage in, the risky behaviour. Normative messages which provide feedback to correct these misperceptions can reduce engagement in the risky behaviour (Berkowitz, 2004).

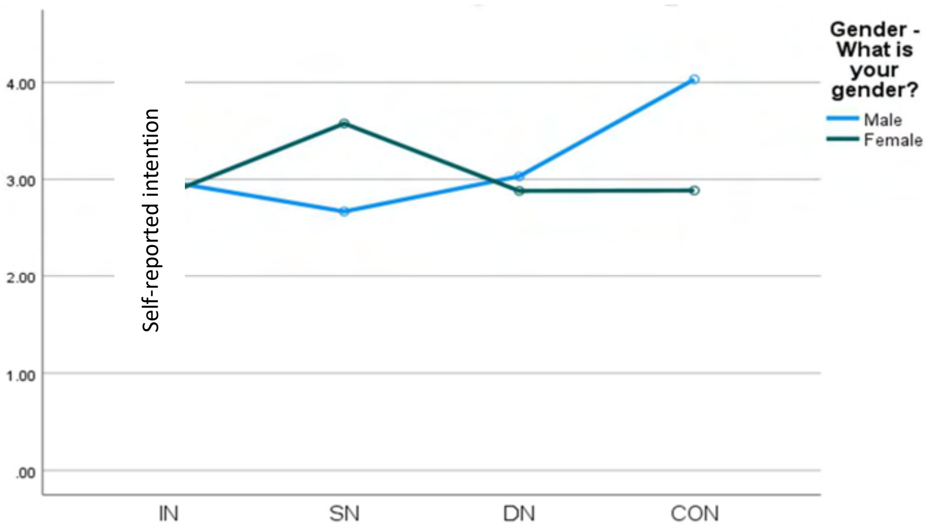
Guided by Step 4 of the SatMDT framework (Lewis et al., 2016), this study evaluated the effectiveness of three newly developed normative messages (focusing on descriptive, injunctive, and subjective norm) targeting smartphone use among young drivers.

Method

Participants (*N* = 168, 103F) were aged 18 to 25 years (M_{age} = 21.21, *SD* = 2.17) owned a smartphone, had a driver licence (89 open, 79 provisional), and lived in NSW. They completed an online survey in which they were randomly assigned to a normative message condition or control. The messages were '65 percent of young NSW drivers say mates hate phone use while driving' (subjective), '68 percent of young drivers say phone use while driving is not OK' (injunctive), and '54 percent of young drivers rarely use their phone while driving' (descriptive). The dependent variable was self-reported intention to use a smartphone while driving in the next week. Gender, licence type, and behavioural identity were also assessed.

Results

Two 4 (message: subjective, injunctive, descriptive, control) X 2 (gender or licence type) ANCOVAs were conducted with behavioural identity as the covariate. For the ANCOVA including gender, there was a significant interaction effect $F(3, 159) = 3.15$, $p = .03$; partial eta^2 =.06 suggesting males and females responded differently to the different messages. In particular, the subjective norm message appeared more effective for young males than young females. For the ANCOVA including licence type, there was a significant main effect for licence type $F(3, 159) = 5.10$, $p = .03$; partial eta^2 =.03. Specifically, provisional licence holders had a lower intention than open licence holders to use a smartphone in the next week regardless of the message.



Message type (IN = injunctive norm; SN = subjective norm; DN = descriptive norm; CON = control)

Figure 1. Interaction effect of message X gender

Conclusions

Normative messages could be an effective component of future public education messages targeting smartphone use among young drivers. Given young male and young female drivers responded differently to the different normative messages, it may be important to develop distinct normative messages for each gender such as focusing on the subjective norm message for young male drivers.

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Descriptive Road User Movements: taking all road users into account

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Abstract

Incidents between various road user types in the road reserve have historically been between motorised vehicles travelling in a lane. Analysis has shown that this has led to crashes involving a bicycle often being coded under a single movement action, entering the roadway, when the actual movement was being struck while in a bike lane, a concept that did not exist when crash codes were created. A review of Queensland's existing Definitions for Coding Accidents (DCA) highlighted that since its introduction back in the early 90's, the changes to descriptions of the road space, allocation of space for different road users and new modes of transport, has a lack of codes available to describe all crashes. Queensland has produced updated guidance to better describe road user movements for all road users involved in a crash rather than having a very motorised vehicle centric process to define an accident, another archaic term that was being used.

Background

One of the basic tools for understanding what happened during a crash is the road user movement or crash type (originally referred to as the RUM code when introduced in Victoria in 1968). ARRB Technical Manual ATM 29 (Andreassen, 1991; Andreassen, 1992) established the model guidelines for describing the procedures for deriving accident codes from a crash sketch and narrative contained in a police crash report. During the coding of information from the crash report form, each crash is given a Definition for Coding Accidents (DCA) code indicating the movements the involved road users were making when the crash occurred based on the established codes used by a particular road jurisdiction.

Project

Queensland Police Services (QPS) (and hence the Queensland Department of Transport and Main Roads (TMR)) adopt such a protocol for assigning crash codes to reportable crashes that occur in Queensland (Queensland Department of Transport and Main Roads (NA)). Through DCA codes, a practitioner can quickly identify any crash pattern at a particular location, which may suggest a common contributing factor and lead to an appropriate countermeasure.

In early 2020, TMR identified that 45 percent of crashes involving bicycles entering a roadway might have been coded in a way that did not clearly indicate crash nature. This led to a series of meetings to explore this issue further, resulting in the identification of not just crashes involving bicycles entering from the footway being mis-represented but a number of other crash types not being captured (due to the outdated methodology).

Subsequently, the reach of the project was expanded in response to a request from QPS to review all DCA codes and to republish a fully revised set of DCA codes. This resulted in identifying several new recommended crash types, each were added to the coding diagram.

This project drew this information together into the Technical Note 206: Guide to coding crashes (Queensland Department of Transport and Main Roads, 2023), with the outcome being the new Descriptions for Road User Movements (DRUM) protocol to replace the DCA protocol in

Queensland. This guidance will be incorporated into the Austroads Guide to Road Safety Part 2: Safer Roads (Austroads, 2021) at the earliest opportunity in future coding of crashes. A key change in the coding, related to the bicycle crashes was the replacement of DCA code 408 "FROM FOOTWAY", which had been used to describe mot crashes with a bicycle, such as if they were in or entering from a bike lane, shown below, with two columns of DRUM codes to better describe where the bike was, such as being on or entering from a footway or a non traffic lane, to provide a clear crash code that can be used to inform of what treatments may be used in treating this crash.

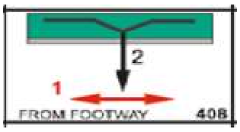

Figure 1: DCA Code 408

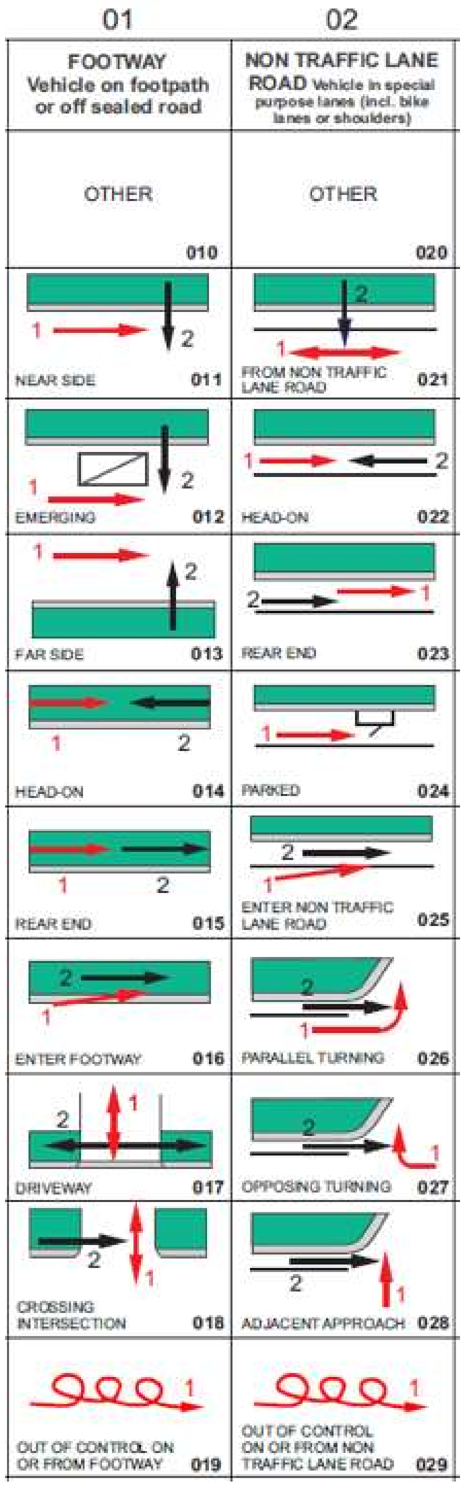

Figure 2: DRUM Codes 010 - 029

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Improving active mobility safety at signalised intersections using drone footage

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Abstract

The intersection of George Street and Wellington Street, West Perth, is signalised with pedestrian/bicycle crossings. Analysis of crash data revealed that cyclists are particularly at risk at this intersection. To gain a deeper understanding of user behaviours at this intersection, drone video footage was processed to produce telemetric data (direction of travel and speed) for vehicles and vulnerable road users (VRUs). By subsequently synchronising the footage with signal phases, it was possible to analyse several metrics that are difficult or costly to accurately collect by other means, including VRU crossings on red or green aspects and waiting times. The analysis revealed a high proportion of VRUs crossing on a red aspect, which was tied to the signals not being sufficiently optimised for VRUs or vehicles. The results were presented to the relevant roads authority which is now actively considering actions to improve safety for all road users at this intersection.

Background

The intersection of George Street and Wellington Street, West Perth, was nominated as the 17th riskiest WA intersection in RAC's 2019 Risky Roads survey. Between 2017 and 2021, there were 34 crashes, including five right angle crashes involving cyclists, three of which resulted in serious injuries. A Principal Shared Path (PSP) runs through the signalised intersection, resulting in high cyclist traffic volumes. RAC commissioned GHD to undertake a study of this intersection to explore if video analytics could offer cost-effective insights on how to improve cyclist and pedestrian safety at urban intersections.

Methodology

During a weekday in April 2021, drone footage covering 2 hours of both the AM and PM peak periods was collected from a vantage point approximately 70 metres above derelict land to the side of the intersection.

Having geo-referenced fixed features within the footage's field of view, AI software was used to determine the class (car, bus, van, pedestrian, cyclist) and telematics (speed, acceleration, and track) of each road user.

By defining a series of virtual gates and regions within analysis software, it was possible to identify, for example, when a pedestrian or cyclist entered the road at a crossing point. When synchronised with signal timing data provided by Main Roads WA, it was possible to determine whether that crossing had occurred on a red, flashing red or green aspect.

Findings

The drone footage captured over 800 pedestrian carriageway crossings, over 1,600 cyclist carriageway crossings and over 7,000 road vehicles travelling through the intersection. The analysis revealed a high proportion of VRUs commencing their crossing on a red aspect (Figure 1). It also revealed that on average pedestrians were willing to wait or 'dwell' longer than cyclists before commencing a crossing on a red aspect.

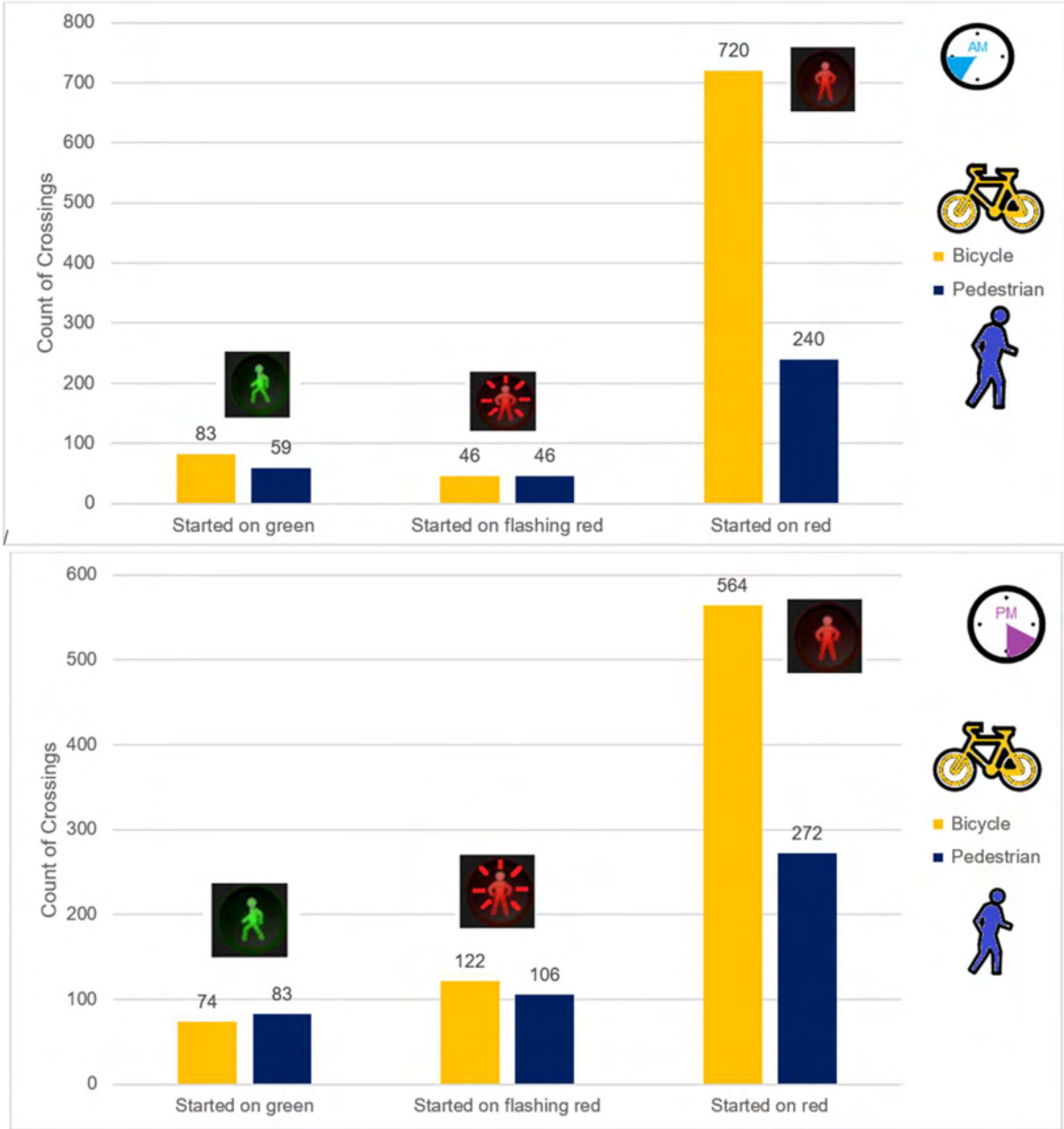

Figure 1. Summary of all VRU crossings by aspect (AM and PM Peak)

There was particularly poor compliance from cyclists using the PSP. On site investigation revealed that, depending upon arrival during the signal cycle, it could take a VRU up to 4 minutes to legally traverse the three staged PSP crossings through the intersection across Wellington Street. The analysis concluded that the signals were not optimised for VRUs or vehicles, resulting in longer than necessary cycle times and gaps in road traffic that may tempt VRUs to cross illegally. These insights would have been challenging to collect without analysing drone footage.

Next steps

RAC and GHD presented the findings of the study to Main Roads WA in January 2023 and proposed several interventions to improve safety, drawing on a review of key literature relating to improving cyclist (Hobday, 2019) and pedestrian (Palamara, 2013) safety at metropolitan intersections. Key recommendations included reducing the signal cycle time to provide more crossing opportunities, amending the signals to enable Wellington Street to be crossed in a single signal cycle, giving VRUs priority over vehicles using the Wellington Street slip lane and installing vehicle activated warning signs. Main Roads WA is now planning to investigate this, and neighbouring, intersections further to understand the impact of different interventions.

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Safe travel for pedestrians: reduce 50km/h default limit to 40km/h

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Abstract

Pedestrian injury data confirms serious head injury risk rapidly rises at collision speeds above 30 km/h. At Australia's 50 km/h default speed limit, head injury risk rises to 60 percent. A systematic review of pedestrian fatalities after being struck by the front of a motor vehicle suggest a 30 percent fatality risk at a 50 km/h impact speed. This study will demonstrate how a car driver travelling at Australia's 50 km/h default speed limit with lights set to low beam in a poorly lit suburban street, will not perceive the pedestrian in time, colliding at 50 km/h. At 40 km/h the driver has just enough time to perceive the pedestrian and react to slow the car to around 30 km/h with a 5 percent risk of killing the pedestrian. This is strong evidence why Australia's default urban speed limit law should be revised from 50 km/h down to a more survivable 40 km/h.

Background

The relationship between estimated impact speed and the risk of a pedestrian fatality has generated much debate concerning what should be a safe maximum speed limit for vehicles in suburban streets as well as in high pedestrian active areas. The impact speed during a crash with a pedestrian is strongly related to the risk of a pedestrian fatality and, hence, to the speed limit. Therefore, the relationship between impact speed and risk of a fatality is a critical factor in making decisions regarding the setting of safe speed limits.

Mizuno (2005) analysed pedestrian injury data showing how the risk of a serious head injury begins to rapidly rise at collision speeds above 30 km/h, and at Australia's default speed limit of 50 km/h, the risk of a fatality from a head injury rises to 60 percent. Additionally, a systematic review and meta-analysis of published pedestrian collisions studies by Hussain et al (2019) from UNSW Sydney and Hasselt University in Belgium, suggest that the probability of fatality at an impact speed of 50 km/h is around 30 percent, whereas at an impact speed of 40 km/h the fatality risk drops to 13 percent and at 30 km/h it is 5 percent. Neal-Sturgess et al (2007) shows a comparison between injury severity and impact speeds for pedestrian injuries from studies spanning 26 years, where at 30 km/h the risk of a serious injury (SI) is around 40 percent and a minor injury (MI) is 100 percent whereas at 40 km/h SI is 90 percent and MI is 100 percent.

A simple crash reconstruction analysis of a car into pedestrian collision at night, with a car's lights set to low beam in a poorly lit suburban street, indicates that on average a driver will not perceive the pedestrian in time if the car is travelling at Australia's default speed limit of 50 km/h (Australian Government, 2021a). The car will impact the pedestrian at that speed with a 29 percent risk of being killed unless it has an automated braking system. At 40 km/h the driver has just enough time to perceive the pedestrian and react to slow the car to around 30 km/h with a 5 percent risk of the pedestrian being killed. The analysis further indicates that had the car been travelling at 30 km/h, the driver would have readily perceived the pedestrian to be able to brake in time without impacting the pedestrian.

It is important to note that modern vehicles will likely have autonomous emergency braking (AEB) after recent EU and Australian legislation was introduced (Australian Government, 2021b;

European Union, 2020) and more vehicles will progressively have pedestrian head up night vision displays illuminating pedestrians (Ahire, 2014). Nevertheless, the average age of vehicles registered in Australia is around 10.6 years (Australian Bureau of Statistics, 2021) which do not have such technology and it will likely require more than a decade and a half for such technology to feed into the vehicle fleet. Hence, action regarding reducing the default urban speed limit needs to be considered to cater for the older vehicles and to meet the Australian Government's commitment to achieving the targets of a 50 percent reduction in road fatalities and 30 percent reduction in serious injury set down in the 2021-2030 National Road Safety Strategy (Australian Government, 2021c).

Method

A case study of an older model car into pedestrian collision that occurred after dark in a rural town setting at an intersection is used for illustrative purposes. Police measurements, at-scene police photographs, the police interview with the driver, and a survey of the site, were available. This provided the basic parameters relating to the collision. The driver alleged the vehicle's travel speed was 40 to 50 km/h in a 50 km/h zone. The pedestrian, when crossing the intersection, had their head down looking forward and did not turn to look at the approaching car. Figure 1 shows the intersection and how the vehicle struck the pedestrian. The longer skid mark measured was 16.2 metres.

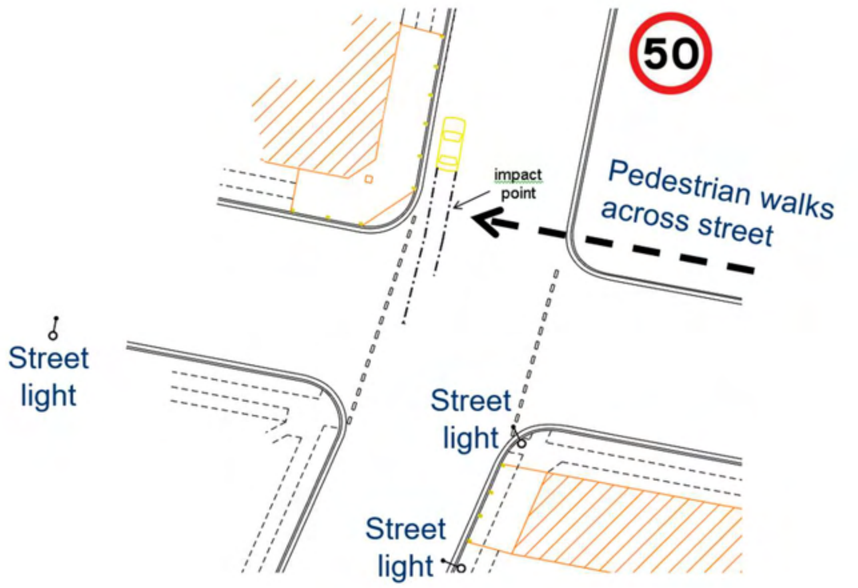


Figure 1. Sketch of intersection, street lighting from survey and Police measurements. North is directly up and pedestrian approaches from the east.

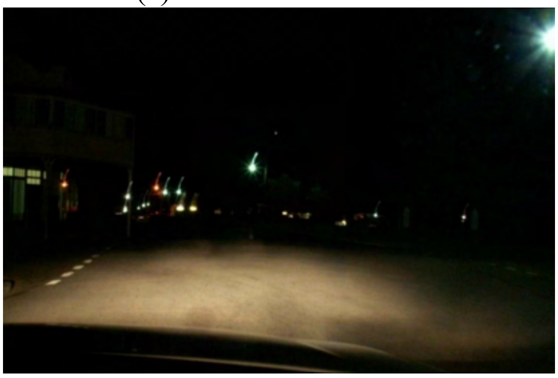
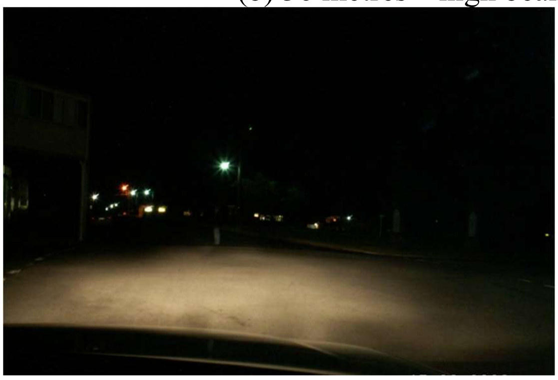
The speed of the vehicle prior to braking can be estimated based on the final rest position of the vehicle and the length of the skid marks. The key variable is the coefficient of friction of the tyre on the road surface. Typical values (Grzebieta et al., 2019; Baker & Fricke, 1986) for travelled dry bitumen roads range from 0.55 to 0.7. For 'new, sharp' asphalt surfaces, the coefficient of friction can vary from 0.6 to 1.0. For this incident, a values of 0.6 was adopted for a travelled road.

Actual perception/reaction times (PRT) vary depending on the situation, but they can range from around one second to up to two and a half (2.5) seconds depending on the experience and alertness of the driver (Triggs & Harris, 1982; Olson & Sivak, 1986). The time taken for a driver to bring their vehicle to a stop is the summation of three basic times: perception time, reaction time and actual stopping distance time. This comprises the time taken to detect the presence of the pedestrian, identify that the pedestrian represents a potential hazard, decide the action to be taken and react or respond by taking action (e.g., apply brakes). Around 1.5 seconds is usually adopted as the length of perception/reaction time to the moment brakes would have been applied although 1 second can be adopted for an alert driver.

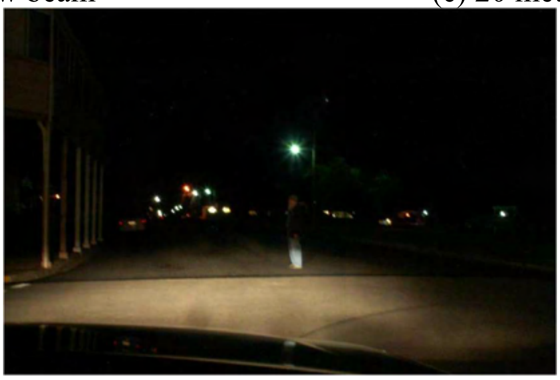
In terms of visibility, the pedestrian was wearing dark clothing. Olsen (1987) conducted a study using standard low beam headlamps to determine the distance at which pedestrians were visible under headlight conditions. The pedestrians were either clad in blue denim or in a white vest. Based on 60 trials from 23 young subjects the 5th and 95th percentile response for distances were 15 to 76 metres near (kerb) side and 8 to 38 metres off (far) side for the blue denim clad pedestrian.

A series of night photographs at the crash location, contrasting the visibility of a pedestrian at various distances from a vehicle, for low and high beam illumination, were taken. Figure 2 shows that a pedestrian standing in the middle of the street close to where the impact occurred, would not be perceived by a driver with the vehicle's lights set to low beam until the vehicle was at or less than around 20 metres from the impact point. There was no background lighting that would assist with providing sufficient contrast that would illuminate a pedestrian crossing the street from the northeast corner. Hence, the distance of 20 metres was found consistent with Olsen's research findings.


(a) 36 metres – low beam (b) 36 metres – high beam

(c) 26 metres – low beam (c) 20 metres – low beam



(d) 14 metres – low beam

Figure 2: Visibility of pedestrian at various distances from the vehicle, standing in the middle of the road, at the intersection close to where the pedestrian was struck.

Results

Using a coefficient of friction of 0.6 and 1.5 seconds PRT with the vehicle travelling at a speed of 50 km/h (14 m/sec), in 1.5 seconds the vehicle will travel around 21 metres. Hence, it is not possible for the driver to perceive and react in time. Impact would occur at 50 km/h with a 30 percent fatality risk (Hussain et al, 2019). This is equivalent to jumping out of the top window of 3 story building (Murray, 1994) and reaching 50 km/h at ground level. Assuming 1 second PRT, the driver would just be able to apply the brakes and impact speed would be around 40 km/h with a 13 percent fatality risk (Hussain et al, 2019). That would be equivalent to reaching that speed at ground level if jumping out top floor window of a 2 story house.

If we assume the vehicle is now travelling at 40 km/h (11 m/sec) under the same conditions, in 1.5 seconds the car would travel around 17 metres. The driver would then be able to brake the car for 3 metres (needs around 10 metres to stop) and would strike pedestrian at around 33 km/h with a fatality risk of around 6 percent. That would be equivalent to reaching that speed at ground level if jumping off a house roof. Assuming 1 second PRT, the driver would be able to apply the brakes to slow the car down to an impact speed of 17 km/h.

If we assume the vehicle is now travelling at 30 km/h (8.3 m/sec) under the same conditions where the pedestrian is visible at 20 m, in 1.5 seconds the car would travel around 12.5 metres and the only require 6 metres to stop. That is, no impact would occur.

Conclusion

This study shows that Australia's default speed limit is set too high particularly if Australia is to meet 2021-2030 National Road Safety Strategy trauma reduction targets. The limit should be reduced to, at most, 40 km/h in poorly lit urban environments, which constitute most suburban and CBD streets in Australian cities and towns, to provide pedestrians a sufficient probably of surviving a pedestrian collision.

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Gearbox: protect your body on every ride

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Transport Accident Commission

Abstract

Motorcycle riders have 10 the risk of serious injury of car occupants, regardless of fault (AIHW, 2008). TAC internal data shows that on average there are 2,500 motorcycle related injury claims per year. Of the approximately 450,000 licensed Victorian riders (203,000 registered motorcycles), 98% report that they own protective gear. However, riders do not wear their protective gear on every ride (Motorcycle Monitor, 2021). Protective gear reduces the severity of the most common rider injuries, particularly falling and sliding on the ground, abrasions, friction burns, cuts and lacerations, including having skin and muscle stripped from their body. The Transport Accident Commission (TAC) needed to find a unique way to communicate with motorcyclists to promote the value of wearing protective clothing at all times when riding a motorcycle.

Gearbox

Everyone has a box of gear they can't quite part with. The gear they were wearing on a day their life changed. Through Graffiti agency, the TAC developed a real-life, story-based campaign, delivered peer-to-peer.

The 5-part content series shows riders sharing those moments, as well as the gear they've kept to remind them of the importance of protective gear, and how it saved them.

This integrated campaign included digital and physical activations to engage riders at decisive moments, whether that was before jumping on the bike or buying their next set of gear, to reiterate the importance of protecting themselves on every ride.

Telling their story

The TAC gave a call out to their network of motorcycle riders for stories and photos of protective gear that saved them. Each of the participant stories in the video series talks about the decision to wear their gear that day and how it protected them.

Figure 1. Paul 'the biggest reminder'

The rider content pieces has generated 2.33 million impressions online. Including 52,000 YouTube views, 93,000 Meta through-plays.

Retail program

Engaging with riders at the point of purchase was an important touch point for the campaign. The Gear Box retail program brought the digital content to life, displaying the actual gear the riders were wearing on a day their life changed in plinths. QR codes will send store visitors to The Gear Box campaign page where they could view all 5 rider stories and learn more about messaging.

The retail program was delivered in 7 stores and achieved 140 QR code scans and 225 in-store interactions with staff.

Figure 2. Retail plinth

MotoGP

All components of the campaign came together at the 2022 MotoGP, where over 90,000 people attended the Philip Island event across the weekend. Plinths were stationed around the exhibition site and the content series being shown on the big screen. In addition to activation staff, experts from Motorcycle Clothing Assessment Program were on hand to talk with visitors about the science behind their gear and safety ratings.

At the MotoGP, GearBox achieved 6,000 engagements at the expo site.

Competition

A competition was held to encourage riders to share their own unique stories, up to 150 words, about how wearing the right gear helped to save their lives. The prizes for the top stories included $5,000, being shared on the TAC website and through the Spokes eDM.

The competition received in excess of 300 entries.

Summary

In terms of reach and engagement across this multi-dimensional partnership campaign, this is one of the most successful in the TAC's history.
Whilst it is difficult to draw specific conclusions that the campaign has directly influenced motorcycle rider intention to wear safety gear, we have seen an increase in intention to wear safety gear through the TAC's annual Motorcycle Monitor. Most notably, this includes 78% of riders indicating they intend to wear boots all the time, up from 55%.
More results will be provided closer to the presentation date to see sustained change.

Acknowledgements

The TAC would like to acknowledge Graffiti Group for bringing this campaign to life.

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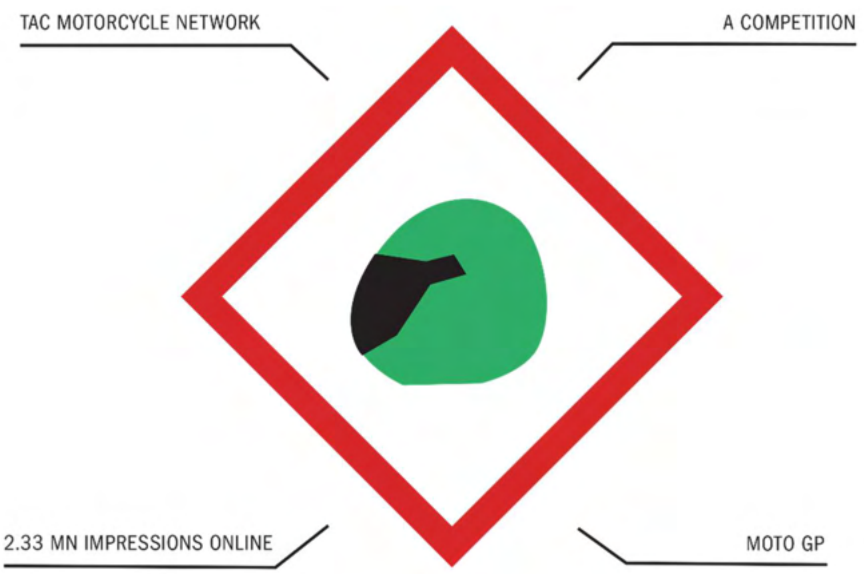

THE TAC GAVE A CALL OUT TO THEIR NETWORK OF MOTORCYCLE RIDERS FOR STORIES AND PHOTOS OF PROTECTIVE GEAR THAT SAVED THEM. EACH OF THE PARTICIPANT STORIES IN THE VIDEO SERIES TALKS ABOUT THE DECISION TO WEAR THEIR GEAR THAT DAY AND HOW IT PROTECTED THEM.

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

Many 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 New Zealand research identified alcohol as a primary factor in recent increases in road fatalities, which had been decreasing up to 2013 (Walton et al., 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 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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Factors associated with helmet use by e-scooter riders

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Abstract

Australian jurisdictions are among the few internationally that require e-scooter riders to wear helmets. In most countries, voluntary helmet use by e-scooter riders is close to zero and consequently, head injuries are common among these riders. This paper reports results from a series of observational studies of shared and private e-scooters from Brisbane and survey-based measures of self-reported knowledge of the rules and compliance. The observations showed that riders of private e-scooters were much more likely to wear helmets and that provision of helmets on shared e-scooters had little effect on wearing rates. The survey results confirmed the higher wearing rates by private riders and that knowledge of the rule was high. The influences of demographic, locational and other variables on helmet use are also described.

Background

Queensland legalized private and shared e-scooters in late 2018. Riders must wear a securely fitted bicycle helmet (or motorcycle helmet since November 2022) (Queensland Government, 2022). Most countries do not require helmets to be worn by e-scooter riders, with wearing rates generally lower than 10% (Serra et al., 2021) and injuries to the head being common (Toofany et al., 2021). Among e-scooter riders presenting to Brisbane hospital emergency departments to May 2020, 9% had head injury (McCreanor, 2022). An early Brisbane study (Mitchell et al., 2019) found that helmet wearing was associated with a much reduced risk of head injury.

This paper aims to identify the extent and nature of helmet use by e-scooters and the influencing factors based on observational studies in Brisbane and self-reported compliance and knowledge of the rules.

Method

Observational studies

Helmet use was observed in the Brisbane CBD in February and October 2019 and in October 2021 during daytime on weekdays. Shared bicycles and e-scooters were compared because many of the potential influencing factors (e.g., concerns about comfort or hygiene) are likely to be similar. The method is detailed in Haworth, Schramm and Twisk (2021).

Survey

E-scooter riders (who reported riding at least once per month in the last year) in Brisbane completed an online survey from 5 July to 21 September 2020. Participants were recruited by paid Facebook advertisements and could win one of five $100 gift cards.

Results

Observational studies

The observed rate of correctly fastened helmets was lowest for shared e-scooters, followed by shared bicycles, then private e-scooters, then private bicycles (Table 1). Non-use of helmets (including not correctly fastened) occurred more often on the footpath than the road and occurred more between 2 and 4 pm than between 7 and 9 am (Haworth et al., 2021). It did not vary by gender or between child/adolescent and adults but was lower for shared e-scooters ridden by two people. The introduction of systems that lock the helmet to the shared e-scooter in 2020 appears to have increased helmet availability but not wearing rate.

Table 1. Percentages of riders observed in central Brisbane according to helmet wearing status

	Shared e-scooter	Private e-scooter	Shared bicycle*	Private bicycle
February 2019	n=686	n=89	n=272	n=2758
Worn, correctly fastened	61.4	95.5	81.3	98.5
Worn, not fastened	3.1	0.0	1.8	0.4
No helmet worn (incl. helmet carried)	35.6	4.5	16.9	1.2
October 2019	n=476	n=264	n=295	n=3203
Worn, correctly fastened	66.8	94.3	85.1	98.8
Worn, not fastened	5.7	2.3	1.0	0.4
Helmet carried	4.0	1.0	0.0	0.2
No helmet visible	23.5	2.4	13.9	0.6
October 2021	n=1303	n=1011	n=121	n=2895
Worn, correctly fastened	59.1	91.7	68.9	97.8
Worn, not fastened	4.1	0.9	7.6	0.7
Helmet carried	30.2	1.2	17.4	0.1
No helmet visible	6.6	6.2	6.1	1.5

* CityCycle in 2019, Neuron and Beam electric bikes in 2021

Survey

Self-reported helmet wearing on the most recent trip was higher for private than shared e-scooters (96.9% versus 88.0%). The higher wearing rates for shared e-scooter riders in the survey than observed may reflect the survey respondents being regular riders and being more likely to be residents than tourists. Private e-scooter riders were less likely to report having ridden at least once in the last 30 days while not wearing a helmet (14.4% versus 32.2%). All of the private e-scooter riders responded that helmet wearing was mandatory for all e-scooter riders but some shared e-scooter riders thought that it was only mandatory for children under 12 (2.3%) or not mandatory (2.3%).

Conclusions

Some shared e-scooter riders choose not to wear helmets, even when helmets are provided and they are aware of the rule, supporting the need to supplement helmet availability with adequate levels of enforcement of the rules. Helmet interlocks are a complex potential approach.

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How does roadside advertising impact on driver behaviour?

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Abstract

There is growing concern that roadside advertising signs may distract a driver's attention away from safety-critical driving tasks, potentially increasing the risk of a crash. While evidence confirming this concern exists, the overall body of research is inconclusive. To improve our knowledge, a novel *Driver Behaviour and Roadside Advertising Conceptual Framework* was developed to explore the relationship between roadside advertising and driver performance and to encourage a consistent future research agenda. A survey is being conducted to test the framework by exploring drivers' real-world experience with roadside advertising. Preliminary data indicates 26.6 percent of participants occasionally have difficulties returning their attention back to the road after observing a sign and 12.7 percent continue to think about a sign for up to five seconds despite having passed it. Further, 87 percent of participants think advertising signs have risky features. Understanding how roadside advertising may impact driver behaviour has important implications for road safety policy.

Background

Distracted driving continues to be a significant contributing factor in road trauma (WHO, 2018). Evidence points towards 68.3 percent of all crashes being associated with observable distractions (Dingus et al., 2016). A recent systematic review of the literature examined the impact of roadside advertising signs on driver behaviour and road safety (Oviedo-Trespalacios et al., 2019). While some studies indicate road safety concerns with digital billboards, the review identified that the research overall is inconsistent and inconclusive. This is a concern for road agencies as they rely on evidence-based research to develop road safety policies and guidelines.

Study 1 Driver Behaviour and Roadside Advertising Conceptual Framework

The *Driver Behaviour and Roadside Advertising Conceptual Framework* (Figure 1) was developed to conceptualise the impact roadside advertising signs may have on driver performance using a human-factors approach (Hinton et al., 2022). Based on current theories and empirical research, the novel framework identified a number of potential mechanisms and pathways involved in driver attention, inattention and distraction that may explain driver behaviour around roadside advertising signs. The way drivers allocate their attention to a sign and whether drivers can self-mitigate any interruptions or diversions of their attention towards signs by returning their attention back to the driving-task, depends on a range of factors. These factors include drivers' pre-existing performance levels (individual differences, traffic/road environment and the vehicle's attributes) along with the characteristics of the signs. A new concept of "extended engagement" was proposed to describe situations where a driver's attentional engagement with a sign persists after the sign is passed which may result in variations in driver performance.

Study 2 Roadside Advertising Survey

A survey is underway to test the framework by exploring drivers' real-world experience with roadside advertising signs. Preliminary survey findings show that 12.7 percent of participants (n=252) think about what they have read or seen on a roadside advertising sign for "up to five seconds or more" after passing a sign, with 21 percent taking up to two seconds to think about it.

This suggests that some drivers extend their attentional engagement with an advertising sign potentially impacting on driver performance.

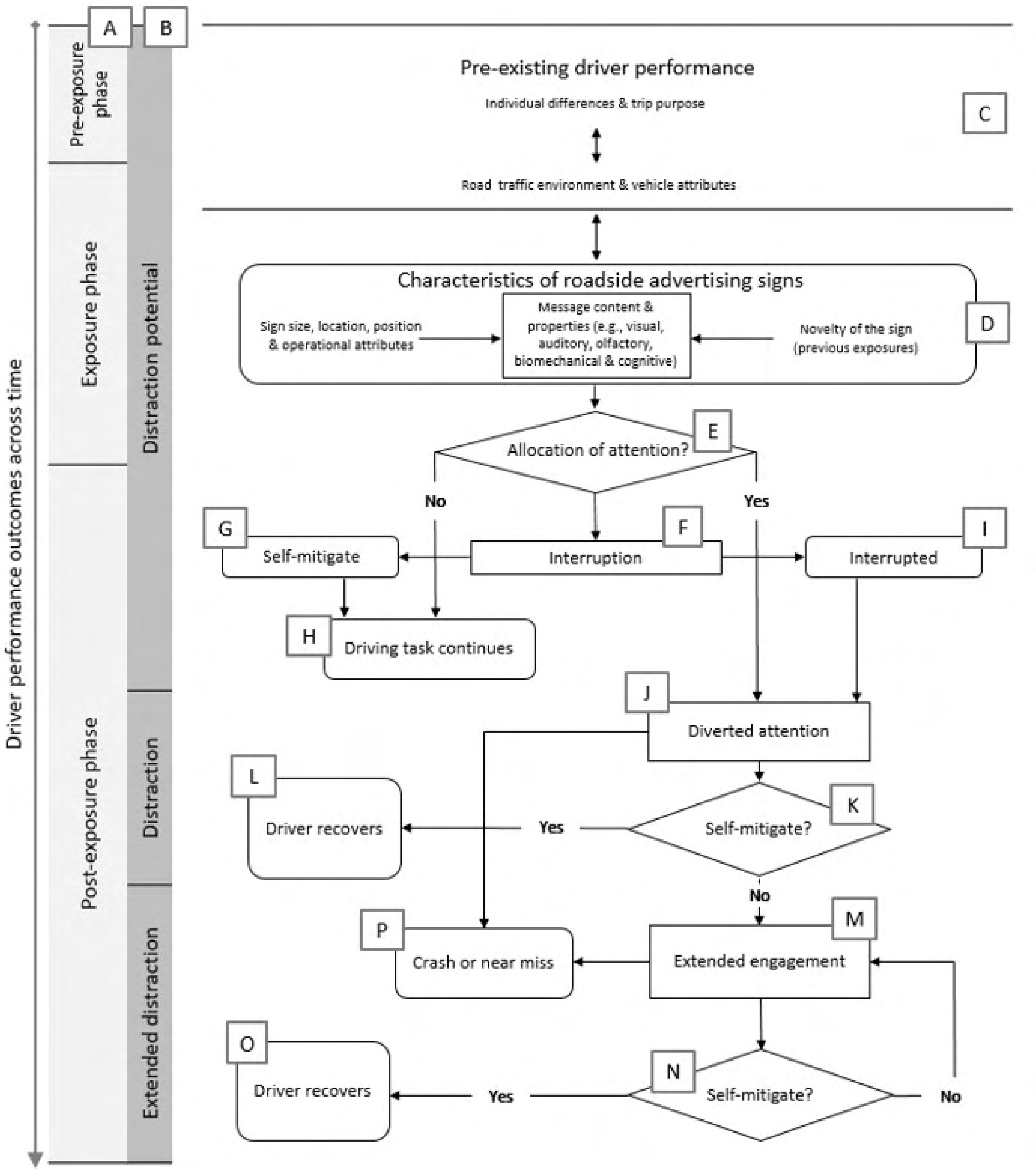

Figure 1. The Driver Behaviour Conceptual Framework
(reproduced from Hinton et al., 2022)

While 52.4 percent of participants reported no difficulty returning their attention back to the road after looking at an advertising sign, 26.6 percent indicated they had difficulty "occasionally" and 13.9 percent "sometimes" had difficulty. These findings highlight a potential road safety concern, since they suggest that drivers may sometimes experience difficulty returning their attention back to safety-critical driving tasks after observing a roadside advertising sign. Of interest, 84.1 percent of participants think there are risky features/characteristics on roadside advertising signs. Further, a preliminary word cloud analysis showed the words participants most often used to explain why they thought roadside advertising signs are risky were: “lights”, “brightness” and “digital”.

Conclusions

The preliminary survey results highlight the practical utility of the novel conceptual framework to broaden our understanding of the mechanisms and pathways involved. It is hoped the framework will help guide future research relating to roadside advertising signs, leading to a more coherent evidence base to inform relevant policies and practices.

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Identifying effective mechanisms for child restraint services in remote Australia

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Abstract

Child restraint fitting services reduce rates of incorrect use almost two-fold, but the reach of these services is limited in rural and remote areas. While hands-on instruction is an effective way to increase correct use of restraints, restricted capacity and limited resourcing have challenged provision of this service. This study used a three-arm randomised controlled-trial design to investigate the most acceptable, effective, and cost-efficient countermeasure to reduce incorrect use of restraints in rural and remote Australia. Overall, interactive hands-on instruction through in-person fitting services and virtual fittings using augmented reality technology appear to be more effective and more acceptable compared to an on-line instructional video. Our estimates indicate in-person fittings were the most cost-efficient method in and near urban areas but virtual fittings were more cost-efficient in locations more than one day's drive away from metropolitan regions.

Background

Child passenger mortality rates in New South Wales are 11 times higher for children living in remote areas compared to major cities. Restraint misuse is a contributing factor to many of these deaths (NSW Child Death Review Team, 2019).

Children whose parents use restraint fitting services are almost twice as likely to be correctly restrained than children of parents who did not use these services (Brown et al, 2011). However, there is limited restraint fitting services in rural and remote areas (Brown et al., 2014). There is evidence that online video instruction and interactive virtual presence technology can be potential countermeasures (Hall et al., 2020; Schwebel et al., 2017) particularly in extending the reach of restraint fitting services to regional areas. This study aimed to examine effectiveness, acceptability and cost of in-person and remote fitting services.

Methods

A three-arm randomised controlled-trial was used to investigate four outcomes: comprehension of correct use information, correct use of child restraints, acceptability of the method of information delivery and cost associated with each method. Ethics approval was obtained from the University of New South Wales Human Research Ethics Committee (UNSW HREC) (HC200764). The study was delivered in collaboration with Kidsafe Victoria.

Group 1 (control) received an online video, Group 2 received an in-person restraint fitting service and Group 3 received the 'virtual' fitting service delivered through an augmented-reality technology called 'Help Lightning'. A questionnaire was administered by phone and error observations obtained by certified restraint fitters at Kidsafe Victoria. Online surveys were constructed using the theoretical framework of acceptability (TFA) (Sekhon et al, 2017) to collect feedback from participants on the delivery method. Cost-effectiveness was calculated using operational data from Kidsafe Victoria.

Results

Total sample was 80 participants (37 = Group 1 (control), 24 = Group 2 (in-person) and 19 = Group 3 (virtual).

Fewer errors were observed for participants in the in-person and virtual fittings compared to control participants (p=0.036). The odds of errors being present were 86% less likely in in-person fittings compared to the control (OR 0.14, 95% CI 0.03-0.73) and less likely in virtual fittings compared to control, but this difference was not significant (OR 0.19, 95% CI 0.03-1.12).
Mean comprehension scores were highest in the virtual group (7.2), followed by in-person (6.9) and control (6.5). The mean overall acceptability score were 50.9 for control (n= 22), 57.9 for in-person and 53.3 for virtual fittings.

Cost calcuations were populated for in-person and virtual fittings only. The most cost-efficient method depends on the extent of travel required for in-person fittings and whether one-off costs such as equipment purchase are included. The minimum cost was $38.48 for in-person fittings and $20 for the virtual (per customer in AUD).

Conclusions

While, the study was limited by a small sample, both in-person and virtual restraint fittings appear effective, acceptable, and cost-efficient mechanisms for improving correct use. Removing factors like travel, our cost-analysis indicated that in-person fitting services were most cost-efficient, however, 'virtual' services may be of greater value in areas where travel over long distances are required.

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A Before-After safety evaluation of a new part-time protected right-turn signal

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Abstract

This study conducts a before-after safety evaluation of a new part-time protected right-turn signal strategy at signalised intersections applying Artificial Intelligence (AI)-based video analytics.The permissive right-turn signals at five signalised intersections were converted to part-time protected right-turn signals, in which protected right-turn signals were mainly implemented during off-peak hours. The opposing through crash risks in the before and after periods of signal change were compared in terms of Post Encroachment Time (PET) conflict counts and estimation of before-after right-turn crash risks by applying an extreme value theory model. Results suggest that part-time protected right-turn signals reduce two-thirds of opposing-thorough traffic conflict frequencies. Extreme value theory models suggest that opposing-through crash risks along the treated approaches with part-time right-turn signals reduce by 72 percent. The average queue lengths of the treated approaches during protected phases did not exceed those of the permissible right-turn phases. Therefore, a part-time protected right-turn signal strategy offers a good safety solution.

Background

Protected right-turn phasing generally provides better safety for opposing-through crashes. A recent crash-based before-after evaluation in Queensland suggests that changing traffic signals from permissible to fully protected right-turn signals reduces about 87 percent and 91 percent of right-turn crashes at cross and T intersections, respectively (Howlader et al., 2023). However, fully protected right-turn signals may reduce operational efficiency (Chen et al., 2015). To overcome this challenge, the Department of Transport and Main Roads (TMR), Queensland, has trialled a new part-time protected right-turn signal strategy that operates permissible right-turn phases during peak periods and protected right-turn phases during off-peak periods.

Method

Part-time protected right-turn signal phasing was introduced at five intersections, namely, a) Sheridan St-James St, b) Sheridan St-Anderson St, c) Anderson St-English St, d) Anderson St-MacNamara St and e) Bruce Highway-Lily St intersection located in TMR's Far North Queensland district. Dedicated overhead cameras were deployed to collect video footage at these five intersections in the before and after periods of signal treatments. Video footage was collected for 266 hours and 388 hours, respectively, before and after the trialing of the signal strategy. To examine the queue length of the treated approaches, video cameras were placed at the back of queues at three of the treated intersections.

An artificial intelligence-based traffic conflict extraction technique (Arun et al., 2021a) was employed to automatically extract the traffic conflict from the video footage. The most prevalent conflict measure for opposing-through crash prediction, post encroachment time (PET), has been used in this study as the traffic conflict measure (Arun et al., 2021b). A non-stationary univariate generalised extreme value model with block maxima (BM) approach (Songchitruksa & Tarko, 2006) was employed to estimate opposing-through crash risks at the signal cycle level. To account for the heterogeneity associated with opposing-through conflicts, various exogenous variables were included in the extreme value models, including signal cycle-level directional volumes, conflict count, signal cycle duration, mean vehicle speed, and speed variability.

Results

On average, the opposing-through conflict frequencies were reduced from 35.20 conflicts/hour in the before period to 11.35 conflicts/hour in the after period, suggesting a 67.75 percent reduction of conflict frequencies. Extreme value models showed that opposing-through crash risks were significantly related to conflict count (PET ≤ 3.0s), the average speed of right-turning vehicles, and signal cycle duration. Figure 1 shows a comparison of before-after opposing-through crash risks for a typical intersection, as estimated by the extreme value models. Table 1shows the intersection-wise and overall results of crash risk reductions. A before-after comparison of predicted crashes from the models showed that part-time protected right-turn signal strategy, on average, reduced opposing-through crash risks by 71.69 percent. Interestingly, Queensland data also suggest that two-thirds of DCA202 or opposing-through crashes at signalized intersections occur during off-peak hours. An investigation of queue lengths on treated approaches showed that both average and maximum queue lengths in protected phases during the off-peak hours did not exceed the average and maximum queue lengths in permissible phases during the peak hours in general.

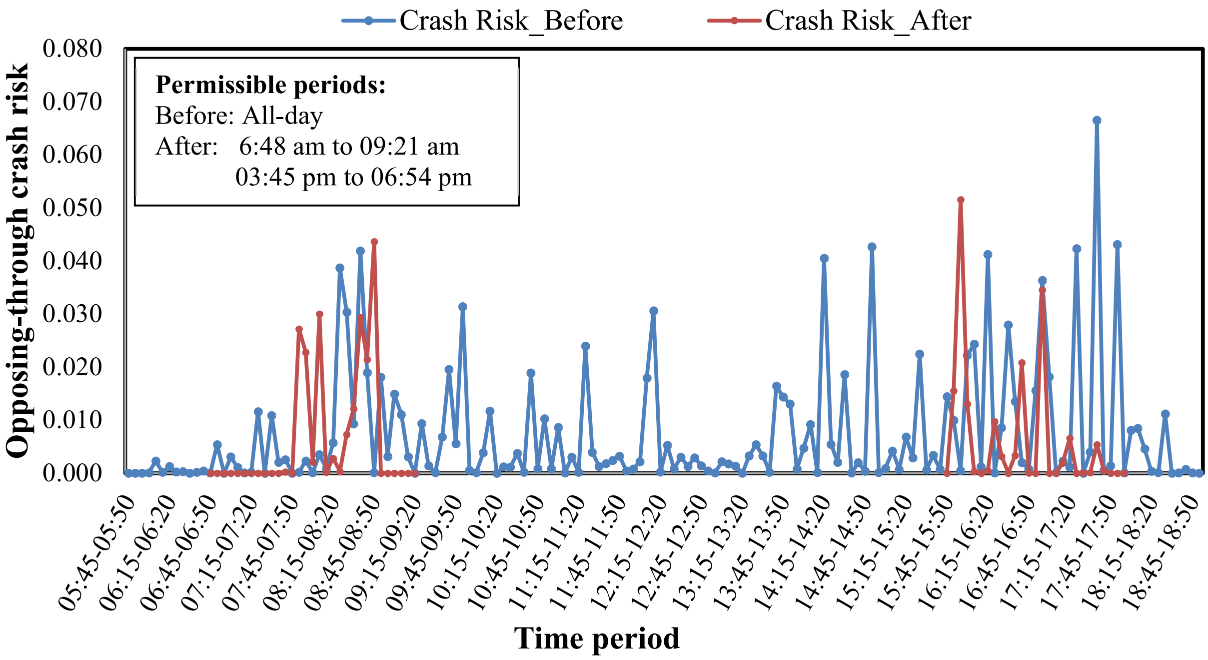

Figure 1. Typical before-after opposing-through crash risks at Anderson-MacNamara intersection

Table 1. Reduction in opposing-through crash risk across the study intersections

Intersection	Reduction in Crash Risk
Sheridan St – James St Intersection	88.77%
Sheridan St – Arthur St Intersection	82.30%
Anderson St – English St Intersection	49.24%
Anderson St – MacNamara St Intersection	67.63%
Bruce Highway – Lily St Intersection	45.13%
Overall	**71.69%**

Conclusions

A well-designed right-turn signal strategy can reduce crash risk and mitigate capacity requirements at a signalised intersection (Tageldin, Sayed, & Ismail, 2018). This study shows a significant reduction in opposing-through crash risk due to a part-time protected signal strategy with permissible phases during peak periods and protected phases during off-peak periods. The part-time protected right-turn signal phasing strategy does not show any negative effect on the queue lengths along the treated right-turn lanes. Therefore, a part-time protected right-turn signal strategy offers a good safety solution without precipitating the need for capacity upgrades to accommodate queued right-turners at signalised intersections.

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Lower protection levels observed in women's motorcycle leggings and jeggings

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Abstract

Fashion trends, activewear and casualisation of dress have increased the use of leggings and jeggings worn in society. High stretch leggings provide support, body shaping, wearer comfort and ease of movement making them popular with women. This trend has extended into motorcycle protective clothing with more than ten brands selling leggings and jeggings in Australia and New Zealand. This research analysed MotoCAP tested women's leggings and has shown that they perform poorly in protection. Ten different leggings were evaluated on the elements comprising the safety rating: abrasion, seam strength and impact protection. Garments performed poorly over all three categories. Poor impact protection was due to no hip impact protection. Burst strength was indicative of low burst strength fabrics and seams. Low burst strength fabric contributed to poor abrasion resistance. The goal is to improve rider protection for female riders through knowledge of poor performing products in the market.

Background

Motorcycle protective clothing is an effective way of reducing the severity of injuries in a crash (de Rome et al., 2011; de Rome et al., 2012). Motorcycle clothing comes in a range of forms and is made from a wide range of materials. In 1997 the launch of protective denim jeans for motorcycle use was the start of casual-look clothing designed to be functional and fashionable both on and off a motorbike. In recent years the casualised clothing range has increased to include riding shirts, hoodies, chinos and stretch leggings.

Leggings and jeggings are a high stretch form fitting garment from the activewear industry. Leggings are popular with women as their structure provides the wearer with support and body shaping whilst not impeding comfort or freedom of movement.

Motorcycle clothing manufacturers realised that the popularity of women's leggings created potential for a new protective pant product. Most motorcycle leggings use a protective denim liner fabric and place it under a knitted stretch fabric shell. Leggings increase in availability in Australian stores going from 5 brands in 2018 to 12+ in 2023.

This project analysed ten different women's motorcycle protective leggings tested by MotoCAP. It has identified the key reasons for low performance of these garments and suggested ways to improve protection levels in future products.

Results

An analysis of the individual MotoCAP test parameters of abrasion, burst and impact was used to determine the key areas of weakness (Table 1, Figure 1). The leggings performed poorly over all three parameters. Of the ten legging products tested seven had achieved only a half star rating for protection. A higher score is indicative of higher protection in each of the measured categories.

Table 1. Leggings MotoCAP performance

Brand	Model	Protection Stars	Protection Rating	Abrasion time (s)
Bull-it	Envy	⯨	6.9	0.90
Rev'it	Ellison	⯨	7.5	0.50
Bull-it	Fury	⯨	8.5	1.64
Alpinestars	Banshee	⯨	8.5	0.67
Motogirl	Ribbed Knee	⯨	9.4	0.80
Oxford	Super	⯨	11.1	1.15
Draggin	Stealthz	⯨	11.4	2.23
Richa	Kodi	★	27.6	0.67
Motogirl	Sherrie	★★	31.0	1.44
Resurgence	Sara Jane	★★	37.8	2.30

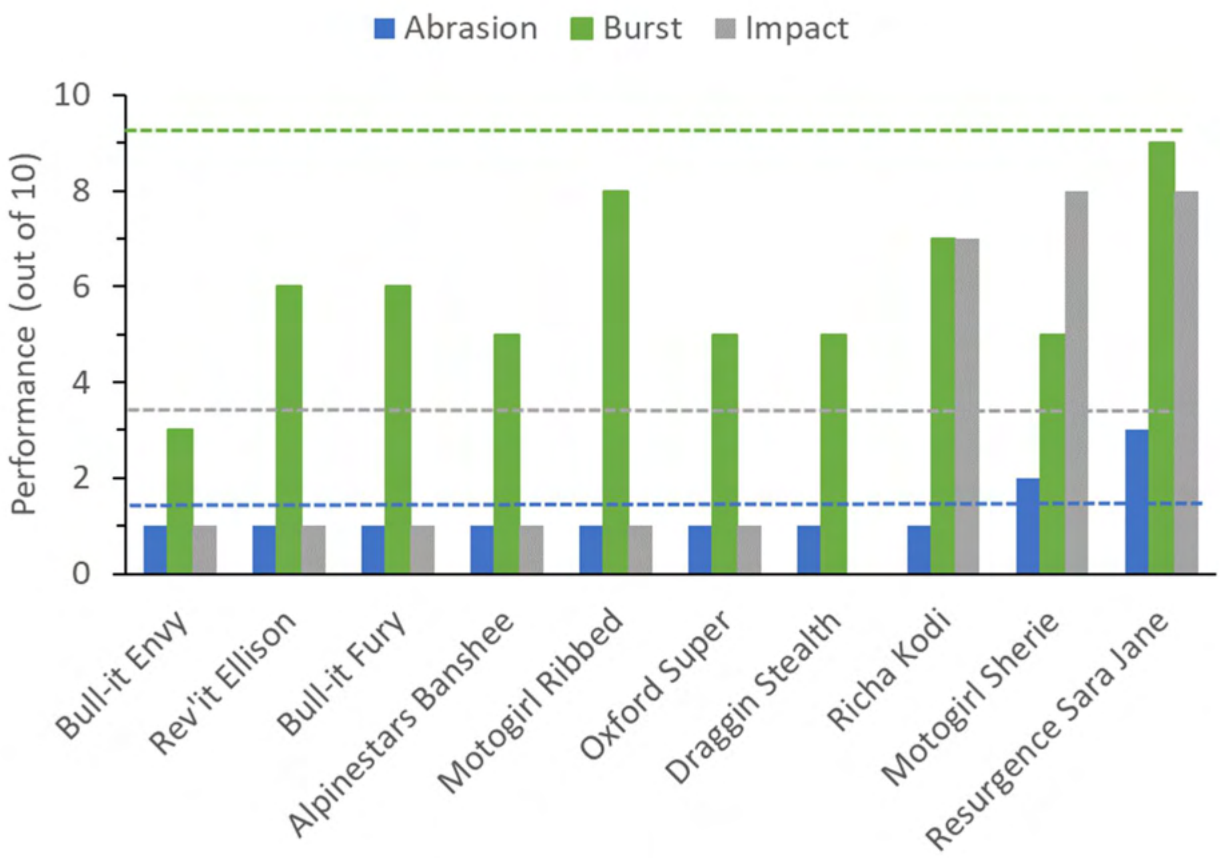

Figure 1. Leggings performance ranked from lowest (left) to highest (right) performance.
Note: the coloured dotted lines show the benchmark for textile pants for each test criteria.

Only three leggings were supplied with hip impact protectors. In leggings traditional impact protectors stand out disrupting the clean lines of the leg. Modern, thin impact protectors with a feathered edge would reduce impact protector conspicuity. All leggings performed poorly in abrasion resistance due to the low strength and stretch nature of the shell fabric. Low coverage of protective liners in many of the products, compromised abrasion protection. Most leggings had marginal to poor burst strength that may be improved by doubling seams and improving fabric burst strength.

Conclusions

Women’s leggings tested by MotoCAP have exhibited consistently low protection levels across all protection parameters when compared with other motorcycle protective clothing. Protection could be improved by always including hip armour, doubling seams and increasing coverage of abrasion resistant liner fabric. Findings will be provided to riders and manufacturers to raise awareness of this issue and improve rider safety. We acknowledge the MotoCAP program for the use of these test results.

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Modelling the macroscopic effects of road pavement conditions on traffic safety

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Abstract

This research investigated the effects of road pavement conditions on traffic safety at a macroscopic level, using Victoria as a case study. Negative binomial (NB) regression was used to model the effects of the international roughness index (IRI) and rutting on crash frequency in Statistical Area Level 2 (SA2) zones in Victoria. Results illustrated, for the first time, the macroscopic effects of pavement conditions on traffic crashes. Specifically, zones with a higher proportion of freeways and arterials with very poor roughness or rutting tend to be associated with more total crashes, fatal and serious injury (FSI) crashes and fatal only crashes.

Background

Much research has looked at the effects of road pavement conditions on traffic crashes at microscopic (e.g., intersection) and mesoscopic (e.g., road segment) levels, reporting significant effects of IRI, rutting and skid resistance (Huo et al., 2020; Hussein et al., 2021; Li & Huang, 2014). These effects, however, have rarely been explored from a network-wide or macroscopic perspective using a zonal unit of analysis, e.g., statistical areas or Traffic Analysis Zones (TAZs). In a rare attempt to link pavement conditions and traffic crashes at a macroscopic level, Lee et al. (2015) developed a multivariate TAZ-based crash prediction model, which showed no significant relationships. There is a need for research into the relationships between pavement condition indicators, e.g., IRI or rutting, and traffic safety at a macroscopic level. Understanding the network-wide safety effects of pavement conditions is critical to strategic road safety planning and pavement management planning. To address this gap in knowledge, this study aims to investigate the traffic safety effects of road pavement conditions at a macroscopic level, using Victoria as a case study.

Method

Multiple datasets (including socioeconomic, land use, travel to work, traffic, road infrastructure, pavement conditions and 2015-2020 crash data) were compiled from the Australian Bureau of Statistics (ABS) 2016 census and Victorian government open data portal (Data.Vic) and aggregated into Statistical Area Level 2 (SA2) zones, using ArcGIS Pro 3. SA2s, medium-sized functional areas of the Australian Statistical Geography Standard (ASGS), have an average area of 500.2 square kilometres in Victoria. It was noted that pavement condition data only included freeways and arterials. Given its effectiveness in accounting for over-dispersion in crash frequency data (Lord & Mannering, 2010; Phan et al., 2022; Truong & Currie, 2019; Truong et al., 2016), negative binomial (NB) regression was employed in this study to explore the effects of pavement condition indicators (including IRI and rutting) on the number of total crashes, fatal and serious injury (FSI) crashes, and fatal crashes only. The NB models were estimated by using NLOGIT 5.

Results

Table 1 shows estimation results of three NB models for total crashes, fatal only crashes and FSI crashes in SA2. Results showed that a higher proportion of freeways and arterials with very poor roughness was consistently and significantly associated with more total crashes, fatal only crashes and FSI crashes. A higher proportion of freeway and arterials with very poor rutting was also significantly correlated with more total crashes and FSI crashes. However, there was no correlation between the proportion of freeway and arterials with very poor rutting and fatal only crashes. Furthermore, the effects of controlled factors in all three models were expected and in alignment with previous research. For example, vehicle kilometres travelled, population, and industrial land use positively affect total, fatal only and FSI crashes. In addition, commuting by active transport could increase total and FSI crashes while a higher proportion of freeways and arterials with a speed limit of 80 km/h or below could reduce fatal only crashes.

Table 7 Results of NB models for the number of total crashes, fatal only crashes and FSI crashes in SA2, Victoria

Variables	Total crashes		Fatal only crashes		FSI	
	Est.		Est.		Est.	
Constant	-2.089	***	-5.842	***	-3.433	***
Log of vehicle kilometres travelled per day (km)	0.543	***	0.613	***	0.584	***
Population density (10,000 persons per km2)	0.506	***	-0.807	**	0.695	***
Proportion of length of freeway and arterials with speed limit <=80 km/h	0.133	***	-1.06	***	-0.125	*
Proportion of commuting by walking and bicycle	1.24	***	-0.216		0.793	**
Proportion of industrial land use	0.636	***	0.653	**	0.623	***
Proportion of freeway and arterials with very poor roughness (IRI>5.3)	1.992	***	3.21	***	1.41	**
Proportion of freeway and arterials with very poor rutting (>=20mm)	2.138	***	-1.244		2.571	***
Dispersion parameter	0.131	***	0.079	***	0.123	***
Akaike information criterion (AIC)	4871.7		1768.2		3962.5	
Log likelihood function	-2426.845		-875.081		-1972.243	
Restricted log likelihood	-6239.453		-884.545		-3131.294	
Number of observations (SA2)	450		450		450	

*Note: *p<0.1; **p<0.05; ***p<0.01*

Conclusions

This study has explored the effects of pavement conditions on traffic crash frequency at a macroscopic level, using NB regression with SA2 zones in Victoria. Modelling results showed that very poor roughness on freeways and arterials could lead to more total crashes, fatal only crashes and FSI crashes at a SA2 zone level. In addition, very poor rutting could also lead to more total crashes and FSI crashes in SA2s.

There are several limitations in this study. There is a lack of control for potential confounding factors, e.g., line markings' presence, type and condition, presence of road safety infrastructures like road safety barriers and roundabouts, and other socio-demographic characteristics. Future research should consider these factors and investigate the safety effects of other pavement indicators and with different spatial units, e.g., TAZ. In addition, since the condition of the pavement may have a greater effect on certain crash types, e.g., loss of control crashes, future work should explore the effects of pavement conditions on these crash types.

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The road safety consequences of modal shift in Victoria

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Abstract

This study estimated potential annual fatal and serious injury (FSI) rates and cost savings across eight modal shift scenarios in Victoria, Australia. The results show that a shift from private modes of travel (e.g., cars and motorcycles) to public transport modes offers the greatest safety benefits and cost reduction in injury prevention. While an increase in public transport use will result in annual savings in FSI and costs, it also leads to an increase in active travel (i.e., walking to public transport stops) and therefore may increase the risks/costs for these journey components. To support positive reductions in FSI associated with a modal shift towards public transport, more efforts are needed to improve the safety of active travel and intervention measures are needed to prevent any potential shifts away from public transport.

Background

Ibrahim et al. (2022) reported that the risk of fatal and serious injuries (FSI) varies across different travel modes in Victoria. In addition, other authors (e.g., Cairney, 2010; Litman & Fitzroy, 2016) have suggested that modal shift may have an impact on road safety outcomes. However, while shifting people's travel mode towards safer alternatives would reduce FSI in a single mode, the whole-of-journey risks involving multiple transport modes must be considered (Evans & Addison, 2009; Cairney, 2010; Beirão & Sarsfield Cabral, 2007). A multi-mode travel journey could lead to a combination of both safe and unsafe modes within the same journey (Corpuz, 2007). The current study aimed to estimate the potential annual FSI rates and cost savings from modal shift.

Method

Eight modal shift scenarios (across four shift levels) were investigated to explore the consequence of mode shift on road safety outcomes in the state of Victoria. These scenarios focused on a shift towards public transport as the safest travel mode, bearing in mind the consequences for supplementary modes that might be less safe (e.g.; bicycle or pedestrian modes) of active travel to align with other transport needs (Infrastructure Victoria, 2021) as well as the increased use of the private car as a response to COVID-19 concerns (Sipe, 2020). Travel quantity and FSI numbers were estimated for each scenario by mode and the differences compared to the base case which was estimated by (Ibrahim et al., 2022) using travel data from the Victorian Integrated Survey of Travel and Activity (VISTA) and injury data from CrashStats between 2012-2016.

Results

Table 1 shows that a modal shift from private car to train in scenario 1 has the greatest safety benefit, with an annual reduction in FSI between 97 and 389, depending on the level of shift (between 5% and 20%). These FSI reductions would be offset when including the safety impacts of walking to and from a train station in scenario 2 (e.g., 700 metres increase of walking for each additional train trip). Similarly, the shift from private car to bus/tram would lead to an annual reduction in FSI between 63 and 254. A shift from the high-risk motorcycle mode to a private car would result in annual reductions in FSI of between 47 and 188.

On the other hand, a shift from using public transport towards other travel modes could result in an increase in FSI (e.g., shift to walking: annual FSI increases of 3 to 14; to cycling, 34 to 136; to private car, 12 to 49). The costs associated with each scenario were also estimated based on previous injury costing by the Australian Automobile Association (2017) (see Table 1).

Table 1. Modal shift scenarios and FSI consequences

Scenario	Travel Mode shift scenario	Annual Net Change in FSI by proportion of trips shifted				Annual Net (A$ M) Savings in FSI			
		5%	10%	15%	20%	5%	10%	15%	20%
1	Car Driver to On-road PT (Bus+Tram) (without considering additional walking)	-63	-127	-190	-254	-27	-54	-81	-108
2	Car Driver to Train Passenger (without considering walking)	-97	-195	-292	-389	-42	-83	-125	-167
3	Car Driver to Train Passenger (considering walking)	-57	-114	-171	-227	-24	-45	-73	-97
4	Car Driver to Taxi Passenger	-32	-65	-97	-130	-14	-28	-42	-56
5	Motorcycle rider to car driver	-47	-94	-141	-188	-20	-40	-60	-80
6	On-road Public Transport user to pedestrian walking	3	7	10	14	+1.5	+3	+4	+6
7	On-road Public Transport user to cycling	34	68	102	136	+15	+29	+43	+58
8	Train passenger to a car driver	12	25	37	49	+5	+10	+15	+21

Conclusions

A shift from private modes of travel (e.g., cars and motorcycles) to public transport modes offers the greatest safety benefits and cost reduction in injury prevention. However, the interdependency between public transport and other active travel modes could reduce the potential safety benefits which highlight the importance of further active travel mode assessments. Intervention measures are needed to prevent any potential shifts away from public transport and further research is warranted.

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The road to solving impaired driving using Artificial Intelligence

Alexander Jannink and Steven Lee

Acusensus

Abstract

Impaired driving is a phenomenon that encompasses a variety of instances – alcohol intoxication, drugs or sleep deprivation. Acusensus is partnering with the Office of Road Safety, Griffith University and the Queensland Police Service to produce a solution addressing impaired driving. Two rounds of internal simulator testing at Acusensus indicate that a list of promising, identifiable features can be linked to impaired driving: vehicle trajectory patterns, vehicle speed and lateral movements within lanes. Following successful simulator testing, Acusensus has conducted a roadside observation of random drug testing processes and plans to proceed to the real-world trial stage, working with the Queensland Police Service to conduct roadside data collection.

Purpose – Impact of Impaired Driving

Impaired driving refers to instances where a driver is incapable of operating a vehicle safely. This can be due to alcohol intoxication, drugs or sleep deprivation. In the last five years, approximately 41% of all drivers and motorcyclists killed who were tested had drugs in their system, with cannabis and stimulants most commonly detected (TAC, 2023a).

Aside from the fatalities caused by impaired driving, fatigued driving is also a prevalent issue. Driving when tired is a contributing factor in between 16-20% of all road crashes in Victoria with around 30 people dying each year and up to 200 people suffering serious injuries due to crashes associated with fatigued driving (TAC, 2023b). Driving when sleep deprived is also unsafe – being awake for 17 hours leads a driver to be impaired to the same level as someone with a blood alcohol concentration of 0.05 (TAC, 2023b).

Testing a Solution

Research in the impaired driving space is a work in progress both in the public and private sectors (Jones et al., 2003). Despite having a large number of research papers published, there are few attempts on creating an external fixed solution for the detection of impaired driving (Chen & Chen, 2017). As a result, Acusensus is partnering with the Office of Road Safety, Griffith University and the Queensland Police Service to address this issue.

Acusensus internal simulator testing has been conducted to produce a solution capable of detecting features synonymous with impaired driving. For simulation and real-life testing, gathering well-calibrated and controlled data from non-impaired and impaired drivers are required. After two successful rounds of simulator testing, a list of promising and quantifiable features of impaired driving were identified: vehicle trajectory patterns, vehicle speed and lateral movements within lanes.

The next steps are to proceed to the real-world trial stage and work with the Queensland Police Service to conduct roadside data collection. Feedback from the partnered authority will help determine the most suitable implementation for the project. Real-world data collection is a critical step because simulator testing outcomes may not effectively translate into real-world situations. Limitations of simulator testing include the absence of actual motion, ambient wind noise and the driver’s familiarity with their own vehicle. Therefore, the results of real-world data collection are essential to verify the accuracy and robustness of the detection algorithm.

Once the implementation ideas have been finalized, Acusensus will modify its existing technologies and develop the relevant software and hardware for the real-world and data collection. This is expected to include the development of new vehicle tracking algorithms and systems tailored for impaired driving detection, involving sensor technologies such as radar and cameras. The collected data will be anonymously linked to the roadside random breath test and random drug test results for further analysis, which will advise on the further development of impaired driving detection strategies.

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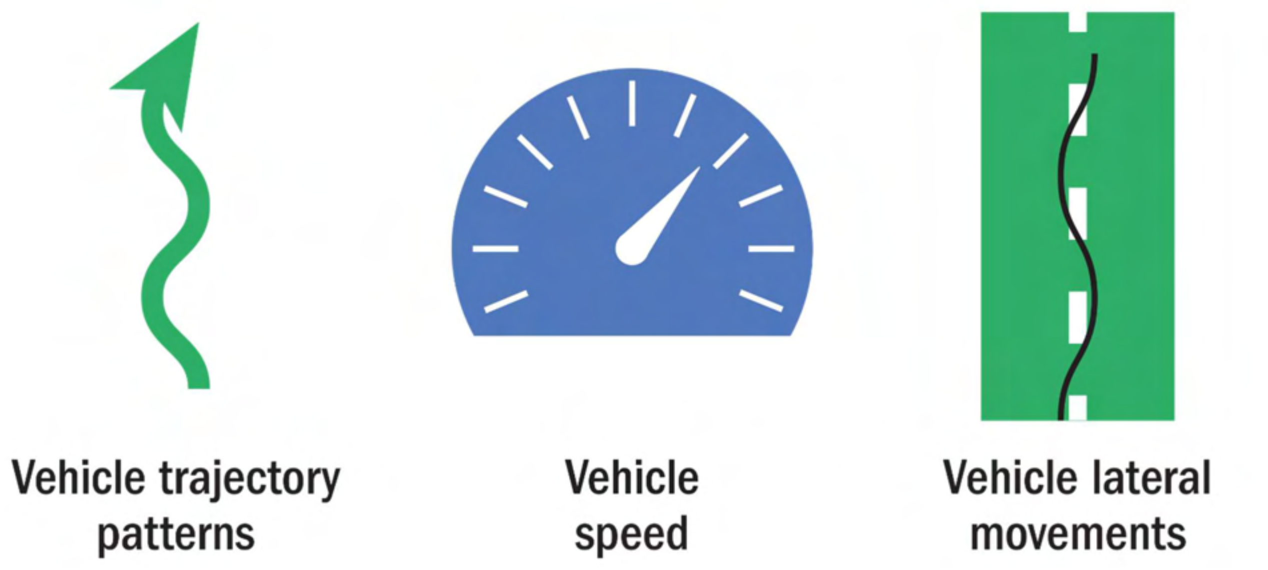

AFTER TWO SUCCESSFUL ROUNDS OF SIMULATOR TESTING, A LIST OF PROMISING AND QUANTIFIABLE FEATURES OF 'IMPAIRED DRIVING' WERE IDENTIFIED: VEHICLE TRAJECTORY PATTERNS, VEHICLE SPEED AND LATERAL MOVEMENTS WITHIN LANES (MOVING FROM SIDE TO SIDE).

A national overview of current and emerging road safety technologies

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Abstract

This study is a national overview of current Australian road safety technologies. The project was conducted in three stages: 1) review of the scientific literature, 2) in-depth interviews with key stakeholders (government and/or Police) and 3) a debrief in the Northern Territory (NT). Using the PRISMA protocol 48 scientific papers identified the evidence base for the road safety technologies. This review identified a scientific basis for a range of established technologies (e.g. road safety cameras (speed, fixed, mobile), random breath/drug test, alcohol interlocks) and some evidence for new technologies (e.g. drones, MAC sniffers). The interviews identified the utility of these technologies and the role of other factors in the effectiveness (e.g. hypothecation, community attitudes) and barriers to implementation (e.g. system barriers, legislative delays). Insights provide a national overview of technologies in use and the potential for new and emerging technologies.

Background

The Northern Territory (NT) is geographically the third largest jurisdiction in Australia (Geoscience Australia, 2023) and has the smallest population (250,600) (ABS, 2022) with the highest proportion of Aboriginal and Torres Strait Islander people (30.8%; national average, 3.8%) (ABS, 2021), many of whom live in remote and very remote communities. While urban, city-based road safety issues are comparable to other Australian towns, there is an overrepresentation of fatal crashes in remote/very remote areas. In 2022, of the 47 fatalities due to crashes on the road in the NT, the majority occurred in remote/very remote areas (63.8%) including a quarter on roads with a 130 kph speed limit. Two of the people killed on high speed roads in very remote areas were walking (i.e. pedestrians).

The aim of this study was to identify technologies that could be used to improve road safety outcomes in the NT. Requested by the Commissioner, Motor Accident Compensation Commission (NT), the study had three objectives: 1) scan of the scientific literature, 2) jurisdictional review of new and emerging technology used in Australia and 3) identify facilitators and barriers to implementation.

Method

This project was conducted in three stages, a review of the literature and in-depth interviews, followed by a debrief with key NT stakeholders. Study protocols were approved by the Monash University Human Research Ethics Committee (2022-35106-80840).

Scoping review of the literature

Conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol, a search strategy was developed, piloted and applied to five databases (Cochrane Library, Ovid Medline, Ovid Embase, Ovid Transport, TRID). A search for ‘speed’ was performed on public reports from Monash University Accident Research Centre (MUARC), The University of Adelaide Centre for Automotive Safety Research (CASR) and Austroads. Searches were restricted from 2010. Search results were independently assessed against an a-priori eligibility criteria (Table 1). Figure 1 is an overview of the publications identified and included.

Table 1. Eligibility criteria

Criteria	Included	Excluded
Study design	Meta-analysis Systematic reviews Cohort studies Case-control studies Cross-sectional studies	Case reports
Population	On road transport vehicle	Off road transport vehicle
Intervention	Fixed speed camera Mobile speed camera Point-to-point camera Automatic number plate recognition Induction loop Mobile phone carrier data Random breath test / Drug test Pneumatic road tube sensor Roaming / floating enforcement Media Access Control (MAC) sniffer Drone / Unmanned Aerial Vehicle	

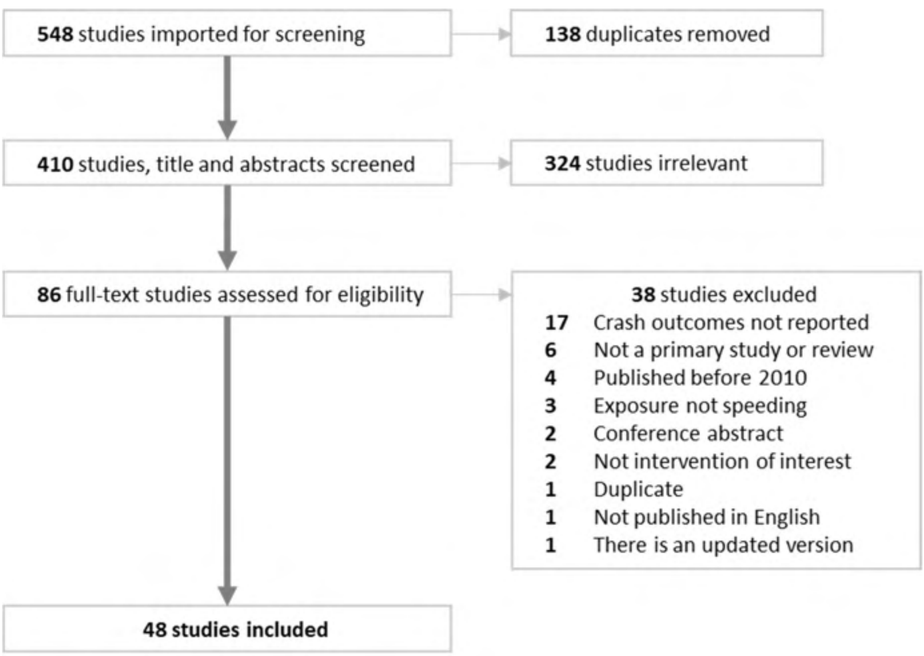

Figure 1 Flowchart of publications identified and included in the desktop review

Interviews

Ten semi-structured interviews were conducted with experts who have extensive experience in road safety (7-35 years) with a role related directly to road safety technology in Police or government.

Results

The technologies were divided into two broad categories, 1) established, and 2) current and new. Established technologies were widely implemented with scientific evidence for the effectiveness of reducing road crashes. These technologies included: alcohol interlocks, automatic number plate recognition, network speed measurements, random breath test/drug test and road safety cameras including fixed speed, mobile speed and fixed point-to-point. These technologies were considered well established by the interviewees and in the main were considered standard equipment.

Current and new or emerging technologies were also being implemented or trialled in Australia. While some of these technologies were evolutions of earlier, established technology (e.g. multi-function road safety cameras, trials for road safety cameras), others did not yet have scientific evidence of effectiveness in reducing road crashes (e.g. acoustic cameras, drones, MAC sniffers). This category of technology also raised the issue of the gap between implementation and evidence. The roaming/floating enforcement, often called 'radar cars' has been widely implemented in France since 2018 (over 450 cars). However, we did not identify any scientific evidence of effectiveness. There was consensus amongst interviewees that the most important first step was for the NT to be clear about their top road safety priority. Interview participants were very supportive about offering additional information to the NT to further investigate technologies and provide advice on investment.

> 'Each jurisdiction has slightly different requirements…but we're all working towards the same goal…the more we can share, the better.'
>
> Government

Conclusions

This study provides a synthesis of the current technology being used in road safety in Australia. The major limitation specific to the NT is the lack of physical infrastructure in remote and very remote locations. The success of technology that requires electricity and internet connection cannot easily nor affordably be applied in most areas across the NT. Further, attention is needed to ensure the safety of Aboriginal and Torres Strait Islander peoples that is co-designed and culturally inclusive. Outcomes from the debrief with NT stakeholders will be available in the coming months.

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Road rules cards: an easier way to understand the rules

Marilyn Johnson[a], Robbie Napper[b], Sienna Fernando[b], Vanessa Johnston[c] and Kieran Medici[b]

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Abstract

Road rules are part of every action on our roads yet are often not considered in road safety practice, research, programs and campaigns. This gap can negatively impact road users with increased confusion and potentially greater crash risk, particularly when applying the road rules is not straightforward and/or the road environment is complex. Our aim was to make the road rules accessible and increase people's confidence in professional and educational settings. Based on a deck of playing cards, structured by scenarios (e.g., turning left), cards have been developed for each road rule, including a simplified graphic of the road user interaction. A fold-out scenario card lists the key road rules that need to be considered. The road rules cards are part of the Mobility Kit that incorporates scale Lego® pieces (1:31) and is currently in the user-testing stage.

Background

Most road users have limited interaction with the road rules as delegated legislation under state and territory road safety laws. Typically, in Australia, the greatest focus on road rules is during the driver training and licensing stage with some inclusion in primary and secondary education. Beyond licensing, road users acquire 'point-in-time' knowledge through summaries of the road rules produced by state licensing authorities in print or online. For the rest of their driving years, the majority of road users' adult life they have little/no engagement with the road rules, including as they exist in delegated legislation (Johnston et al., 2022).

This lack of understanding of the road rules can have serious consequences, especially for novice drivers. When novice drivers attempt to follow current road rules they may be challenged by experienced drivers with outdated knowledge. This knowledge gap also extends to the road safety sector. Further, as the road rules are updated over time, amendments and additions are made piecemeal. This makes it more difficult to connect the statutory rules relating to road user interactions together through notes, schedules, and defined terms. This can leave a non-expert uncertain about how a road rule applies to the road environment and whether all relevant rules have been considered.

This critical gap between the disciplines of law and road safety needs to be addressed. Intuitive road design that aligns with the road rules (and vice versa) is essential. If we are to achieve 'Safe travel for all', we all need to follow the rules in the same way. Our aim was to make the road rules accessible and increase people's confidence in professional and educational settings.

Method

An interdisciplinary approach was used in a collaboration that included our expertise in road safety, law and design. Building on research that identified the lack of understanding in the interaction at an intersection when a cyclist plans to continue straight through an intersection and a driver intends to turn left (Tierney, 2015; Napper et al., 2021), we used this scenario to develop the first group of road rules cards. The scenario approach was the framework for our approach as it was not feasible to develop a card for each road rule (i.e., there are over 400 individual road rules in Victoria).
We developed physical objects that made the road rules tangible. Communication design strengthens the rules through illustrations and a graphical system for penalty units. The cards

literally place the road rules on the table, helping people grasp the concept individually and in groups. The format was informed by familiar card games (e.g. UNO®, Pokemon®) to increase accessibility.

The biggest challenge was getting the balance right between simplicity (greater useability) and legal accuracy (more complicated). This required an iterative approach that considered how we would present the road rules including:

- Typographic treatment for example bolding and italics have significance in the road rules
- Verbatim wording
- Legibility, including enough text on the cards to be accurate but also to be readable
- Continuation between cards, where is too much text to fit legibly, finding an elegant solution that did not complicate the deck and flowed rules over multiple cards.
- Diagrams

The diagrams were carefully considered so they did not compete with the detailed diagrams that form a legally binding element of some road rules. However, given the complexity of the descriptions of some interactions, we added a simple diagram to every road rule card.

Results

To date we have created 41 cards. The design language helps the user navigate the road rules with each division of the road rules allocated a different colour, the division and part noted in the top left (division) and bottom right (part) of the card. Symbols were also used to simplify information, for example, penalty units are represented by the red dots in the top right corner. Wording on the cards is verbatim and has not been altered or abbreviated. For road rules with content that did not fit on the card, we added ellipsis dots to indicate that the road rule continues on another card (Figure 1).

Figure 1. Road rules cards

The road rules cards provide the precision needed to create an accurate resource. However, in early testing we recognised the need for additional instructions. While we were able to describe the cards with users, after the initial induction, they needed reference instructions, similar to the rules of any card game. To address this need, we developed a fold-out index that provides the users with information about the scenario and the confidence that they have considered all the relevant road rules (Figure 2).

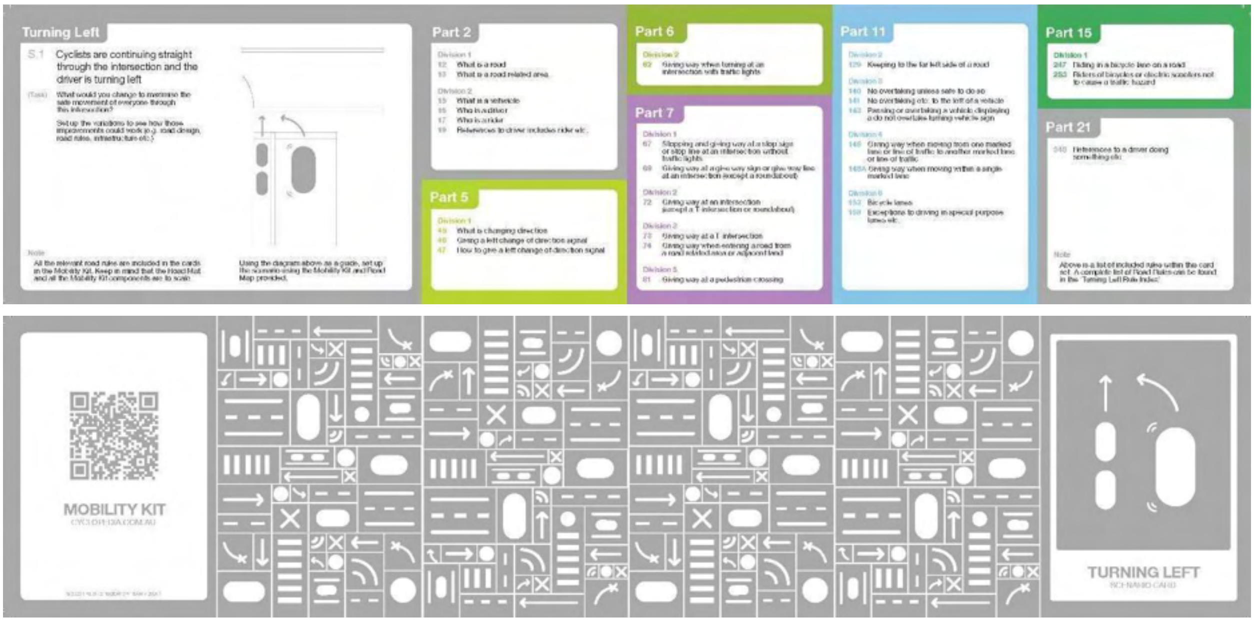

Figure 2. Scenario index fold-out (left turn)(front and back)

Conclusions

The road rules cards are the first interactive resource developed to increase access and useability of the Australian model road rules. This first group of cards has used the road rules that are adopted in Victoria. These clear, simple yet precise cards, created through the interdisciplinary expertise of road safety, law and design, will help road safety professionals, both practitioners and researchers, and educators to engage with the road rules in a fun and accurate way. The road rules cards also provide the users with the confidence which has been missing in the road safety sector to date.

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62 Road rules cards: an easier way to understand the rules
(1)
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ROAD RULE CARDS
LANE
TURNING LEFT
Turning Left
Part 2
Part 5
Part 6
Part 7
Part 11
Part 16
Part 21
Marilyn Johnson, Robbie Napper, Sienna Fernando, Vanessa Johnston, Kieran Medici
MONASH University
RMIT UNIVERSITY
UNSW
2

Lead and lag indicators of success for Top 20 Roads

Chris Jones and Amir Sobhani

Department of Transport and Planning, Victoria

Abstract

Between 2017 and 2023 the Victorian Transport Accident Commission (TAC) and Department of Transport and Planning (DTP) aimed to 'eliminate' head on and run-off-road crashes on 20 major high speed, high traffic volume rural highways with flexible barrier systems. Flexible barriers systems are intended to contain errant vehicles within a safe envelope of the road environment and to prevent high severity crash with oncoming vehicles and unforgiving roadsides. DTP has prepared lead and lag indicators of success to provide interim metrics ahead of long-term evaluation. Leading indicators of success, using the AusRAP assessment method, 'before' and 'after' ratings demonstrate an increase from 2.6 stars to 4.5 stars. Lag indicators demonstrate a 37.5 to 64.1 per cent reduction in fatal and serious injury crashes. The results support further Australasian investment in continuous barrier transformation of these corridors.

Purpose of the Top 20 Program

Flexible median and roadside barriers are a proven road safety treatment, having been installed along urban freeways and at targeted high-risk locations such as curves. Between 2017 and 2023, 20 major high speed rural road corridors were transformed with continuous barriers with a vision of eliminating the predominant systemic risks of head-on and run-off-road crashes, thereby reducing the incidence of fatalities and high severity serious injuries.

Routes were selected based on their collective crash risk, with high volume connecting routes between major population centres including Geelong, Ballarat, and the length of Hume highway. Treatments included median barrier, roadside barrier, wide centre line and in-fill of barrier between existing treated locations. Through the program 1730km of road was upgraded.

Evaluation and Effectiveness

To yield long term evaluation and estimation of crash reduction factors, an effective 3-5 years after period is typically recommended. However, there is significant public and community interest in the results of the program given the level of investment, and high visibility of the barriers within the road environment. Accordingly, DTP have prepared leading and lagging indicators of success.

AusRAP Star Ratings

AusRAP Star Ratings are an objective measure of the level of safety which is 'designed-in' to the road through more than 78 road attributes that influence risk for vehicle occupants. Increasing star ratings is internationally regarded as a strong predictor of future road safety outcomes. The Department of Transport and Planning collected extensive data through:

- 2014 collection of Victoria's 26,000km road network ANRAM assessments
- scope approval reports determining barrier location and discussions with project managers on treatment locations
- video surveillance and coding of 3 routes
- surveillance and coding of 5 routes through LiDAR data capture of roads

Using the AusRAP analytical platform 'VIDA' before and after star ratings were generated demonstrating an uplift from 2.6 stars to 4.5 'vehicle occupant' stars.

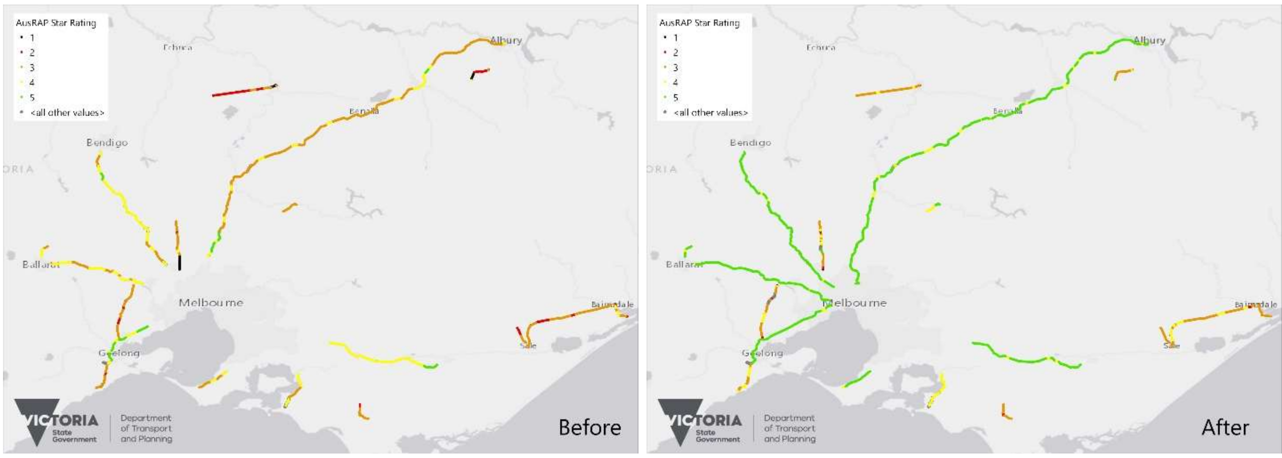

Figure 1. Before and After Star Ratings

Road Trauma Analysis

An extensive data gathering process was undertaken. Data sources include:

- Project location from DTP project scope approval reports
- Before and after crash data extracted from DTP's Road Crash Information System

The scope and method of analysis included:

- head-on and run-off-road (ROR) crash types, at non-intersection locations only (excluding on and off ramps).
- vehicle occupant crashes
- control sites selected
- up to 5 years of before data, and crash data at least one year post completion with selection period excluded to avoid regression to the mean.

Reductions in road trauma across the Top 20 program, pre versus post, is presented in Table 1. All results are statistically significant with 95% level of confidence.

Table 1. Pre and post fatal crash- based crash reduction factor

	ROR and Head-on Crash Reduction Factor Including Control Site (95% CI)	Crash Reduction Factor Excluding Control sites (95% CI)
All Roads	37.5% (24.0 - 48.6)	64.1% (48.8 - 74.9)
Divided Roads	35.9% (22.2 - 47.3)	64.1% (48.5 - 74.9)
Undivided Roads	73.5% (45.9 - 87.1)	69.6% (0.2 - 90.8)

Probe Speed Data Pilot for Local Government

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[a]SafeMobility, Melbourne, Victoria

Abstract

Managing towards safe speeds for all transport users is a key goal of local government practitioners. This goal has been hampered by high costs and limited locations where traffic speeds are sampled. Speed data probed from connected vehicles was investigated in the City of Maribyrnong (Victoria), as there were adequate sample sizes to monitor mean and 85th percentile speeds and speeding across entire road networks. Evaluation of speed changes due to traffic calming and speed limit changes was possible with good accuracy. The low data costs and ubiquitous coverage will assist local government practitioners in planning and evaluating speed management road safety initiatives.

Background

Local street networks provide multiple transport functions, and need to be fundamentally safe for travel by all. For decades, local government practitioners relied on analogue speed data collected with tube counters at selected locations, hoping to gain insights about safety performance of their street networks. This has been limiting and expensive.

This abstract presents analytical findings of an innovative local government pilot of digital data probed from connected vehicles to inform speed management by local government practitioners. Thirty days of probe data was extracted for street segments where 7-day tube counter surveys were conducted during March 2021 by the City of Maribyrnong.

The pilot provided insights into the characteristics of probe speed data. The ubiquitous nature and low cost of probe data could help these practitioners overcome the current data limitations in local speed management.

Availability and Fleet Representation

Probing involves anonymous upload of GPS location and time stamp information from in-vehicle internet-enabled devices and sensors to aggregators such as Google, HERE and TomTom.

Probe data is expected to be representative of vehicles and drivers on Australian roads thanks to wide diversity of sources being aggregated, especially from mobile devices (Ambros, Usami and Valentova, 2022). In this pilot, on average 15 % of Maribyrnong's traffic was captured by TomTom. Three quarters of segments had penetration rates higher than the desirable threshold of 10% proposed by Rahman (2019), and further 14% were close to it. Probe sample sizes obtained from TomTom exceeded Austroads (2020) minimum sample sizes across all street types from low volume access lanes to busy distributor roads.

Speed Distributions

Standard deviations tended to be higher for probe speed distributions as probed vehicles are expected to vary their speeds along a segment. Figure 1 shows an example of two such speed distributions measured on a 105 m segment in Maribyrnong (speed limit of 50 km/h). This is a source of the differences in the two distributions.

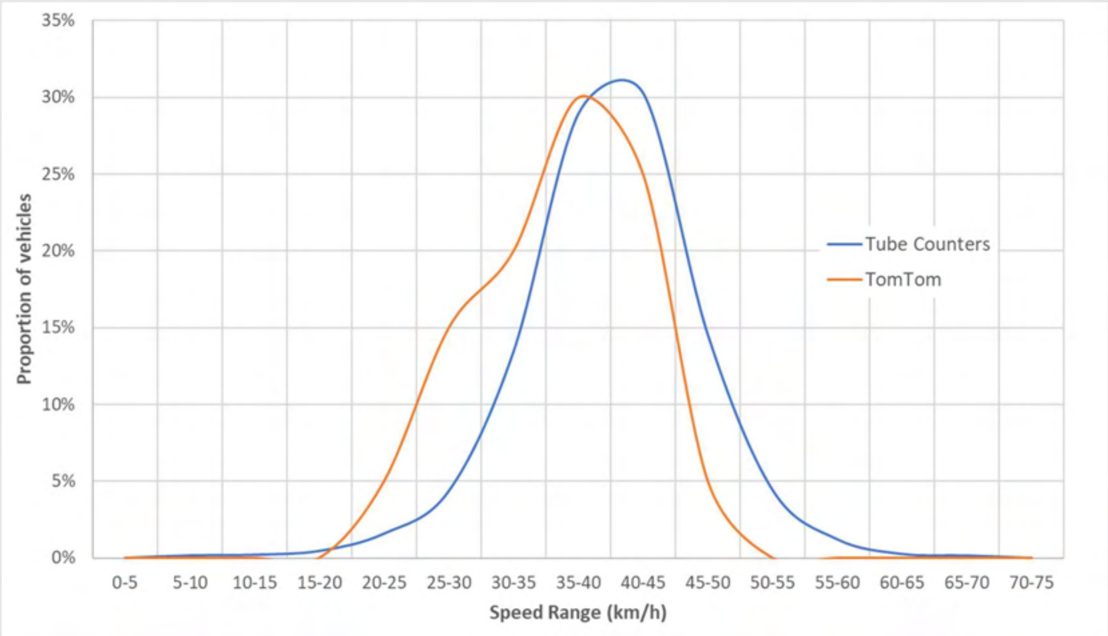

Figure 1. Tube counter and TomTom speed distributions for the same street location

Mean and 85th Percentile Operating Speeds

Probe speeds can be more accurately described as space-mean speeds derived from measured travel time between two points. Tube counter speeds are time-mean speeds of vehicles passing a roadside observer (a tube counter). According to fundamental research on speeds summarised in Austroads (2020), space-mean speeds should be lower than time-mean speeds. Figure 1 shows this. Further, Figure 2 (upper), shows the relationship between mean speeds from the two sources. Mean speeds sampled from TomTom were on average 10% lower than those measured with tubes.

Figure 2 (lower) shows that the 85th percentiles were more similar, with TomTom speeds being only 2 percent lower than tube speeds. This reflects higher standard deviations found in TomTom speeds.

At individual locations, probe speeds may be lower or higher than when measured with tube counters. This may need to be communicated carefully, especially when considering enforcement and its evaluation.

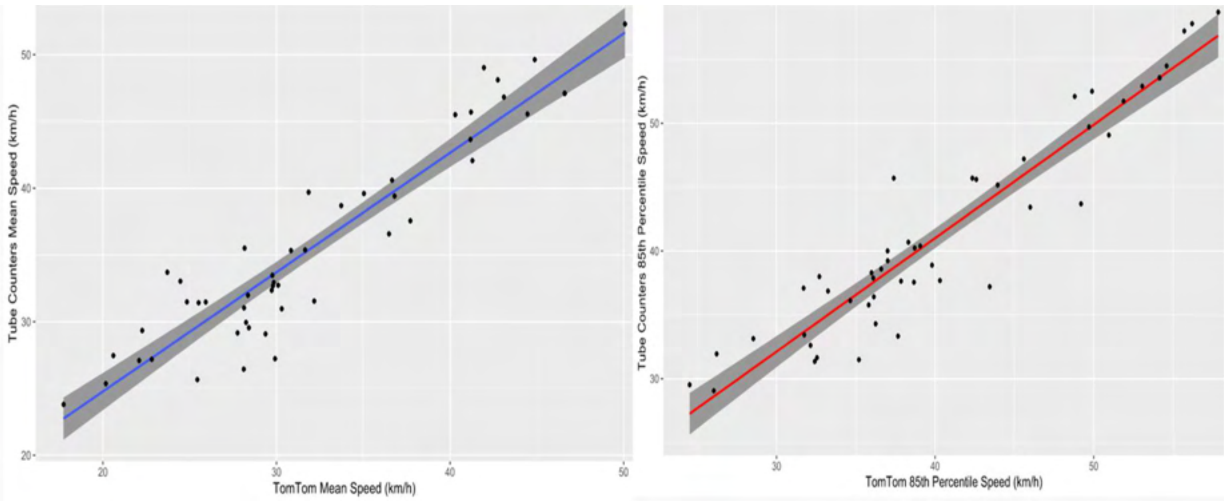

Figure 2. Mean and 85th percentile speeds from tube counters and TomTom

Evaluation of Speed Changes

SafeMobility tested TomTom data in realistic evaluation scenarios of traffic calming and speed limit reductions on local streets. Figure 3 demonstrates mean and 85th speed changes due to installation of a raised zebra crossing combined with a reduction in speed limit from 60 to 50 km/h. The observed mean speed reduction was highly statistically significant.

Easier and lower cost access to data could promote greater community consultation and feedback, especially during implementation of ambitious 40 km/h or 30 km/h speed limits supported by street environment changes.

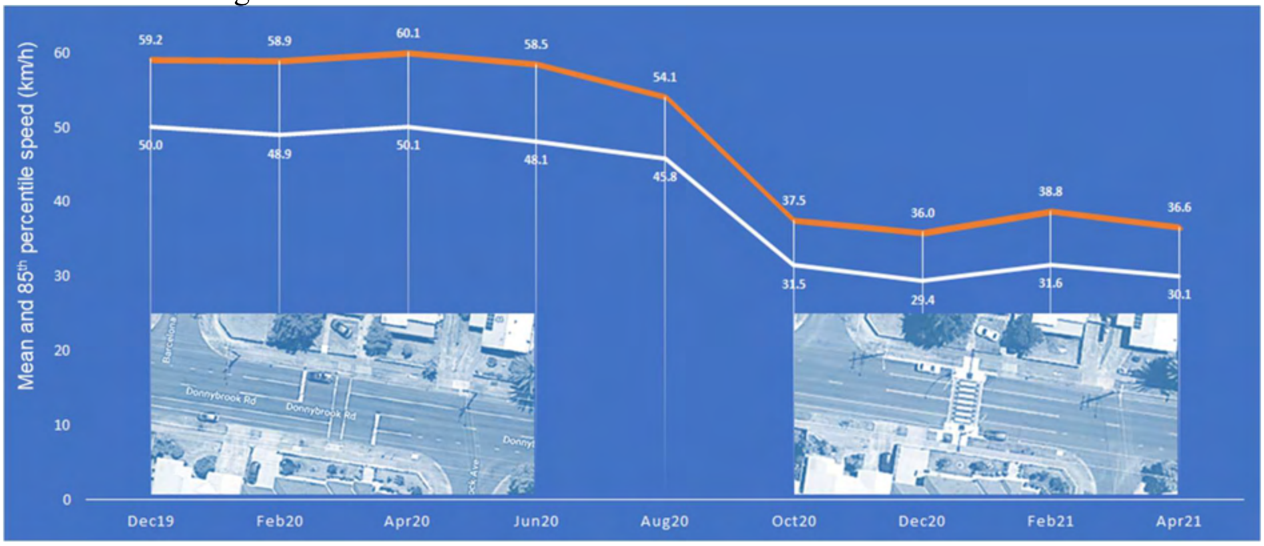

Figure 3. Speed effects a raised crossing and speed limit reduction installed in September 2020

Costs

A recent speed management evaluation project undertaken by SafeMobility was conducted using both tube counter and probe data sources. Probe data costs were five times lower than tube counter data collection costs, while not requiring onsite installation and traffic management. Use of probe data also allowed inclusion of more routes, area-wide effects, and retrospective access to data before road improvements.

Discussion and Conclusions

The differences between the two speed sources suggest they should not be directly compared. It would be clearer to report probe speeds as ‘segment’, ‘route’ or ‘journey’ speeds, and tube counter speeds as ‘point’ speeds. Also, with some guidance and experience, high level calibration could be made. As with many technological advancements, some transitional practitioner guidance may be required to interpret probe speeds in context of familiar conventional sources.

Overall, probe speed data provides adequate sample sizes to monitor mean and 85th percentile speeds and speeding on local streets. There is sufficient data to evaluate speed changes due to traffic calming and/or speed limit changes with good accuracy.

The Maribyrnong probe data pilot demonstrated how local government practitioners could access ubiquitous and low-cost speed data for their street networks. This should reduce barriers to planning and evaluation of road safety initiatives based on speed management.

Acknowledgement

SafeMobility wishes to thank Loc Ly from Maribyrnong City Council and Eng Hwa from Shire of Macedon Ranges for support and sharing of their council data which enabled this pilot project.

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Intersection detection using vehicle trajectories data: Deep Neural Network Application

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[a] Minia University, Egypt, [b]The Centre for Accident Research and Road Safety–Queensland, Queensland University of Technology, Australia, [c]Arab American University, Jenin, Palestine.

Abstract

In 2021, intersection-adjacent crashes were stated to cause 7.7% of total annual road deaths in Australia (BITRE, n.d.). Generating intersection maps is essential for future Cooperative Intelligent Transport Systems (C-ITS) deployment. Nonetheless, crowdsourced vehicle trajectories are a viable and affordable data source that can be used to generate maps. However, intersection maps are changeable, and building one map inference model for all intersection types is challenging. Therefore, we need an object detector that can detect and classify the different intersections using the 2-D scatter plot of the crowdsourced trajectories. Consequently, each subset of trajectories data points passed to the suitable intersection map inference model. This study used two real-world vehicle trajectory datasets, T-Drive and ECML-PKDD 15, to classify the intersections by building an object detection model using Deep Neural Network (DNN). We created 2000 images to train a Single-Shot detector the initial testing results were promising.

Background

Object detection models have two tasks to perform, localization which the model tries to accurately locate the object, and classification which the model tries to classify the object. we use object detection to classify the intersections and know their locations on the map by that you can use an intersection inference map model to build an intersection map. Intersection maps in C-ITS play a crucial role in enhancing situational awareness for drivers, promoting safer driving behaviors, and facilitating coordinated actions to prevent conflicts and crashes. These maps provide geometric data, including lane configurations, road widths, intersection layouts, and traffic signal locations, which enable vehicles to make informed decisions regarding path planning, and lane selection, and C-ITS systems can issue warnings to drivers about potential conflicts, such as red-light violations or stop sign violations. Additionally, C-ITS systems leverage intersection maps to assist in complex intersections and leading to safer and more efficient transportation.

Method

First, we need to convert the trajectory data from the chosen datasets into images, so we would be able to use them as training data for the CNN. We extracted random areas from the map within the area of interest. We then use software to create the bound box and label it for each intersection. The extracted dataset consists of less than 2000 images with 20% of it used for training. We have three classes; T-intersection, Cross-intersection, and Round-intersection. we decided to give attention to location error and reduce that error to the lowest degree we started by using Single-Shot Detection (SSD) models that could give us low location loss. Examples of training photos and testing photos are in **Error! Reference source not found.**.

The vehicle trajectories datasets

The T-drive dataset [2, 3] has a total distance of the trajectories that reaches nine million kilometers, an average sampling interval of about 177 seconds. ECML-PKDD-15 [4] dataset contains the trajectories of taxis of about 1.7 million instances and each data sampled corresponds to one complete trip. The properties of the datasets are in Table 8.

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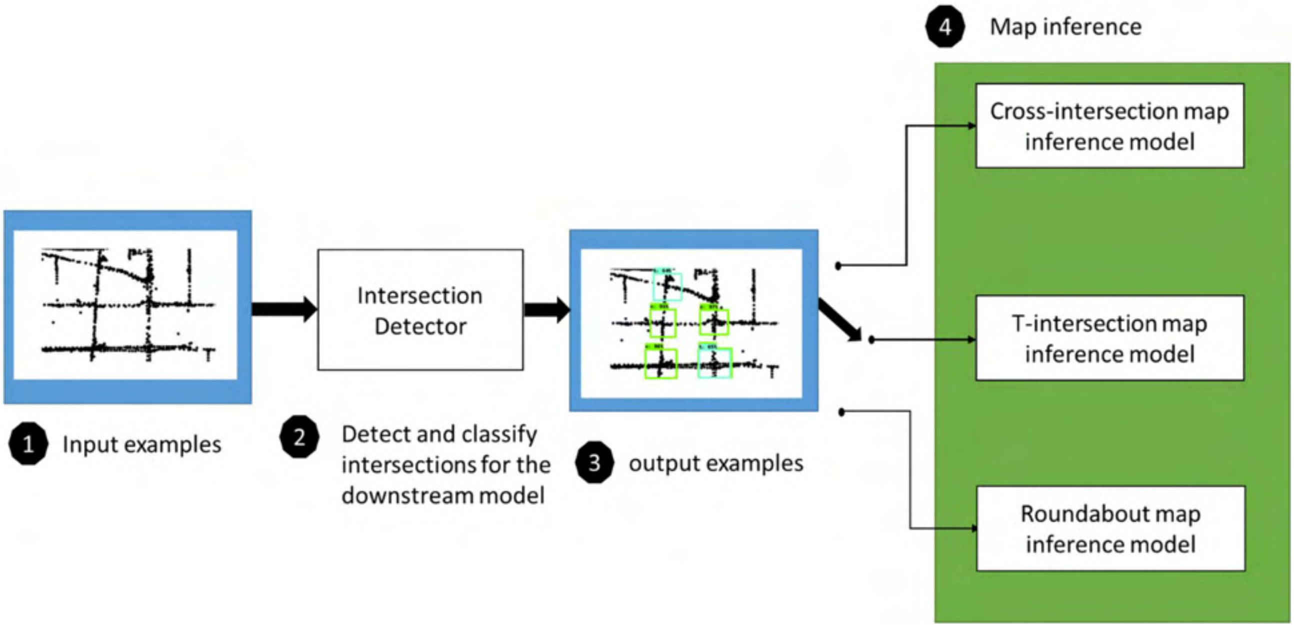

Figure 2. Illustration of the need for object detectors for intersection map inference

Table 8. Properties of the two datasets used in this study

Dataset	Location	Period	Users	Events	Reference
T-Drive	Beijing, China	1 week	10,357	15 million	Yuan et al., 2011; Yuan et al., 2010
ECML-PKDD 15	Porto, Portugal	1 year	442	83 million	Moreira-Matias et al., 2013

Results

The object detection model was tested on two data sets T-drive and ECML-PKDD 15. the cross intersection was more common than the other intersections in the datasets, so the numbers of intersections are slightly skewed. the confidence score ranges for the intersections were: [42-94], [51-98], and [66-94] for the T-intersection, cross-intersection, and round intersection respectively. the mean average precisions (mAP) for each class were: 15.86,18.96, and 8.19% for the T-intersection, cross-intersection, and round intersection respectively. The mAP results are relatively low but for a dataset of fewer than 2000 images and only tested on one type of model it's a good start.

Conclusion

The initial mAP results were: 15.86, 18.96, and 8.19 % for the T-intersection, cross-intersection, and round intersection respectively. Which is relatively low but the dataset consists of less than 2000 photos, so this is a good starting point. We believe that trying different types of models like Faster-CNN or any of the R-CNN family and expanding the dataset will result in us achieving better results.

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Perceived effectiveness of traditional and technology-based approaches to reduce speeding

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Abstract

This study examined a sample of drivers' perceptions towards both traditional (e.g., police enforcement) and technology-based (e.g., Advanced Driver Assistance Systems) approaches to reduce speeding behaviour. Drivers (*N*=680) were randomly allocated to read one of four scenarios, which differed based on road environment (urban or regional) and speed zone (60 km/hr or 100km/hr), or to a control condition (no scenario) in an online questionnaire. Low-level speeding behaviour was a common occurrence among participants, with 40.7 percent and 50.4 percent of respondents reported *often*, *very often*, or *always* driving 1-5km/hr over the posted speed limit in 60km/hr and 100km/hr speed zones, respectively. Further, participants reported significantly higher mean ratings that police enforcement strategies would be effective at helping them to comply with the posted speed limit in both urban and regional locations compared to other traditional and technology-based approaches. The findings indicate increased need and potential means to further target reductions in speeding.

Background

Speeding increases crash risk and severity (e.g., Aarts & van Schagen, 2006). Various approaches have been used to promote adherence to speed limits, such as police enforcement and public education initiatives (Glendon & Lewis, 2022; Simpson et al., 2020). However, speeding remains prevalent on our roads (Queensland Government, 2021), and it is recognised that such behaviour requires an array of strategies to reduce its occurrence (e.g., Stevenson & Thompson, 2014). Coupled with these traditional approaches, however, is the prospect of new technological solutions, including Advanced Driver Assistance Systems (ADAS) and in-vehicle speed alerts, that assist drivers to comply with the posted limits. Examples of ADAS which may assist drivers to manage their speed include cruise control, adaptive cruise control, and intelligent speed assist. Currently, there has been limited research assessing whether drivers would use technology-based approaches to prevent speeding. This research addressed the following research questions: 1. How common is speeding behaviour? 2. What approaches do drivers find most effective at helping them to comply with the posted speed limit?

Method

Paid on-line advertising was used to recruit drivers (*N*=680) aged 17-89 years (*M*age=49.34 years, 446 males) to complete a 20-minute online questionnaire. Participants were randomly assigned to one of four driving scenarios which differed based on environment (urban or regional) and speed limit (60km/hr or 100km/hr; Figure 1) or assigned to the control condition (no scenario). The study was between groups as participants driving behaviour may differ as a function of location (urban or regional locations) and posted speed limits (60km/hr or 100km/hr speed limits). The questionnaire included items which measured demographics, speeding behaviour, and perceptions of the effectiveness of traditional and technology-based approaches to assisting drivers to comply with the posted speed limit.

Scenario 1: Urban 60km/hr (*n*=140)  You are driving along a 2-lane road in an urban area. The speed limit is 60km/hr. The weather is dry, and visibility is clear. Traffic is light and moving freely.	**Scenario 2:** Regional 60km/hr (*n*=129)  You are driving along a 2-lane road in a regional area. The speed limit is 60km/hr. The weather is dry, and visibility is clear. Traffic is light and moving freely.
Scenario 3: Urban 100km/hr (*n*=132)  You are driving along a highway in an urban area. The speed limit is 100km/hr. The weather is dry, and visibility is clear. Traffic is light and moving freely.	**Scenario 4:** Regional 100km/hr (*n*=141)  You are driving along a highway in a regional area. The speed limit is 100km/hr. The weather is dry, and visibility is clear. Traffic is light and moving freely.

Figure 1. Experimental scenarios
Note. Control condition (n=138). All images are screenshots of roads in Queensland, Australia taken from Google Maps.

Results

When asked, "Over the past 12 months, how often have you driven over the posted speed limit?" 40.7 percent of participants reported often to always driving 1-5km/hr over the posted speed limit on a 60km/hr road and 50.4 percent reported often to always driving 1-5km/hr over the posted speed limit on a 100km/hr road. Fewer participants reported often to always driving 11+km/hr over the posted speed limit on a 60km/hr road (6.3%) and on a 100km/hr road (11.5%).

A mixed ANOVA assessed which approaches drivers find most effective at helping them comply with the posted speed limit. Mauchly's test of sphericity was significant and therefore, the Huynh-Feldt is reported as the multivariate test statistic. Descriptive statistics are presented in Table 1. The findings revealed a significant main effect of approach, $F(3.39, 2285.65) = 171.05$, $p < .001$. Pairwise comparisons showed that participants reported significantly higher mean ratings that police enforcement strategies would be effective at helping them to comply with the posted speed limit compared to all other approaches. There was no significant main effect of condition, $F(1,674) = 1.02$, $p=.398$. However, there was a significant approach x condition interaction, $F(13.57, 2285.65) = 4.88$, $p< .001$. These interaction statistics will be presented and discussed as part of the presentation.

Table 1. Participants' mean scores for the approaches they reported effective at helping them drive to the posted speed limit

Approaches	Mean scores				
	Urban 60km/hr	Regional 60km/hr	Urban 100km/hr	Regional 100km/hr	Control
ADAS	4.13	4.90	5.22	4.91	5.15
Alerts	4.69	4.61	4.84	4.70	4.76
Police enforcement/presence	6.15	6.10	6.16	5.92	6.23
Messaging	4.81	4.61	4.50	4.31	4.54
Other	5.34	5.15	5.14	5.02	5.30

Note. 1 = Extremely unlikely, 7 = Extremely likely. ADAS = cruise control, adaptive cruise control, intelligent speed assist technology. Alerts = audio speed alerts via vehicle, navigation systems, mobile phone application. Enforcement = presence of a fixed camera, mobile camera, point-to-point cameras, or police vehicle. Messaging = passing a smiley-face speed awareness sign, variable message sign, or presence of a billboard displaying a 'slow down' message. Other = checking speedometer, speed limit on road markings, more frequent speed signs. Participants responded to each item individually, however these items were grouped for the purpose of analysis.

Conclusions

Despite efforts to reduce speeding, low-level speeding remains prevalent on our roads, highlighting the need for further action. The study emphasizes the significance of police enforcement, including speed cameras and increased police presence, to ensure drivers adhere to posted speed limits.

Acknowledgements

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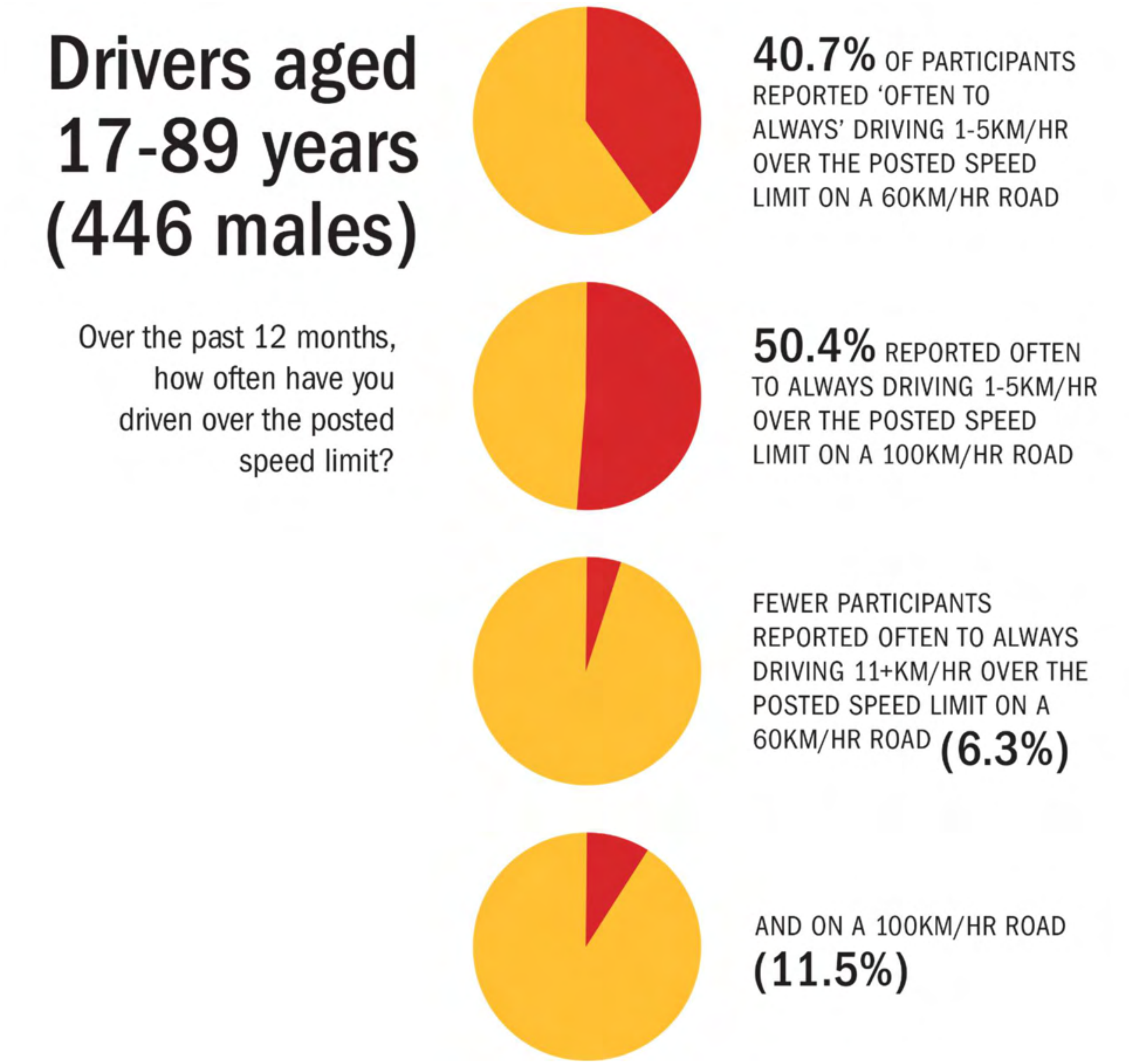
Drivers aged 17-89 years (446 males)
Over the past 12 months, how often have you driven over the posted speed limit?
40.7% OF PARTICIPANTS REPORTED 'OFTEN TO ALWAYS' DRIVING 1-5KM/HR OVER THE POSTED SPEED LIMIT ON A 60KM/HR ROAD
50.4% REPORTED OFTEN TO ALWAYS DRIVING 1-5KM/HR OVER THE POSTED SPEED LIMIT ON A 100KM/HR ROAD
FEWER PARTICIPANTS REPORTED OFTEN TO ALWAYS DRIVING 11+KM/HR OVER THE POSTED SPEED LIMIT ON A 60KM/HR ROAD (6.3%)
AND ON A 100KM/HR ROAD (11.5%)

Raising awareness of advanced rider assistance systems among motorcycle riders

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Abstract

Consistent with the Step approach to Message Design and Testing (Lewis et al., 2016), a mixed-method project was undertaken to develop and test messaging to raise awareness of advanced rider assistance systems (ARAS) among motorcycle riders. Study 1 explored 39 riders' beliefs towards ARAS and which informed the development of six written message concepts, which were tested in Study 2 with a further 20 riders. Three messages were selected (based on those rated most favourably in Study 2) for evaluation in an online survey with 239 riders (Study 3). Overall, it was evident that some technologies were better known than others. For instance, most participants reported good-excellent knowledge about standard anti-lock braking systems (ABS) and cruise control yet poor-fair knowledge of other systems, including cornering ABS. All three messages were feasible options for use in raising awareness of ARAS which the findings of this project supported as being required.

Background

Motorcyclists are vulnerable road users and represent a significant proportion of road fatalities. In 2021, 235 motorcyclists died in crashes on Australian roads (BITRE, 2022). Advanced rider assistance systems (ARAS) may offer the potential to increase the safety of motorcycle riders; but real-world evidence of effectiveness is currently available only for standard anti-lock braking systems ([ABS], Allen et al., 2019) and riders are often reluctant to adopt ARAS (FEMA, 2020). This program of research comprised three studies which developed and tested messages that sought to raise awareness of ARAS. The study applied the Step approach to Message Design and Testing (SatMDT; Lewis et al., 2016; Figure 1) to understand the barriers and facilitators associated with riders' intentions to use ARAS and to use such understanding to devise targeted message content.

Method

The methods and materials implemented in this project were consistent with the SatMDT. Study 1 comprised eight focus groups with 39 motorcycle riders (*M*age=44.54 years; 27 males) and explored their underlying beliefs regarding use of a range of ARAS. The findings of Study 1 informed the development of six written message concepts. These concepts were tested with a further 20 motorcycle riders (*M*age=42.80 years; 15 males) in a series of five focus groups. One group focused particularly upon terminology in terms of riders' preferences regarding how best to refer to ARAS. Study 2 identified three messages that riders reported as effective in raising awareness of ARAS and which were taken on for further testing in Study 3. In Study 3, participants (*N*=239 motorcycle riders; *M*age=44.40 years; 174 males) completed a 20-minute online survey and were randomly allocated to one of four conditions (i.e., to view one of three message concepts or allocated to the control, no message condition). A range of message efectiveness measures were implemented to assess riders' responses regarding the messaging.

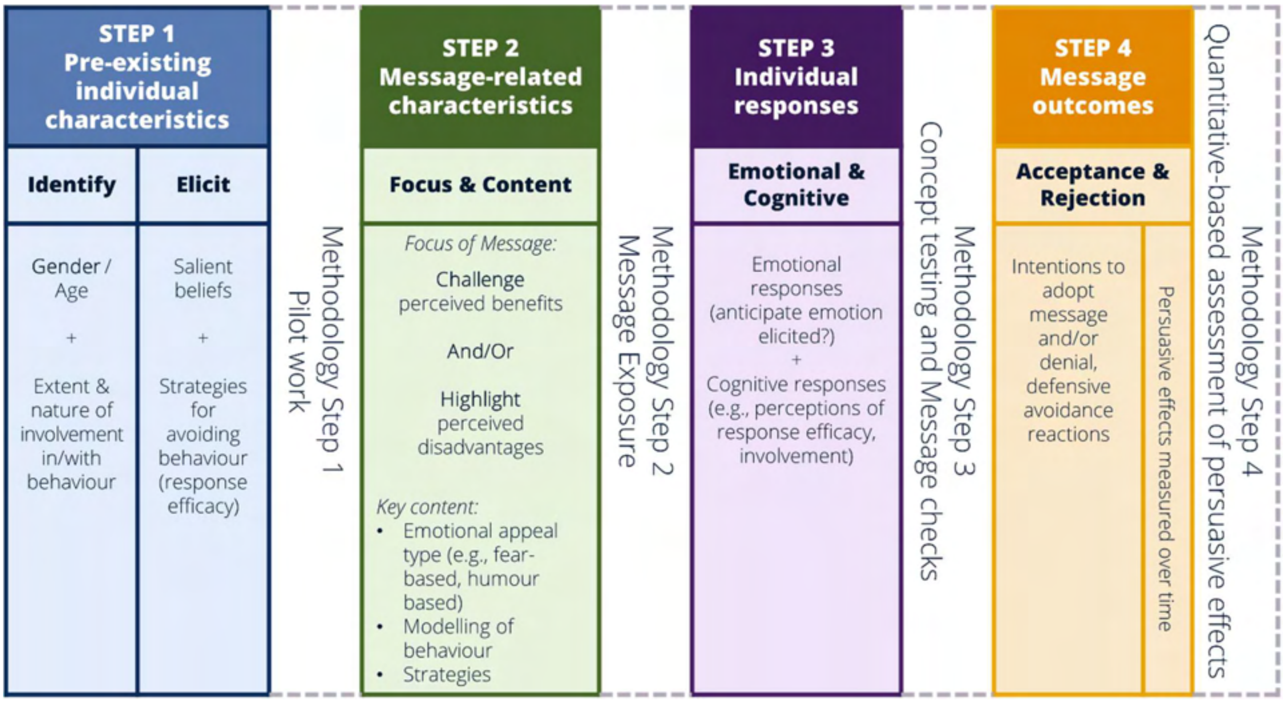

Figure 1. The Step approach to message design and testing (Lewis et al., 2016)

Results

For all studies, most participants reported good to excellent knowledge about standard anti-lock braking systems (ABS) and cruise control and poor to fair knowledge of cornering ABS, adaptative cruise control, and selectable riding modes. For Study 3, participants perceived the three message concepts to be *somewhat effective*. There were no significant differences in attitudes, intentions, and willingness to use advanced technologies on motorcycles pre-and immediate post-message exposure. However, there were some differences between the message concepts on participants' willingness to disengage/switch off advanced technologies on a motorcycle in the future and perceptions on whether the messages would have more impact on themselves or more impact on other riders in general.

Conclusions

Overall, the project confirmed that motorcycle riders have better knowledge of some types of ARAS relative to others and, thus, there remains a need to raise awareness and, ultimately, encourage uptake of proven technologies. This project offers evidence-based targeted messaging which was informed by understanding the barriers and motivators for riders' uptake of ARAS. However, and when developing awareness-based ARAS messaging, it is important not to overstate the safety benefits of these systems with more research required to examine the effectiveness of ARAS.

Acknowledgements

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Giving young people the green light to travel safely

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Abstract

In response to the demand from local councils for face-to-face community road safety education and informed by the Victoria Police Road Safety Strategy 2021-2024 (Victoria Police, 2021) and both the Victorian and the National Road Safety Strategies 2021-2030, Fit to Drive developed the Green Light Initiative (GLI) (Commonwealth of Australia, 2021; TAC, 2021). The GLI was launched in metropolitan and regional areas in 2022. Its aim is to empower young people to make safer choices on our roads through the strengthening of partnerships between inexperienced young road users, their families, and the wider community. The in-person format involves a combination of large group discussions and small group brainstorming to encourage open dialogue between Learners and their supervising drivers. Participants engage with Victoria Police members to learn L-plate relevant rules and restrictions and create an actionable plan to tackle a local road safety challenge (e.g., speeding). Post-session survey data exemplifies the value participants gain from the workshops with 100 percent of attendees believing that other Local Government Areas (LGAs) should participate in the GLI (Fit to Drive Foundation, 2023). Community engagement is key to uniting young people and their communities towards the common goal of safer roads.

Background: Road safety education for young people

Young people are tragically overrepresented in road trauma, accounting for 25 percent of driver fatalities (TAC, 2022). Between 2018 and 2023 in Australia, 218 young people between the ages of 16 and 25 have lost their lives on Victorian roads (TAC, 2022). In addition, over the same period, 5,987 young people between the ages of 18 and 25 have been hospitalised due to serious injuries on Victorian roads (TAC, 2022). This direct effect on young road users impacts the entire community and requires a whole of community response.

At the Fit to Drive Foundation, we remain dedicated to reducing road trauma among young people through the delivery of our school-based F2D Workshop, and the community-based road safety education program, the Green Light Initiative (GLI). With current participation from Victoria Police (VicPol) and Fire Rescue Victoria (FRV), Fit to Drive's programs are designed for young road users, supervising drivers, as well as their communities, to equip young people with the tools to manage risky situations on the roads.

In turn, young people and their communities are provided with tangible preventative strategies to minimise the devastating impacts of road trauma. We recognise the overrepresentation of young lives lost on Victorian roads, the major impact this has on local communities, and understand that research-based, road-safety education programs are a part of the overarching strategy to promote safer people.

New community-based initiative: Green Light

In 2022, the GLI was piloted across four diverse LGAs in Victoria. These regions included the outer north-western metropolitan area of Hume, the regional city of Warrnambool, the western metropolitan area of Brimbank, and collaboratively across the inner-city areas of Melbourne, Yarra and Port Phillip. In the final component of the GLI session, Victoria Police guided discussions on the key road safety issues affecting each community, which included road infrastructure, speeding and hooning, transport challenges in regional and rural areas, the e-scooter trials in Melbourne, and the challenges newly arrived migrants face in navigating Victorian roads.

According to overall GLI post-session survey data, participants agreed to a degree of 4.1/5 that the GLI workshop provided them with the opportunity to share their ideas and increased their confidence as road users and supervising drivers (Fit to Drive Foundation, 2023). Participants also agreed that the workshop made them more aware about available key resources and road rules that are relevant to them (Fit to Drive Foundation, 2023). For many of the participants who were culturally and linguistically diverse (CALD), the GLI was a rare opportunity to connect with experts in the field and learn about the latest road safety practices, laws and regulations. Post-session survey data revealed that the GLI workshop made participants feel more connected to their communities and that they understood the ways they can be supported to stay safe on our roads (Fit to Drive Foundation, 2023).

Moving forward: We're all in this together

It is clear that road trauma is a critical issue among young people, with significant impacts on the community. It is therefore vital that young people and their communities are provided with opportunities to engage with a range of different approaches as part of the Safe System principles to improve their overall road safety, which includes road safety education initiatives. Other elements include VicPol's enforcement of road laws; safer road infrastructure; and investing in new vehicle technologies. By implementing the combination of these strategies, we can all work together to create safer roads and reduce the number of serious injuries and young lives lost.

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E-scooter survey and testing – a safety campaign

Andrew Kirk, John Ewing, Joel Tucker and Candice Watt
The Royal Automobile Club of Queensland

Abstract

E-scooter use is increasing in Queensland and so is the rate of crashes and injury to riders and pedestrians. The Royal Automobile Club of Queensland (RACQ) developed a research campaign to better understand current usage of e-scooters amongst its almost 1.8 million members and examine the design features and characteristics of e-scooter devices for sale in Queensland. The research campaign comprised social and traditional media and included e-scooter road testing and a survey of 400 Queenslanders. Longitudinal market research was conducted in April 2022, physical e-scooter testing was performed at RACQ's Mt Cotton Mobility Centre in June and July 2022.

Background

E-scooter injuries have been the subject of increasing research and public education campaigns in recent years. Shichman et al (2022) found a 6-fold increase in e-scooter-related injuries presenting to the emergency department (ED). Piatkowski and Moran (2022) found injuries from electric scooters in Darwin have cost the medical system more than $350,000 in eight months. E-scooter injuries are becoming much more common and increasingly severe (Hayward et al., 2022). Research commissioned by the Jamieson Trauma Institute shows that most emergency room presentations are for injuries to the head, face and upper limbs. Vallmuur (2022) said of the presentations nearly 30% had alcohol in their system and were using the e-scooter at speeds over 20km/h.

Overseas studies have found that up to a staggering 91 percent of ED presentations at night had alcohol in their system (Stray et al. 2022).

With a long-term goal to reduce e-scooter crashes where people are killed or injured in Queensland and reduce the frequency of unsafe and illegal e-scooter use, the Royal Automobile Club of Queensland (RACQ) developed a campaign using a fresh approach – focused on researching the relationship between alcohol consumption, knowledge of e-scooter laws, speed and rideability traits of e-scooters and the resulting numbers of crashes and injuries.

In summary, the strategy for the campaign was to survey riders and non-riders to gauge how and why people are using e-scooters, their knowledge of the relevant laws around their use, whether or not they abided by these rules and whether or not the rideability of the e-scooters is contributing to accidents.

Method

The campaign consisted of a survey in April 2022 of 400 people to obtain data on e-scooter use along with knowledge and compliance with the relevant laws. Physical testing was carried out in June/July 2022 on 15 different high selling e-scooter models with a combination of different drives, suspensions, braking systems, battery sizes, power outputs and tyre/wheel sizes and types.

The campaign was delivered in two waves, the first was the survey results highlighting areas where greater education was required. The second was the physical road testing which showed design limitations and handling characteristics of the models tested to inform purchases of private e-scooters what they should be looking for when buying an e-scooter.

The findings of the research were rolled out through the following channels:

- RACQ-owned channels – *The Road Ahead* magazine, social media pages, traditional media comment; and
- Social media advertising including boomerangs, long form videos and images.

Results and Conclusions

A longitudinal research piece was designed around the campaign to understand rider and non-rider beliefs, behaviours and accident data.
The survey yielded the follow key points:

- 80% of e-scooter riders are based in SEQ.
- A quarter of private e-scooter owners have modified the device to go faster.
- Almost one third of e-scooter riders agreed with the statement that if they could easily modify an e-scooter to go faster they would.
- 31% of people considering buying an e-scooter rate a higher maximum speed as being important.
- The majority of e-scooter riders believe they know where they can legally ride, however 30% believe it is legal to ride on CBD streets and 20% believe it is legal to ride in bike lanes and suburban streets with a speed limit over 50km/h. Since this survey was conducted there has been a revision of Queensland's e-scooter rules and regulations (Qld Government 2022).
- The majority of riders and non-riders believe irresponsible behaviour is a major factor for making e-scooters unsafe.
- 11% of e-scooter riders don't use any safety equipment and 46% have engaged in non-compliant behaviour.
- Riders and non-riders both agreed that safety, training and road rules are key elements they would like to see introduced.
- Over half of e-scooter riders involved in a crash were injured. A similar figure was returned from people witnessing accidents. 22% of injuries required an ambulance.

Physical testing was carried out on 15 different high selling e-scooter models with a combination of different drives, suspensions, braking systems, battery sizes, power outputs and tyre/wheel sizes and types at RACQ's Mt Cotton Mobility Centre. Key findings from the testing were:

- The smaller, cheaper e-scooters were less stable due to shorter and narrower deck sizes.
- Scooters with smaller wheels/tyres were more susceptible to instability from bumps/potholes.
- The Mercane Wide Wheel was hard to turn due to the wide tyre which was also solid rubber rather than pneumatic, making every tiny bump in the road was obvious to the rider.
- Narrower handlebars resulted in twitchy steering and were generally harder to steer smoothly.
- Some of the suspensions were very soft which was good for soaking up bumps but caused the steering column to move forward and aft, especially when braking or accelerating.
- Some of the e-scooters had a very sensitive throttles which made them hard to ride smoothly, particularly at lower speeds.

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E-Scooter Survey and Testing
RACQ
A Safety Campaign
Survey Responses
25%
of private e-scooter owners have modified the device to go faster.
33%
of e-scooter riders said that if they could easily modify an e-scooter to go faster they would.
11%
of e-scooter riders don't use any safety equipment.
46%
of e-scooter riders admitted to engaging in non-compliant behaviour.
50% +
of e-scooter riders involved in a crash were injured.
22%
of injuries required an ambulance.
13%
of riders rated safety as the most important purchase consideration.
27%
of survey respondents admitted to riding whilst under the influence of alcohol.
Many riders confident of the rules got them wrong
34%
believe it is legal to ride on CBD streets.
23%
believe it is legal to ride in bike lanes on streets with a speed limit above 50km/h.
16%
believe it is legal to ride in suburban streets with a speed limit over 50km/h.
Since this survey was conducted there has been a revision of Queensland's e-scooter rules and regulations (Qld Government 2022).
Key Testing Findings
A longer, wider deck was more stable.
Larger diameter wheels handle bumps better.
Wider handlebars alleviate twitchy steering.
Adjustable height handlebars are better for different sized riders.
The results displayed are from a survey of 400 respondents across Queensland in April 2022 and testing of 15 different high selling e-scooter models in June/July 2022.

How effective are current road safety interventions targeting school-aged children?

Marton Kocsis[a], Paul Roberts[a], Rachel Goodsell[a,b] and Teresa Senserrick[a]

[a]Western Australian Centre for Road Safety Research, [b] Royal Automobile Club of Western Australia

Abstract

While interventions targeting road safety in school-aged children are roundly used in an attempt to reduce road safety-related childhood deaths and injuries, their effectiveness is not always clear. In order to assess the effectiveness of these interventions, we completed a systematic review of published evaluations in the last 10 years, as well as searching the grey literature for relevant unpublished reports. Overall, the quality of the published literature was deemed fair-poor, and revealed that interventions targeting bicycle and pedestrian safety had more reliable positive effects on road safety knowledge, attitudes, and behaviour, in both the short and long term, than those targeting pre-drivers. Evaluations found in the grey literature revealed a similar pattern of results, though were often higher quality. Suggested improvements are made regarding incorporating and validating more practical training within interventions targeted at pre-drivers.

Background

In Australia, large amounts of resources are invested into road safety interventions, yet school-aged children are still being overrepresented in road safety injuries and death statistics. In particular, while a large number of road safety interventions are implemented, their sustained impact in terms reducing child mortality and injury via improving road safety knowledge, attitudes, and behaviours is unclear. As such, the goal of this systematic review was to examine the short-to-long term effects of contemporary road safety education intervention aimed at school-aged children, in order to examine the evidence base for the various approaches being used.

Method

We completed a systematic review of published studies in the past 10 years that included evaluations of road safety educational interventions targeted at school-age children, based on PRISMA guidelines. Six databases were searched: Scopus, Web of Science, PubMed, PsycINFO, Cochrane Library and Transportation Research International Documentation between February 18 and April 4, 2022. Grey literature was searched via Google Scholar in Q1 2023. The quality of selected studies was assessed using the NIH Study Quality Assessment Tool.

Results

Across the six databases searched, 1464 unique studies were screened, of which 41 met inclusion criteria: 26 pre-driver interventions, 12 bicycle safety, and 7 pedestrian safety.

The studies evaluating pre-driver interventions were mostly poor-fair quality, and often lacked appropriate control groups. These studies typically targeted high school students and were almost exclusively education-based, with no practical training involved. Overall, these studies often showed small, positive short-term effects on improving road safety knowledge and attitudes in pre-drivers. However, there was little evidence supporting any effect long-term effects, or any effects on behaviour.

Evaluations of interventions targeting pedestrian and bicycle safety were of higher quality, and tended to show larger and more sustained effects on road safety knowledge and attitudes, while also providing evidence for some short-term effects on behaviour. In general, these bicycle and pedestrian interventions targeted primary school children, and often involved a combination of education and practical training using technology ranging from interactive programs to virtual reality.

Grey literature included many program documents claiming effectiveness that could not be collaborated, and often relied on methods without a sufficient evidence base. However, we did find seven high-quality, large-scale evaluations of road safety interventions aimed at school children (5 pre-driver, 1 bicycle safety, and 1 pedestrian safety). These studies generally demonstrated similar patterns of effects as published studies, and common struggles with planned elements, such as long-term follow-ups or proposed comparison groups.

Conclusions

While there is good evidence supporting the effectiveness of interventions addressing pedestrian and bicycle safety in school-aged children, the impact of pre-driver interventions is less clear, particularly given continued lack of high-quality evaluations. The supported pedestrian and bicycle safety programs typically included well-validated practical skills training which might enhance pre-driver education, particularly making use of modern technologies such as virtual reality and advanced driver assistance systems. This project highlights the need for long-term commitments between government stakeholders and researchers to ensure pre-driver programs are evidence-based to maximise improvements in road safety.

How do we sell the benefits of lower speeds?

Glen Koorey

ViaStrada Ltd

Abstract

The 2020-30 New Zealand Road Safety Strategy highlighted the role that speed management plays in improving our safety record. However, such changes to speed limits remain polarising, with many people sceptical of their effect on safety and wary about their impact on productivity and convenience. A significant challenge to date has been presenting suitable local evidence of the safety benefits of lower speeds. There are few case studies so far (which tend to be relatively small or introduced relatively recently), making it difficult to ascribe statistical significance to individual reductions in casualties so far. There is also much more resistance to lower speeds on rural roads, despite their greater overall contribution to road deaths. This think-piece introduces the current state of play around setting and changing speed limits in NZ, discusses some of the existing challenges to seeing more speed limit changes being enacted, and suggests ways to address these.

Background

The New Zealand (NZ) Government placed a greater emphasis on road safety with the introduction of the 2020-30 national road safety strategy (NZ Government 2019), with particular attention on the role that speed management plays in improving our safety record. For both urban and rural settings, there had been a growing clamour by elected officials, safety advocates, and general public for greater use of lower speed limits. Updated policy was recently introduced to facilitate this, via the 2022 *Setting of Speed Limits Rule* and *Speed Management Guide*.

However, such changes to speed limits remain polarising, with other people sceptical of their safety benefits and wary about impacts on network efficiency, economic productivity, and personal convenience. This has led to relatively slow implementation of actual reduced speed limits across NZ, despite considerable public and media attention on the topic.

Challenges introducing Lower Speed Limits

A significant challenge to date has been presenting suitable evidence of the safety benefits of lower speeds. While considerable evidence has existed overseas on this (ITF 2017), key stakeholders in NZ are apparently more likely to accept evidence from speed limit changes already implemented here. Such evidence is beginning to build up, both in urban and rural areas (Koorey & Frith, 2017; Koorey, 2019). However, some issues remain:

- The pool of case studies is still relatively small, comprising a tiny fraction of the country’s road network; hence, the overall national statistics for deaths and serious injuries have yet to be greatly affected by these implemented sites, thus contributing to public scepticism.
- Individual road sections/areas implemented to date tend to be relatively small or introduced only relatively recently. Thus, despite invariably showing good downward trends in casualty numbers, it is difficult to ascribe statistical significance to these individual reductions so far, due to the relatively small samples of crashes/casualties being analysed.
- While urban speed limit reductions have been somewhat easier to introduce, due to the greater appeal of protecting road users walking and biking in these areas (particularly around schools), there continues to be much more resistance to introducing lower speeds on rural roads, despite their greater overall contribution to road deaths.

This think-piece will introduce the current state of play around setting and changing speed limits in NZ, and discuss some of the existing challenges to seeing more speed limit changes being enacted. It will also debate some common arguments and concerns raised by people about speed limit changes (particularly in rural areas) and suggest ways to address these in stakeholder engagement. These include countering over-estimated travel time increases and the belief that posted sign changes alone have no effect on observed speeds. Finally, using some existing local case studies of speed limit reductions, attempts will be made to present the findings in a more statistically robust manner, by either pooling multiple studies together (for example, individual versus combined effects of speed limit changes in three Christchurch suburban areas, as shown in Table 1) or extrapolating available data to longer time periods.

Table 1. Example of effect of combining injury data from individual speed reduction sites

Addington	**Treated Site**	**Control Site**	**Total**	***Change in expected injuries***	
Before	8	1	**9**	*% Reduction*	*-87.5%*
After	2	2	**4**	*Chi-Sq value*	*2.359*
	10	**3**	**13**	***p-value***	***0.125***
Sumner	Treated Site	Control Site	Total		
Before	8	7	**15**	*% Reduction*	*-56.3%*
After	6	12	**18**	*Chi-Sq value*	*1.340*
	14	**19**	**33**	***p-value***	***0.247***
Papanui	Treated Site	Control Site	Total		
Before	6	10	**16**	*% Reduction*	*-44.4%*
After	2	6	**8**	*Chi-Sq value*	*0.375*
	8	**16**	**24**	***p-value***	***0.540***
COMBINED	TREATED SITES	CONTROL SITES	TOTAL		
BEFORE	22	18	**40**	*% Reduction*	*-59.1%*
AFTER	10	20	**30**	*Chi-Sq value*	*3.243*
	32	**38**	**70**	***p-value***	***0.072***

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Has cycling safety in New Zealand improved?

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Abstract

Following five cycling deaths in New Zealand during November 2010, the Chief Coroner instigated a national Inquiry to identify any common trends or information that could prevent a re-occurrence of such tragedies. An expert Cycling Safety Panel subsequently convened by the NZ Transport Agency in 2014 made 35 recommendations for improving cycle safety in their final report. Since then, approximately two-thirds of the recommendations have been implemented or are being progressed, although many relating to heavy vehicle protection and driver training have not been followed through. Meanwhile, from ongoing personal monitoring and analysis by the author, cycle deaths and serious injuries in NZ have not shown any prolonged downward trend, although there has been a notable (30%+) increase in cycling observed in recent years. This presentation reviews trends in cycle casualties over the past ~15 years and identifies areas for further improvement, including regulatory changes, infrastructure improvements, and speed management.

Background

Following five cycling deaths in New Zealand during November 2010, the Chief Coroner announced a national Inquiry to identify any common trends or information that could prevent a re-occurrence of such tragedies. The resulting review (Matenga 2013) recommended a national Cycling Safety Expert Panel be convened by NZ Transport Agency to investigate cycling crashes in NZ; this was instigated in 2014.

The author was on the ten-person Panel and contributed an analysis of 94 NZ cycling fatalities between 2006-2013 (Koorey 2014). Notable trends were found using NZ's Crash Analysis System data, Police fatal crash investigation reports, Coroner's findings, and other media reports to inform the analysis. Older cyclists (>50 years) were over-represented, despite their relatively low cycling involvement, and more likely to be at fault. Fatalities involving heavy vehicles and/or state highways was also higher than expected. Poor driver observation was a very common factor. The study also identified inconsistencies in crash information recorded, including non-motor vehicle crashes and clothing/helmets worn.

Previous Initiatives

The Panel's final report (NZ Cycling Safety Panel 2014) made 35 recommendations for improving cycle safety, including more investment in cycling infrastructure, industry design guidance and training, speed management, and cycle skills training. Since then, approximately two-thirds of the recommendations have been implemented or are being progressed, although many relating to heavy vehicle protection features and driver training have not been followed through.

2016-17 saw a particularly high proportion of cycling fatalities involving trucks; Koorey, Woodward and Mackie (2018) subsequently reviewed factors involved in truck/bike crashes to identify common patterns. Several themes emerged, including many cases where truck drivers reportedly did not see the cyclist. It was recommended that the next steps should be to carry out "safe system" analyses of cases (see Mackie et al 2017), to understand how multiple system failures are resulting in truck/cycle fatalities.

Current Analysis

The author has continued to personally monitor and analyse cycling deaths and serious injuries in NZ (see Figure 1) and these have not shown any prolonged downward trend. However, there has also been a notable (30%+) increase in cycling observed in the past decade, based on Household Travel Surveys (MOT 2023). So potentially the individual risk per km cycled is reducing.

Interestingly, the first national Covid lockdown (early 2020) saw a 20-25 percent reduction in cycling DSIs, despite reported increases in cycling, illustrating the effect on cycle safety of less motor traffic. The rise in e-bikes (Lieswyn et al 2017) also presents safety challenges, particularly with their growing use by older riders.

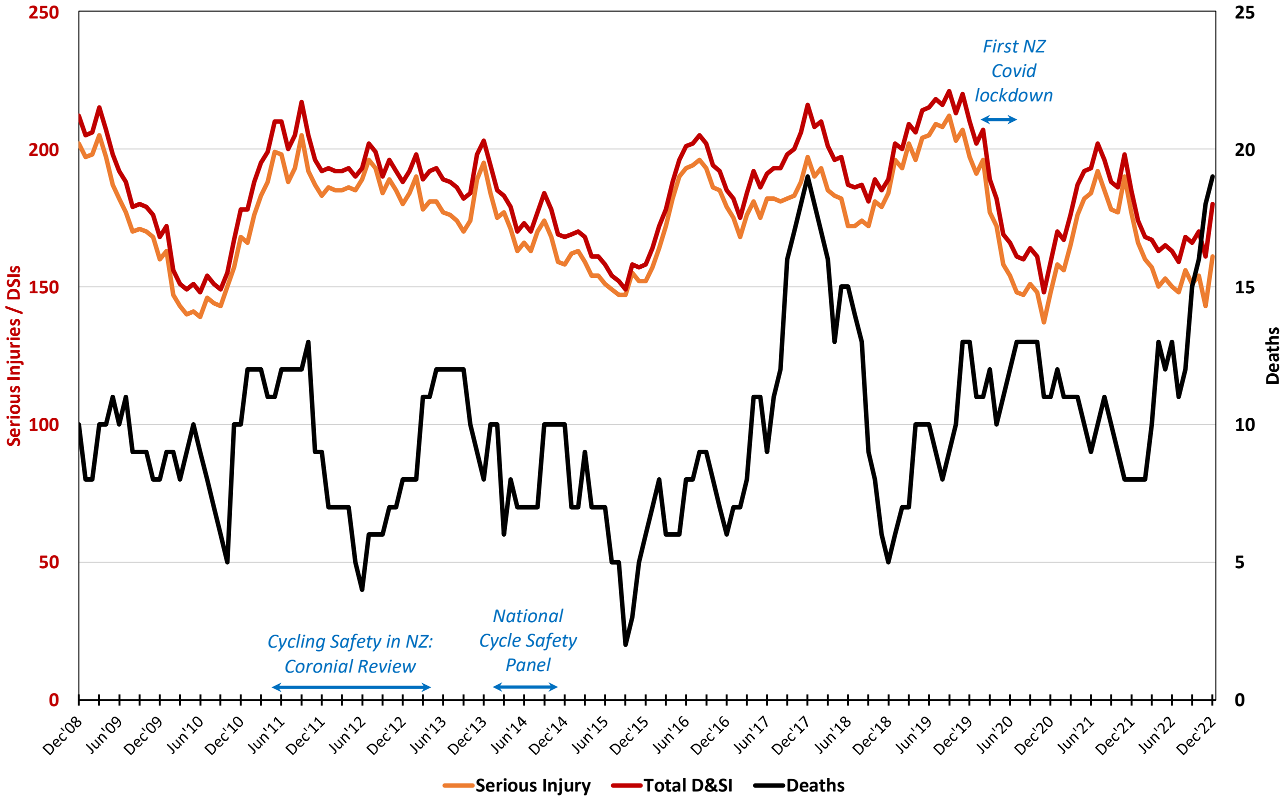

Figure 1. NZ Cycling Deaths and Serious Injuries – 12-month rolling averages 2008-22

Conclusions and Recommendations

Despite some major improvements to national policies and investment for cycling, overall there is relatively little evidence yet of meaningful reductions to cycling casualty numbers over the past ~15 years, and certainly since the Cycle Safety Panel.

There are still many opportunities for further improvement, particularly based around Safe System principles. These include further speed management, separated cycle facilities, and e-bike regulation and training. Regulations should also be considered to introduce minimum gaps when overtaking cyclists, and mandating truck side under-run protection.

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Emerging vehicle technologies supporting safe mobility of older Australians

Sjaan Koppel[a], Jude Charlton[a] , Marilyn Di Stefano[b], David Logan[a] and Kim Mestroni[b]

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Abstract

Independent mobility extends older adults’ quality of life, however frailty and capacity declines may impact mobility and pose increased risk of crash-related injuries and death. Studies highlight reduced driving profiles as drivers age (Charlton et al., 2019). In-vehicle technologies (e.g. Advanced Driver Assistance Systems (ADAS), driver monitoring) and autonomous vehicles (AVs) may offer mobility and safety benefits (Nandavar et al., 2023; Gish et al., 2017). Such benefits can be realised through human-machine interface design to accommodate older adults’ diverse needs and abilities (Young et al., 2017). User knowledge and acceptance also influences uptake and use. The reframing ageing initiative (reframingaging.org, n.d.) challenges biases in design enabling inclusivity to support adults of all ages to be active community members.

Session content will critically examine research and facilitate participant problem solving to explore:

- Ageing, functional capacities, and driving
- How ADAS may extend safe driving
- Barriers/enablers for older adults’ access to vehicles with safety technologies
- Older adults’ knowledge/acceptance of emerging vehicle safety technologies
- Resources and health professionals’ role (Austroads, 2022a; Austroads, 2022b; Austroads, 2020)

Overview of workshop

This workshop directly addresses the conference theme of “Safe travel for all” by drawing on two safe system pillars (the driver and vehicle) to highlight opportunities to exploit ADAS systems and other emerging and future transport options to support older driver safety, extend driving independence and maintain safe mobility beyond driving.

The session will include short presentations (from presenters in-room and on-line) on key themes and a case study. Audience participation will include a quiz, group problem solving (case study) and Panel-Audience Q&A. The session will conclude with a summary of gaps in knowledge and practice, and recommendations for maintaining safe and independent mobility via promoting in-vehicle technologies and customised modifications that can extend independent mobility.

Workshop facilitator: A/Prof Sjaan Koppel

A/Prof Sjaan Koppel holds a PhD in Psychophysiology and is an Associate Professor at the Monash University Accident Research Centre (MUARC). Within this role, Sjaan leads the Behavioural Science team and is passionate about improving the safe mobility of vulnerable road users including: older road users, drivers with medical conditions and/or functional impairments, and child road users. Sjaan has extensive experience in facilitating various seminars, meetings and community workshops. She is skilled in creating a collaborative and engaging environment for participants to share their ideas and work together towards a common goal. Her facilitation style is inclusive and encourages active participation from all individuals involved.

Workshop leader: Prof Jude Charlton

Dr Jude Charlton is Professor Emerita at Monash University with more than two decades experience in road safety leadership roles including former Director of the Monash University

Accident Research Centre, and current Independent Chair of the National Road Safety Partnership Program. Jude has led a sustained program of research over two decades on older people's safe mobility, child safety in cars and medical fitness to drive that has contributed to positive changes in Australia and internationally in safety policy, design and practice. She is engaged in many national and international research activities, which bring together government bodies, health practitioners, transport and road safety industry partners and academics in Australia, Europe and North America. Jude has extensive experience in leading educational and scientific forums to advance change in road safety knowledge and culture through chairing scientific workshops, workplace training, industry safety forums and as an expert advisor to international projects on future transport, ageing, and fitness to drive.

Workshop leader: Dr Marilyn Di Stefano

Dr Marilyn Di Stefano has worked as an occupational therapist in trauma rehabilitation before completing post-grad driver assessment and human factors/ergonomics qualifications including a PhD in driver assessment. She combined road safety consultancy with working as a Senior Lecturer for many years prior to working as a senior policy officer role with VicRoads in 2013. Marilyn has applied practice experience of human factors, driver competencies, fitness to drive, disability and older road users to road safety research, knowledge translation and policy activities. She has led/supported work to develop occupational therapy driving assessor guidelines including for the conduct of on-road assessment and several ADAS national projects. In 2022 she became Road Safety Victoria's inaugural Road Safety Research & Human Factors Lead.

Audience interaction

Audience participation activities will make up approximately 45 minutes of the 90 minute symposium and will be interspersed between brief topic presentations. Interactive activities will focus on new vehicle technologies (ADAS and AVs), facilitators and barriers to uptake/use; and how these might extend safe driving or facilitate safe mobility of those who can no longer drive via application to a case study:

- Icebreaker: interactive case studies with invited questions and commentary from participants (e.g. live or via chat function)
- Quiz(es)
- Digital platform questions
- Small group brainstroming/discussions (using 'zoom' and/or in-person break out groups as appropriate), and
- A live Q&A forum to be Chaired by the Workshop facilitator with expert panelists.
    - Expert panel: A/Prof David Logan and Kim Mestroni

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Factors associated with single-vehicle crash occurrences on Indonesian toll roads

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Abstract

Crashes on toll roads can be extremely hazardous, resulting in fatalities and serious injuries due to high speeds. Although multi-vehicle crashes are more commonly observed on Indonesian toll roads, single-vehicle (run-off-road) crashes should not be disregarded, as they also pose a significant risk of fatality. To identify the factors contributing to the occurrence of single-vehicle crashes on Indonesian toll roads, this study developed a crash prediction model that incorporates both geometric and traffic characteristics of toll roads, using a Negative Binomial regression model. The results indicate that higher average daily traffic, segments without roadside crash barrier, and segments with median concrete barrier are associated with a higher frequency of single-vehicle crashes. Conversely, the presence of a nearby ramp, bridge pillars, and segments with rigid pavement are associated with a lower frequency of single-vehicle crashes.

Background

Crashes on toll roads often lead to fatalities and serious injuries due to the high-speed for vehicles involved. During 2019-2020, a total of 2295 crashes occurred on 347-km length Cikopo to Semarang section of Trans Java toll road, resulting in 554 fatalities and 614 serious injuries. While multi-vehicle crashes are the dominant type of crashes on majority of Indonesian toll roads, single-vehicle crashes should not be neglected as they are associated with fatal crashes and higher fatality rate (Kim & Shankar, 2013; Wu et al., 2016). Such crashes are mainly caused by drivers losing control of their vehicles due to factors such as speeding, driver fatigue and drowsiness, and avoidance of other vehicles. However, road geometric conditions can also contribute to single-vehicle crash occurrences, while the presence of roadside hazards and crash barriers can affect the severity of the outcome.

To study the relationship between crash occurrences and their influencing factors, a crash prediction model can be developed. Studies have indicated that there are differences in road-related factors associated with single-vehicle crashes and multi-vehicle crashes (Wang et al., 2017; Wang et al., 2019). Therefore, it is essential to model single-vehicle crashes and multi-vehicle crashes separately (Geedipally & Lord, 2010; Wang et al., 2019; Yu et al., 2013). While there have been crash prediction models developed for Indonesian toll roads, for example models developed by Rakhmat, Kusumawati, Frazilla and Hendarto (2013) and Kusumawati and Rakhmat (2011), they were for total crashes and not differentiated by different crash types. Thus, it is crucial to develop a single-vehicle crash prediction model for Indonesian toll roads that can be used to identify the associated roadway geometric and traffic factors.

Method

A 320.8-km section from Cikopo-Palimanan, Kanci-Pejagan, Pejagan-Pemalang, Pemalang-Batang, and Batang-Semarang toll roads, as part of Trans Jawa Toll Road network in Indonesia, was analyzed in this study. Roadway geometric characteristics, traffic flow data, and 2019–2020 crash data along the two directions of the toll road section were collected. A total of 1291 single crashes were recorded during that period.

The crash prediction models were developed using generalized linear models with traffic flow and toll road geometric characteristics as predictor variables to estimate the expected crash frequency on the toll road segment. Geometric characteristics that were considered in this study included gradient, curve type, presence of nearby ramp, presence of median opening, type and length of roadside crash barrier, type and length of median crash barrier, presence of roadside hazard, presence of bridge pillar, presence of speed reducer marking, presence of shoulder rumble strips, and pavement type.

The best model was selected among Poisson regression model, Negative Binomial regression model, Zero-inflated Poisson regression model, and Zero-inflated Negative Binomial regression model. The model took the following form:

$$\mu = c \times (ADT)^{\propto} \times exp(\gamma_1 G_1 + \gamma_2 G_2 + \cdots) \quad (1)$$

Where μ is the expected crash frequency (in crash/2-year, ADT is the average daily traffic (in vehicles/day), $G_1, G_2, \ldots$ are geometric factors, c is a model constant, and $\propto, \gamma$ are parameters to be estimated in the model. Hence, NLOGIT 4.0/LIMDEP 9.0 software was used to estimate the model's parameters.

Results

The results of the study show that a Negative Binomial model is the best fit to describe the relationship between single-vehicle crashes and traffic flow and various geometric characteristics of toll roads. The model reveals several factors that are associated with single-vehicle crash occurrences on toll roads. Higher average daily traffic, segments without roadside crash barrier, and segments with median concrete barrier are associated with a higher frequency of single-vehicle crashes. Conversely, the presence of a nearby ramp, bridge pillars, and segments with rigid pavement are associated with a lower frequency of single-vehicle crashes.

This study's finding regarding the association between median crash barriers are consistent with those of Zou and Tarko (2018), who found that the presence of median crash barriers was highly associated with a higher barrier crash frequency. The presence of a nearby ramp on the segment means there are conflicting movements between vehicles on the freeway and those exiting/entering, resulting in a higher likelihood of multi-vehicle crashes rather than single-vehicle crashes. Another factor contributing to the lower risk of single-vehicle crashes is the rigid pavement, where drivers tend to drive at slower speeds due to decreased comfort. Additionally, the presence of bridge pillars may influence driver behaviour, as drivers may feel less safe.

Conclusions

This study found several factors that are associated with single-vehicle crash occurrences on toll roads. Higher average daily traffic, segments without roadside crash barrier, and segments with median concrete barrier are associated with a higher frequency of single-vehicle crashes. Conversely, the presence of a nearby ramp, bridge pillars, and segments with rigid pavement are associated with a lower frequency of single-vehicle crashes. These findings may assist toll road operators in identifying high-risk segments for single-vehicle crashes, enabling them to take appropriate measures to reduce the risk and improve road safety.

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National Road Safety Action Plan 2023-25 – an agreed implementation pathway

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Abstract

The National Road Safety Action Plan 2023-25(Action Plan) (Infrastructure and Transport Ministers, 2023), released in February 2023, details the national actions Australian, state and territory governments will undertake over the next three years to support implementation of the National Road Safety Strategy 2021-30 (Strategy) (Infrastructure and Transport Ministers, 2021). It is the first action plan for the Strategy and outlines actions advancing the Strategy's nine priority areas. It establishes new integrated governance arrangements for monitoring implementation and progress. It features enabling activities for development of a National Road Safety Data Collection and Reporting Framework; includes development of a National Research Framework to improve coordination of research and support best-practice approaches to emerging issues; and actions to support and build capacity in road safety for local governments. This presentation will discuss the jointly agreed national implementation pathway for The Action Plan and cover progress to date.

Background

The National Road Safety Strategy 2021-30 (Strategy) sets out Australia's road safety objectives over the next decade. It includes key priorities for action, enabling activities to support implementation and sets targets to reduce the annual number of fatalities by 50 percent and serious injuries by 30 percent by 2030. The National Action Plan 2023-25 (Action Plan) is the first action plan under the Strategy and it highlights the need for a joint national effort to achieve Australia's collective road safety goals. The Action Plan represents an agreed implementation pathway, and the enabling activities help build the foundations to progressively transform the road transport system towards Vision Zero by 2050.

Description

The Action Plan was developed co-operatively by the Australian Government with state and territory transport and road safety government agencies. Its development included extensive consultation with governments, the Australian Local Government Association and it was informed through consultation with a broad range of road safety stakeholders. It sets out the actions the Australian, state and territory government will take to implement the nine priority areas (see Figure 1) from the strategy over the next three years. New enabling activities were agreed for Data, Measuring Transformation of the System, Research and Supporting Local Government.

Figure 1. Nine priority areas identified for achieving greatest reduction in road trauma

Planned Implementation

Data

Actioning high-level findings from the National Governance Review (Department of Infrastructure, Transport, Cities and Regional Development, 2019), all governments have agreed to develop a National Road Safety Data Collection and Reporting Framework including a minimum national dataset. Australian Government is leading this work through the establishment of the Road Safety Data Working Group.

Transformation of the System

Delivery of the Action Plan requires integrated governance arrangements that cut across traditional government boundaries. To achieve this, new governance arrangements have been agreed for monitoring of implementation. Australian Government is leading this work through establishment of strong governance frameworks including newly formed Intergovernmental Steering Committee.

Research

To improve the national picture and coordination on research, **t**he Action Plan includes development of a National Research Framework. Australian Government is leading this work commencing with a review into research funded by the Australian Government and currently being undertaken by institutions across the country.

Supporting Local Government

Acknowledging local government manage 75.3 percent of all roads across the network (BITRE, 2021), actions have been agreed to support and build the capacity of local government to deliver stronger safety outcomes on their network. Australian Government will be leading this work with development of a framework to support local governments conduct fit for purpose network road safety risk assessments to prioritise infrastructure investment.

Also, other important Australian Government actions from the Action Plan include:

- Improving regional and remote road safety through targeted road safety infrastructure programs
- Progressing the uptake of new vehicle safety features and technologies through new Australian Design Rules, and
- Building and upgrading heavy vehicle rest areas

Conclusion and Next Steps

The Action Plan is a national combined effort, representing a pathway of implementation agreed by the Australian, state and territory government. Annual progress reporting will provide transparency on the road safety activities of all governments. It will show how initiatives are progressing and identify where effort may need to change to achieve the greatest benefit.

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Assessing Fitness to Drive – National Implementation Program

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Abstract

The Australian national fitness to drive standards, *Assessing Fitness to Drive* (AFTD) have been in place for more than two decades, developed through national consultation and collaboration involving researchers, licensing authorities, health professionals, industry and consumers. Despite this rigorous approach to development, implementation (in the form of promotion, education, system support and general promulgation) has been mainly at the discretion of Driver Licensing Authorities (DLA) and other stakeholders and is therefore variable and lacks coordination. There is evidence that this lack of implementation leads to poor road safety outcomes (Vicroads, 2018, Coroners Court Queensland, 2020). In 2021, Austroads released an Implementation Framework (Austroads, 2021), followed by a strategy (Austroads, 2022) aimed at embedding implementation as an ongoing national initiative. Our goal is to achieve consistent application of the standards, continuous improvement in the quality of the standards and ultimately, improved road safety. This paper discusses how the Implementation Strategy is addressing key barriers to assessing fitness to drive.

Background

Medical fitness to drive is an important consideration for road safety and is underpinned by the national AFTD standards developed by the National Transport Commission (NTC) and published by Austroads. The standards provide a basis for assessments by health professionals and licensing decisions by DLAs across Australia. Coinciding with development of the latest edition, and recognising the need for a proactive and coordinated approach, Austroads developed an Implementation Strategy to assist DLAs and health professionals applying the standards. This involved extensive stakeholder engagement to understand:

- barriers to implementation that could be addressed by a national strategy
- the nature and extent of current implementation efforts
- opportunities for implementation
- opportunities for stakeholder collaboration.

Issue

Barriers to the consistency and quality of fitness to drive assessments and decision-making exist at various levels. For the health professionals, there remains a lack of awareness and knowledge of the standards as well as gaps in knowledge and skills in conducting the assessments and fulfilling reporting obligations. Consumers may be concerned about their independence and livelihoods, and are often unaware of the potential impacts of health conditions on driving, their legal obligations to report and options such as conditional licences that may enable them to continue to drive safely. The AFTD Implementation Strategy identifies six domains of activity to address the identified barriers:

- **Platforms** to facilitate access to AFTD and supporting resources.
- **Communication and promotion** to secure widespread awareness.
- **Education** to equip health professionals with the knowledge and skills to apply the standards and provide support to their patients.
- **Systems and tools** to support and improve applicationof the standards.

- **Collaboration** among stakeholders to enable sharing of knowledge and resources, and coordinate implementation efforts.
- **Measurement and feedback** to sustain a system of continuous improvement and demonstrate impacts and outcomes.

Progress to Date

The first two years of the Strategy (2023-2025) will:

- Establish structures to enable ongoing stakeholder engagement;
- Commit resources for key project building/management tasks;
- Establish mechanisms for ongoing health professional education;
- Engage with the transport industry to address barriers to fitness for duty of heavy vehicle drivers; and
- Inform the next AFTD review and support the NTC review processes.

National collaboration has already had a positive impact across the domains of activity with an active community of practice now established to identify and resolve issues and contribute to implementation priorities. Communication channels, including the website and a quarterly newsletter enable sharing of knowledge and resources. Work is also underway to scope work in areas of education and tool development.

This paper will discuss in detail progress so far and it’s effective impacts across the domains of activity.

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Piloting Sinusoidal Audio Tactile Line Marking (ATLM) in Australia

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Transport for NSW

Abstract

Audio-Tactile Line-Marking (ATLM) is a road safety treatment proven to reduce the frequency of lane and roadway departure collisions by reducing the likelihood of crashes associated with fatigue and inattention. Drivers are alerted by the sound and vibration within the vehicle cabin caused when their vehicle strikes the uneven surface of the ATLM (Laughlin & Donahue, 2018). The sounds produced however, brings about supplementary concerns, as the exterior noise carries and may disturb sensitive receivers located nearby. Sinusoidal ATLM, an alternative design and type of ATLM adopted internationally, has been reported to produce reduced exterior noise but maintain adequate internal cabin noise and vibration to alert drivers (Bedsole et al., 2017). This study pilots the installation of Sinusoidal ATLM in Australia and assess the external and internal noise associated through experiments by professional sound engineers.

Background

Currently, under the TfNSW *Technical Direction - Installation of Audio Tactile Linemarking (TTD 2020/04)* ATLM installation within a 200m offset to a sensitive receiver is prohibited unless approval is obtained (Transport for NSW, 2020). This restriction causes non-continuous ATLM installation on sections of the road network which could otherwise have benefited from continuous ATLM installation.

An identified approach to mitigating fragmented ATLM installation is to apply an alternative ATLM design which produces less external noise but still provides adequate internal cabin noise and vibration. Such a design includes the Sinusoidal ATLM, encompassing continuously running longitudinal indentations in the pavement surface like an oscillating sine wave pattern (Figure 3) that differs from the traditional ATLM design of alternations between cylindrical milled indentations and unmarked surface (Figure 4) (Staats et al., 2020).

Figure 3: Sinusoidal ATLM treatment

Figure 4: Traditional Milled ATLM treatment

Purpose

The purpose of this research is to conduct pilot installation of Sinusoidal ATLM on a NSW road and investigate the internal and external cabin sound levels and internal vibration levels associated with Sinusoidal ATLM compared to traditional ATLM.

Methodology

Installation

The pilot location is Lanyon Drive in Jerrabomberra NSW. The road is classified as a state road with posted speed of 80 km/h. Sinusoidal ATLM and traditional ATLM were installed on either side of the road.

Noise and vibration testing

Attended sound and vibration measurements utilising controlled pass-bys with and without impacting the ATLM were conducted. Two types of vehicles were used for the sound test, including a sedan and an Ute. Both vehicles were driven in both directions, impacting and not impacting the ATLM, and at controlled speeds of 60km/h and 80km/h.

For internal sound and vibration measurements, an acoustic and vibration measurement system was located within the vehicle. For external sound measurement, sound level meters were located at distance of 13 metres away from the edge-line.

Results

In-vehicle noise levels when traversing both ATLM were clearly emergent above the within-lane travel - ranging between 4.1 to 12.8 dBA. Table 9 presents a summary of the measured internal cabin L_{A10} noise (noise level is below this value 90 percent of the time).

Table 9: Measured internal cabin noise, L_{A10} - dBA

Vehicle Type	ATLM Type	Speed (km/h)	LA10 Noise Level		Noise Level Difference (dBA)
			Within Lane	On ATLM	
Sedan	Traditional	60	68.1	80.9	12.8
Ute	Traditional	60	62.9	71.1	8.2
Sedan	Sinusoidal	60	70.01	75.5	5.5
Ute	Sinusoidal	60	60.8	70	9.2
Sedan	Traditional	80	71.1	82.1	11
Ute	Traditional	80	65.8	74.6	8.8
Sedan	Sinusoidal	80	68.9	75.4	6.5
Ute	Sinusoidal	80	64.7	68.8	4.1

Traditional ATLM produced higher external noise levels (6.9-11.4 dBA louder) than sinusoidal ATLM (1.5-4.7 dBA louder) from normal travel, for all test vehicle types and travel. **Error! Not a valid bookmark self-reference.** presents a summary of the measured external noise (L_{Amax}).

Overall, peaks in the vibration spectra are evident in all measurements (**Error! Reference source not found.**) and appear to be dependent on vehicle speed and ATLM type, and correlates with the measured in-vehicle noise levels.

Table 10: Mean external noise, L_{Amax} - dBA

Vehicle	ATLM Type	Speed (km/h)	L_{Amax} Noise Level		Difference to Normal Travel
			Within Lane	On ATLM	
Sedan	Traditional	60	67.8	75.3	7.5
Ute	Traditional	60	67.5	76.9	9.4
Sedan	Sinusoidal	60	64.4	67.4	3
Ute	Sinusoidal	60	65.7	67.2	1.5
Sedan	Traditional	80	72.1	79.4	7.3
Ute	Traditional	80	71.9	80.4	8.5
Sedan	Sinusoidal	80	66.9	71.6	4.7
Ute	Sinusoidal	80	70.2	72.5	2.3

Conclusion

The results from this study indicate that Sinusoidal ATLM provide similar internal sound and vibration levels as traditional ATLM, but produce markedly reduced external noise, which may otherwise disturb sensitive receivers. Currently, TfNSW are using these results to investigate adding a concession to the TTD 2020/04 to recommend use of Sinusoidal ATLM if site is within 200 m from a sensitive receiver, in order to provide the road safety benefit of continuous ATLM installation to our road users.

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Contributing factors in motorcycle rider and pillion fatalities

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Abstract

The number of road fatalities involving motorcycle/pillion riders appears to have increased in recent years. This study provided a detailed analysis of motorcycle rider and pillion fatalities by examining police investigative information obtained from the Queensland Police Service (QPS) to determine the characteristics and contributing factors of fatal motorcycle crashes. A modified version of Haddon's matrix was used as the conceptual framework to identify relevant themes from police investigative records. Police information provided the most insight into the host (human) factors in a crash, particularly in relation to pre-crash riding behaviour. The findings indicated a large proportion of motorcycle rider fatalities involved alcohol, illicit drugs and/or risky riding behaviour, with speeding or driving at a speed unsuitable to the conditions being the most reported risky behaviours. The presence of alcohol and/or illicit drugs was also reported in all pillion fatalities.

Background

As a vulnerable road user group, motorcycle riders often represent a significant proportion of road fatalities. During 1 January to 27 May 2021, there were 41 motorcycle/moped rider/pillion fatalities as a result of crashes within Queensland which represents 26.5 percent of all fatalities within Queensland.

The purpose of this study was to conduct a detailed, thematic analysis of the characteristics of motorcycle rider/pillion fatalities and contributing factors associated with fatal crashes involving motorcycles. The study used data obtained from the Department of Transport and Main Roads' (TMR) RoadCrash and Crash Analytics Reporting System (CARS) and the Queensland Police Records and Information Exchange (QPRIME) database.

Method

Road crash data for motorcycle rider/pillion fatalities were extracted from TMR's RoadCrash and CARS systems for the period 1 January 2019 to 31 March 2021. Relevant investigative information was manually extracted from QPRIME for the same period. Information collated by police will be more detailed and, in most cases, specialised/technical given the expertise required to conduct a crash investigation.

A modified version of Haddon’s matrix was used to provide a theoretical framework for identifying broad themes and contributing factors surrounding motorcycle rider/pillion fatalities. The post-event phase was excluded from the framework as most police information extracted from QPRIME will focus on the crash event and any contributing factors or circumstances (pre-event). Case studies are also provided to highlight key findings and common themes from police investigations.

Results

The findings indicated a large proportion of motorcycle rider fatalities involved alcohol, illicit drugs and/or risky riding behaviour. The presence of alcohol and/or illicit drugs was identified in 40 percent of rider fatalities and over a quarter of riders detected with illicit drugs (including riders with alcohol and illicit drugs) had at least one or more unsafe or risky behaviours involved in the crash i.e. speeding, driving an unregistered or stolen motorcycle, unlicensed. In relation to risky behaviours, speed was a contributing factor in slightly over 40 percent of rider fatalities, with the rider speeding at the time of the incident or travelling at a speed that was unsuitable for the conditions.

There was limited investigative information available to analyse the remaining factors in Haddon's matrix – agent (vehicle), physical environment and social environment. Police reported most motorcycles were generally in good mechanical condition, noting primarily maintenance issues with a small number of motorcycles which were unlikely to be a contributing factor in the crash. Road and weather conditions were considered unremarkable in most incidents and the very limited information available regarding social factors made it difficult to assess whether the deceased person's social environment influenced or had any impact on their riding behaviour.

Conclusion

The findings suggested a large proportion of motorcycle rider fatalities involve alcohol, illicit drugs and/or risky riding behaviour, with speeding or driving at a speed unsuitable to the conditions being the most reported risky behaviour. However, the small number of fatalities and characteristics identified in this study may not be indicative of which characteristics or contributing factors are over-represented or more prevalent in motorcycle rider/pillion fatalities.

Designing and evaluating public awareness messaging to increase knowledge about and intentions to use Connected and Automated Vehicles

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Abstract

Cooperative and Automated Vehicles (CAVs) offer the potential to significantly improve road safety. However, the technology's success will be contingent on it being widely adopted. To enhance uptake, the public must understand what it is and how to interact with it. The Cooperative and Highly Automated Driving (CHAD) pilot examined the challenges and opportunities of introducing CAVs on Queensland roads. Work package 4 (or WP4) was an extensive program of research within the CHAD pilot and which was completed in 2022. WP4 focused on (i) applying a theoretically informed mixed-methods approach to design and evaluate awareness-raising messaging about CAVs; and (ii) undertaking public demonstrations of a Level 4 CAV prototype, "ZOE2". This paper presents the results of the final stage of WP4 which comprised an evaluation of the developed messaging and the extent to which it increased participants' knowledge about, their positive attitudes towards, and future intent to adopt, CAVs.

Background

WP4 was underpinned by the Step approach to Message Design and Testing framework (SatMDT; Lewis et al., 2016) (Figure 1). As a well-established framework, the SatMDT has aided the design and/or evaluation of messaging about various road user behaviours (e..g, speeding, child pedestrian safety) and for different media (e.g., television, variable message signs) (Lewis et al., 2022). Recently, it was applied to evaluate messaging about connected vehicle technology (Elrose et al., 2022).

Consistent with the framework, WP4 comprised a series of studies that commenced with understanding individuals' perceived barriers and faciltiators to their intended use of CAVs (i.e., Step 1), then message design (i.e., Step 2) followed by message piloting (i.e., Step 3), and culiminating in the evaluation of message effectiveness in increasing individuals' knowledge of, positive attitudes towards, as well as intent to adopt, CAVs (i.e., Step 4). This paper presents on the evaluation phase with more about earlier phases within Lewis et al. (2023).

Method

The final message that was evaluated can be seen HERE.

The messaging was shown to individuals attending a static or dynamic demonstration of "ZOE2". At the static demonstration, "ZOE2" was stationary while, at the dynamic demonstration, members of the public could travel within the vehicle. Participants watched the messaging and completed a survey on an electronic tablet provided by the research team. The survey assessed participants' responses about the messaging and their experience of the demonsrtration. Participants at a demonstration and who saw the messaging were the "intervention group" and their survey responses were compared with "control group" participants who did not see the messaging or attend a demonstration. Control group participants were recruited via paid Facebook advertising. Intervention group participants also provided responses regarding their knowledge, attitudes, and intentions both prior to and following having seen the messaging. Table 1 outlines study sample composition at the static and dynamic demonstrations.

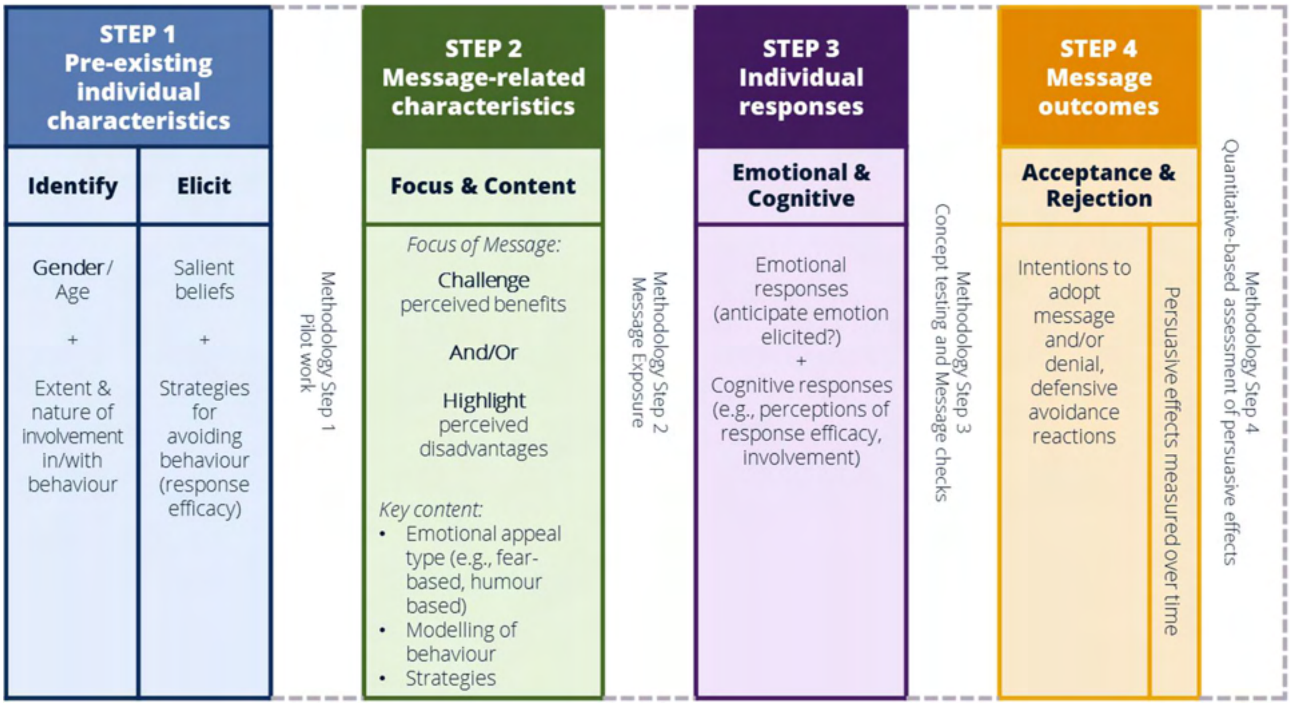

Figure 1. The Step approach to message design and testing (Lewis et al., 2016)

Table 1. Study samples at the Static and Dynamic Demonstration of "ZOE2".

	Static Demonstration N =180 Age range = 19-83 years	**Dynamic Demonstration** N = 206 Age range = 18-87 years
Intervention group	84 (n = 51 males; n = 45 females)	118 (n = 61 males; n = 57 females)
Control group	96 (n = 43 males; n = 40 females)	88 (n = 48 males; n = 39 females)

Results

Overall, irrespective of demonstration type, intervention group participants reported more knowledge about, more positive attitudes towards, and greater intent to use CAVs than control group participants. Moreover, intervention group participants' knowlege, attitudes, and intentions to use increased after watching the messaging.

Conclusions

Overall, WP4 has offered an evidence-based approach to the development and evaluation of messaging about CAVs. This messaging was shown to positively influence participants' knowledge about, attitudes towards, and intent to use CAVs in the future. The capacity to achieve such outcomes is critical given that optimal safety benefits from CAVs is contingent upon widespread adoption of such technology by the public.

Acknowlegements

The CHAD pilot was delivered by the Department of Transport and Main Roads (Queensland), in partnership with the Queensland University of Technology (QUT), iMOVE Australia and Motor Accident Insurance Commission (MAIC).

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An investigation into the influence of metacognitions on aggressive driving

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Abstract

This study aimed to develop a self-report measure, the *Beliefs about Driver Anger Questionnaire* (BDAQ), that is associated with anger-related mental processes (e.g., rumination; anger) and road behaviours. Two Australian samples completed online surveys regarding demographics, anger-related beliefs, self-regulatory ability, antisocial traits, and anger-related tendencies. A series of analyses revealed that five prominent subscales emerged: positive beliefs about the utility of rumination and anger, negative beliefs about the controllability of rumination and anger, and antisocial beliefs about anger expression. Correlations indicated that the BDAQ subscales were positively associated with self-regulatory dysfunction, antisocial traits, anger rumination, trait driver anger, and driver aggression. Furthermore, path analysis showed that the subscales indirectly influenced and explained sizeable portions of the variance in anger rumination (54.3%), driver anger (49.6%), and driver aggression (38.7%). Overall, the BDAQ appears to be a valid measure of anger-related beliefs and can predict psychological processes that underlie aggressive driving behaviour.

Background

Aggressive driving behaviour is a prevalent and difficult to intervene road safety issue. The concept of metacognition is concerned with how thoughts and emotions are regulated and expressed via the beliefs that people hold (Wells & Mathews, 1996) and shown to have an influence over processes involved with aggression (Love et al., 2022). However, there is no current method to measure specific beliefs that might be associated with an increased incidence of aggression on the road. This study therefore aimed to develop a measure of metacognitive beliefs that is associated with self-regulatory dysfunction, anger-related mental processes (e.g., rumination; trait anger), and subsequently, a heightened propensity for driver aggression.

Method

Participants and Procedure

To test the research aims, two online surveys were shared to distinct Australian drivers via Facebook. One survey was used for exploring the factor structure and for concurrent validation, whilst the other was used for confirming the factor structure and for predictive validity. The first sample ($N = 294$) was aged 18 to 78 ($M_{age} = 39.07$) and were primarily male (72.7%). The second sample ($N = 165$) was aged 18 to 81 ($M_{age} = 53.62$) and were also primarily male (79.4%). The two datasets were analysed using the software SPSS and SPSS AMOS.

Measures

In addition to the measure being developed, the *Beliefs about Driver Anger Questionnaire* (BDAQ), measures were implemented to test concurrent validity (i.e., the 18-item Difficulties in Emotion Regulation Scale (Victor & Klonsky, 2016), the Psychopathic Personality Traits Scale – Revised (Boduszek et al., 2022)), and predictive validity (i.e., the Anger Rumination Scale (Sukhodolsky et al., 2001), the 14-item version of the Driving Anger Scale (Deffenbacher et al., 1994), and the 15-item version of the Driving Anger Expression Inventory (Stephens & Sullman, 2014).

Results

Utilising of principal components analysis, confirmatory factor analysis, reliability tests, and correlational analysis, five reliable factors emerged among the BDAQ items (Table 1): positive beliefs about the utility of anger rumination (PB-UR), positive beliefs about the utility of anger experiences (PB-UA), negative beliefs about the controllability of rumination (NB-CR), negative beliefs about the controllability of anger (NB-CA), and antisocial beliefs about the appropriateness of anger expression (AB-AE).

Table 1. Items of the BDAQ and Their Corresponding Subscale

Statement	Subscale
1. Ruminating on angry experiences I've had with other drivers helps me find the cause of my anger.	PB-UR
2. Anger helps me drive better in stressful environments.	PB-UA
3. I cannot ignore my angry thoughts after a negative driving experience with another driver.	NB-CR
4. If another driver has made me angry, it takes me some time to realise how I am acting.	NB-CA
5. It is acceptable to express my anger at other drivers who have done something wrong.	AB-AE
6. In order to understand my driving anger, I need to ruminate about negative experiences I've had with other drivers.	PB-UR
7. My anger helps me focus on what's important on the road when driving.	PB-UA
8. Once I start ruminating about an angry driving experience, I cannot stop.	NB-CR
9. Even if I am aware of how angry I am at another driver, I have difficulty controlling my anger.	NB-CA
10. Expressing my anger at other drivers helps them understand that they have done something wrong.	AB-AE
11. Ruminating about past angry driving experiences makes me feel prepared for future potential events.	PB-UR
12. When I feel angry, I feel more confident in my ability to drive on the road.	PB-UA
13. I cannot stop myself from thinking about revenge following a negative driving event.	NB-CR
14. When I am angry at another driver, my anger quickly becomes out of my control.	NB-CA
15. Venting my anger at other drivers is a helpful way for me to communicate my frustrations to them.	AB-AE
16. I need to ruminate on past angry driving experiences so that I am prepared for similar events in the future.	PB-UR
17. My anger helps me to drive more effectively in tight situations.	PB-UA
18. If another driver has made me angry, I find it very difficult to stop thinking about them.	NB-CR
19. It is very difficult for me to control my anger at other drivers when they have done something wrong.	NB-CA
20. My angry behaviour towards other drivers is usually justified.	AB-AE

Correlations showed that firstly, there were positive associations between the BDAQ subscales (r =.19 to .68). Secondly, the BDAQ also shared positive relationships with emotion regulation difficulties (r = .10 to .45), antisocial traits (r = .08 to .39), anger rumination styles (r = .16 to .69), trait driver anger (r = .18 to .56), and aggressive driving behaviours (r = .16 to .49). Finally, path analysis and showed that firstly, the proposed model (Figure 1) was a good fit to the data (GFI=.98, TLI, = 1.00, CFI = 1.00, RMSEA = .00, SRMR = .04); and secondly, that the BDAQ subscales directly and indirectly influenced and explained sizeable portions of the variance in anger rumination (54.3%), driver anger (49.6%), and driver aggression (38.7%).

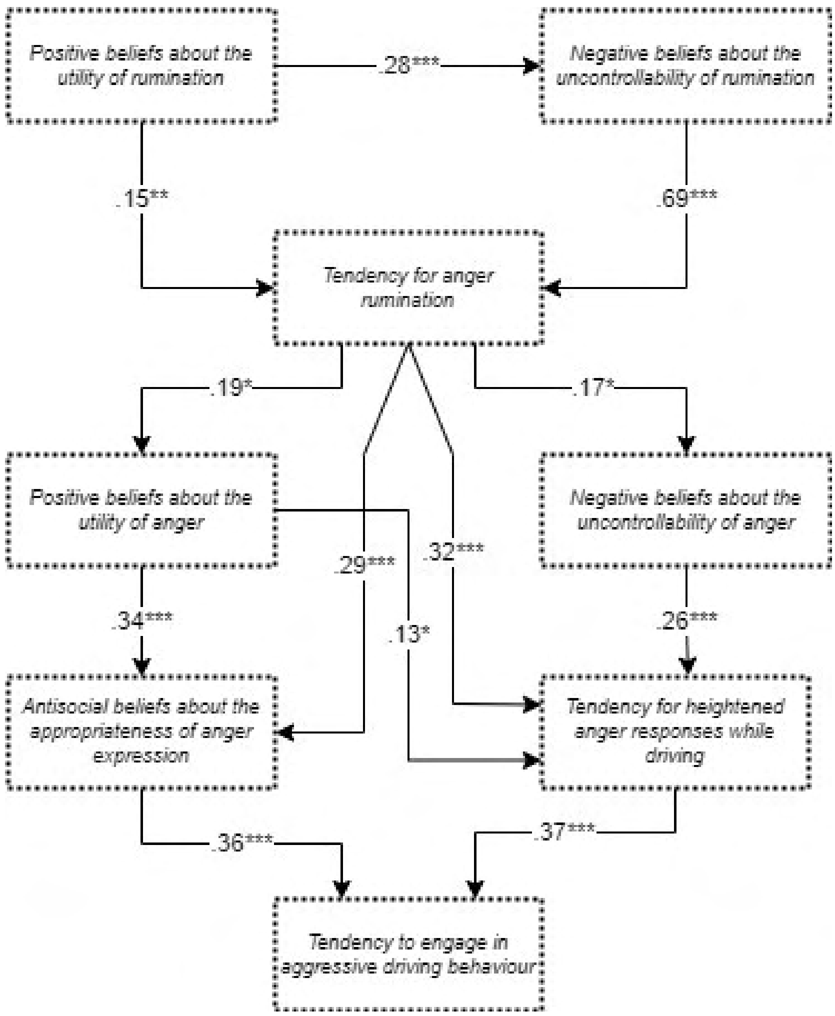

Figure 1. The Metacognitive Model and Direct Regression Weights Between the Variables
Note: *$p < .05$, ** $p < .01$, ***$p < .001$

Conclusions

This study has demonstrated that meta-mental beliefs, as measured by the BDAQ, play an important role in the development of driver aggression. By identifying the influence that specific beliefs have towards psychological processes involved with the initiation and maintenance of anger responses, a more tailored theoretical and practical approach to aggressive driving behaviours can be developed. The BDAQ can therefore be used to better understand driver anger and how to intervene on meta-mental processes (e.g., rumination) that are potentially maintaining and contributing to resultant dangerous behaviours.

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Mobile Phone Detection Camera program: the New South Wales experience

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Transport for NSW

Abstract

This paper describes Transport for NSW's (TfNSW) experience in delivering the Mobile Phone Detection Camera (MPDC) program since 1 March 2020 when it commenced automated enforcement of illegal mobile phone use. The program aims to reduce mobile phone distraction related trauma on NSW roads. Independent modelling has estimated that the program will contribute to a reduction in road trauma of approximately 100 fatal and serious injury crashes over a five-year period (Stephan et al., 2019). Infringement data indicates the MPDC Program has been successful in reducing illegal mobile phone use on NSW roads. The infringement rate of camera-detected mobile phone offences has decreased each year since MPDC enforcement commenced, from 0.22% (1 in 454 vehicle checks) for the first 12 months, to 0.17% (1 in 597) for 1 March 2022-28 February 2023. This is significantly lower than 1.22% or 1 in 82 drivers detected during the program's pilot period from January 2019 to June 2019.

Background

Studies estimate that driver distraction is a contributing factor in up to 16% of crashes, with up to 20% of the distraction related crashes involving technology such as a mobile phone (Regan & Oviedo-Trespalacios, 2022).

Naturalistic driving studies have shown a range of crash risks associated with hand-held mobile phone use (Wall et al., 2019). One study found that mobile phone use during or shortly before a casualty crash was associated with a fourfold increased likelihood of crashing (McEvoy et al., 2005).

NSW experience

The NSW MPDC program uses high-definition cameras to capture images of the front-row cabin space of passing vehicles. Artificial Intelligence (AI) is then used to detect potential mobile phone offences and reject and permanently delete all other images. For potential offences, several stages of human review are undertaken including by the vendor, TfNSW and Revenue NSW.

By December 2022, TfNSW had completed the planned, phased roll out of MPDCs across NSW. Currently, 47 MPDCs operate across NSW including fixed cameras and trailer-mounted transportable cameras that are frequently moved between enforcement sites. The program is designed to meet a target of more than 135 million annual vehicle checks by 2022-23.

The program aims to achieve general deterrence of illegal mobile phone use including by promoting that the cameras operate 'anywhere, anytime' to produce a sustained change in driver behaviour and make the roads safer for all road users.

Selection of enforcement sites

Enforcement locations are selected considering the criteria outlined in the *NSW Automated Enforcement Strategy for road safety.* The criteria includes: risk levels, geographic spread of enforcement, high movement and place, nominated routes or locations, difficult locations for NSW

Police to enforce, operational criteria, alternative road safety works and other considerations include existing infrastructure.

In NSW, transportable MPDCs have exemptions from certain parking restrictions to enable a wider range of sites to be used for enforcement.

Community support

The MPDC program has maintained a strong level of community support. Research conducted in March/April 2021 among a representative sample of the NSW population showed that 79 per cent of drivers believed MPDCs are an important measure in making our roads safer.

Evaluation

The evaluation design includes an operational review completed in 2021-2022, process evaluation to be completed in 2023 and an outcomes evaluation to be undertaken in 2024-2025. The evaluation findings will inform program optimisation and will be communicated to the community.

An internal audit found privacy protections to be working reasonably well, although there have been learnings along the way resulting in enhancements to the program.
Data since 1 March 2020 suggest that driver behaviour is improving and there is increased compliance with the law (Table 1).

Table 1. Number of vehicle checks, fines issued and infringement rates for camera-detected mobile phone offences in NSW

	Vehicle checks	Fines issued	Infringement rate (%)	1 in X vehicle checks
1 Mar 2020-28 Feb 2021	76,919,156	169,311	0.22	454
1 Mar 2021-28 Feb 2022	83,536,289	159,011	0.19	525
1 Mar 2022-28 Feb 2023	121,937,861	203,978	0.17	597

Conclusions

The MPDC Program aims to reduce trauma on NSW roads by deterring drivers from illegally using a mobile phone while driving. The MPDC Program has been successful in effectively detecting illegal mobile phone use by drivers across NSW while protecting privacy and maintaining community support.

Next Steps

Automated seatbelt detection

In NSW, on average, each year around 29 drivers and passengers are killed and around 79 are seriously injured in crashes when not wearing available seatbelts (NSW crash data 2017 - 2021). Not wearing a seatbelt was a factor in around 14% of fatalities between 2017 and 2021, and 19% of fatalities in 2021. The 2026 Road Safety Action Plan, includes a commitment to use mobile phone detection cameras to detect and enforce seatbelt offences.

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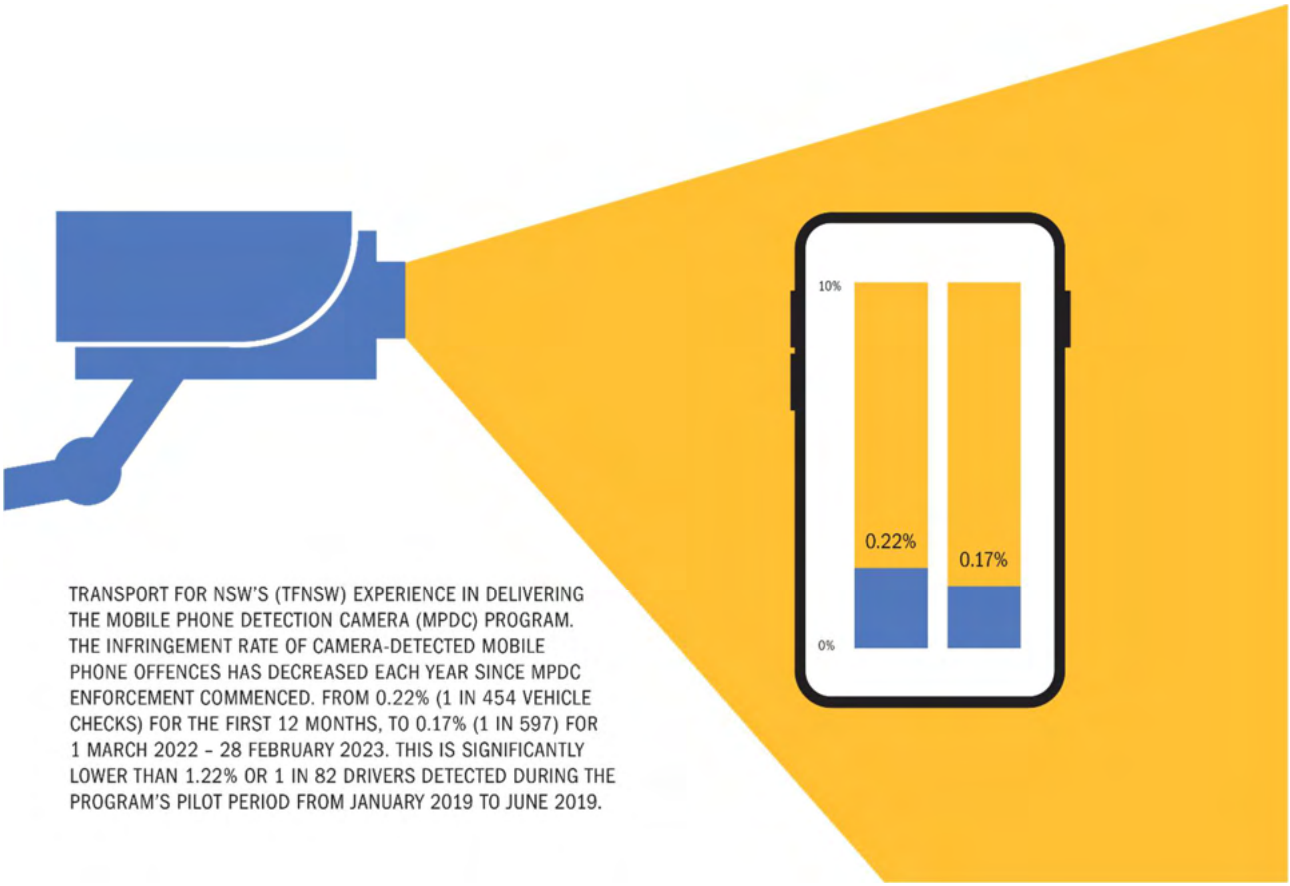

Informing road safety policy with near-miss detection technology

Justin Lu

Real Time Traffic Pty Ltd

Abstract

Transport for New South Wales (TfNSW) has set an aspirational target of zero fatalities and serious injuries on its roads by 2056, known as the Towards Zero strategy. Achieving this goal means that it must be proactive in its approach to road safety. Analysing 'near-misses' before they become serious crashes is a proactive method that can help to predict crash risk. A better understanding of the factors surrounding these types of incidents would help practitioners proactively design appropriate site-specific road safety treatments. Real Time Traffic with its partner Lab3 was commissioned by TfNSW to provision and trial a deployable computer vision and artificial intelligence technology to detect and report near misses and crashes weekly. Over four weeks, 217 near misses were detected at two locations making this trial a significant success. TfNSW is now working to deploy this state-wide.

Introduction

Transport for New South Wales (TfNSW) has set an aspirational target of zero fatalities and serious injuries on its roads by 2056, known as the Towards Zero strategy. Achieving this goal means that it must be proactive in its approach to road safety. Analysing 'near-misses' before they become serious crashes is a proactive method that can help to predict crash risk. A better understanding of the factors surrounding these types of incidents would help practitioners proactively design appropriate site-specific road safety treatments.

In 2022, TfNSW was seeking creative and innovative approaches to deliver a proof of concept that would assist road safety analysts to investigate the potential underlying causes of near-misses, crashes, and other safety incidents. Real Time Traffic with its partner Lab3 was then commissioned to provision a deployable computer vision (CV) and artificial intelligence (AI) technology to detect and report near misses and crashes weekly.

Conventional thinking

The aspirational target of zero fatalities and serious injuries on our roads cannot be achieved if we continue our reliance on historical accident rates to drive transport safety investment. It can take some time before data related to a crash is processed, validated and available. Most instances of minor crashes, near-misses and dangerous driving behaviour go unreported. More information about these incidents can support better policy, planning and design.

The trial

The need for quicker feedback loop, quantifiable risk metrics and deeper insights has motivated the development of proactive surrogate measures of safety around the world (Laureshyn, 2018) to identify high risk areas prior to a crash(es) occurring. However, conventional performance evaluation techniques done using automated tube counters and accident data falls short in their ability to capture surrogate safety measures.

TfNSW considers that the analysis of video footage can fill this gap by:

- providing greater insights due to the richness of the information;
- enabling comparisons in the crash data with the factors observable in the video of the incident;
- enabling earlier detection and addressing of a problem; and
- shortening the feedback loop when evaluating the effectiveness of a treatment(s) after it has been implemented.

In this trial, Real Time Traffic deployed a CV and AI technology at two locations in rural New South Wales and captured data such as Speed, Post Encroachment Time, Gap Time, and lane positioning.

Near-miss detection

Based on the above metrics, the technology automatically identified events which are high-risk. Some additional requirements included:

- unexpected driving behaviour including wrong-way travel, erratic swerving, breakdown;
- classify types of road users;
- road user’s turn path;
- speed of travel to determine the potential impact in the event of a collision;
- not allow for identification of a person or vehicle licence plate; and
- operating at night and in all weather conditions.

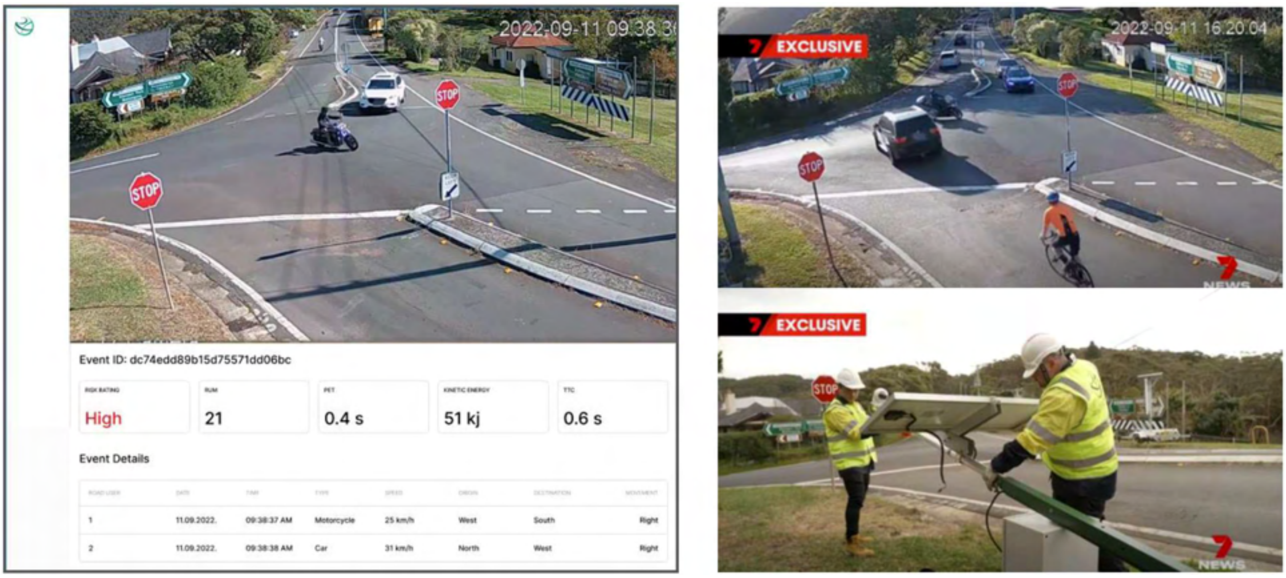

Figure 1. Dashboard screenshots of recorded high-risk incidents (left and top right), and site deployment of the hardware (bottom right)

Results

Over a period of four weeks, 217 near misses were detected at two locations (Figure 2). TfNSW has considered this trial as a significant breakthrough. It is now working to deploy this solution and approach statewide to capture data on more sites to inform changes to road rules and conditions.

Figure 2. Official report by Channel 7 of the number of near misses detected during the trial

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Photoluminescent linemarking and LED tactile ground surface indicator evaluation

Justin Lu

Real Time Traffic Pty Ltd

Abstract

The Victorian Department of Transport and Planning (DTP) has commissioned the development and implementation of an innovative delineation trial as part of its Road Safety Program. The trial deploys two unconventional treatments, namely photoluminescent (PL) on-road linemarking and LED tactile ground surface indicator (TGSI) paving. These types of delineation aim to reduce crash likelihood and severity, particularly on curves and at intersections and especially at night, mainly by producing safer speed profiles and improved driver and pedestrian visibility and awareness of hazards. Real Time Traffic is leading the evaluation of the trial to inform DTP whether to support further application of these novel products if proven successful or to remove the treatments if deemed unsuccessful. We do so by assessing various aspects such as vehicle speed, lane positioning, intersection conflict analysis, pedestrian crossing compliance, pedestrian positioning, and community acceptance.

Background

The Victorian Department of Transport and Planning (DTP) has commissioned the development and implementation of an innovative delineation trial as part of its Road Safety Program. The Road Safety Program aims to support road safety research and the development of new road safety technologies to better inform policy development. Real Time Traffic has been engaged to lead the evaluation of the statistically significant safety benefit of two innovative treatments namely:

- Photoluminescent (PL) on-road line marking (Figure 1)
- LED tactile ground surface indicator (TGSI) paving to improve pedestrian safety (Figure 1)

Figure 1. Example of PL linemarking (left image) and pedestrian TGSI (right image)

Safe System Alignment

The Victorian Road Safety Strategy 2021–2030 highlights that the approach to road safety is built around a human-centred Safe System approach that is coordinated and collaborative. This evaluation project has been developed to align with the overarching objectives of the Victorian Road Safety Strategy and is underpinned by the Safe System approach to road safety. Delineation is considered a supporting safety treatment within the Safe System hierarchy (Austroads 2016). While delineation does not assist to protect an occupant in a collision, nor is it likely to affect the exposure of people to collisions, good delineation can reduce crash likelihood

and severity, particularly on curves and at intersections and especially at night, mainly by producing safer speed profiles and improved driver and pedestrian visibility and awareness of hazards.
The evaluation therefore aims to inform the following objectives for DTP:

- enable further application of these novel products (if the trial is deemed successful);
- inform the design guidance for the innovative treatments applied (if the trial is deemed successful); or
- justify the removal and discontinuation of these treatments (if the trial is deemed to be unsuccessful).

Evaluation Framework

This evaluation project has the following objectives:

- Evaluating photoluminescent lines and signs to understand whether they are effective in improving road safety outcomes on rural roads;
- Understanding whether the application of photoluminescent linemarking on shared user paths affects safety and amenity for cyclists and pedestrians; and
- Determining if the LED pavers affect pedestrian safety and amenity at signalised intersections.

Key Performance Indicators and hypotheses

To meet the above evaluation objectives, the project team has developed a set of key performance indicators (KPI) listed in Table One with each having a clearly defined quantitative and/or qualitative hypothesis.

Table 1. Key performance indicators

Photoluminescent line marking on roads	**Photoluminescent line marking on shared user paths**	**LED tactile ground surface indicator pavers**
Vehicle speed Vehicle conflict analysis (if geometry of road appropriate) Vehicle lane positioning Vehicle behaviour Community acceptance of treatment Crash statistics	User speed User volume User conflict analysis (if geometry of road appropriate) Community acceptance of treatment Crash statistics	Pedestrian crossing compliance Pedestrian positioning Vehicle speed Community acceptance of treatment

Next step

The survey design and data collection are underway, and the results are expected to be available for the analysis in May 2023. We intend to share the hypothesis findings in the updated abstract and/or the presentation at the conference in September 2023.

Monitoring speeding using GPS data to inform road safety initiatives

Elaine Luc and Adam Evans

HoustonKemp Economists

Abstract

Compliance with speed limits plays a critical role in creating a safe environment for road users. Understanding the extent to which road users speed excessively, defined as 20 percent above speed limit, at a road level will inform road safety programs of targeted and cost-effective measures. Using GPS probe data, we monitor speeding on individual roads across the network in Queensland since 2016. We observe that excessive speeding had been declining before the Covid-19 pandemic hit in 2020. In addition, speeding has remained particularly high in a number of major highways and motorways around metropolitan Brisbane. The continuity of our monitoring in the last seven years has shed light onto the distinct characteristics of speeding across speed zones and types of roads. Such data-driven insights are useful in directing road safety measures to areas with the highest incidence of speeding. This paper sets out the insights resulting from this analysis.

Background

The Queensland government is committed to implementing road safety initiatives to improve safety across the road network. Our analysis leverages GPS speed probe data provided by HERE Technologies to gain insights into speed and speeding on a road level across Queensland. Annual reports have been published to support government agencies in the identification of key trends of speed and speeding in the previous year, which helps inform policy implementation to reduce speeding and improve road safety across the Queensland network.

Key findings

On average across the Queensland network, excessive speeding, defined as that which exceeds the speed limit by more than 20 per cent, has been decreasing since 2016 due to various road safety initiatives implemented by the Queensland Government. However, movement restrictions imposed due to the Covid-19 pandemic led to increases in speeding from 2020.

The extent of speeding varies across speed zones. Notably, the frequency of excessive speeding has reduced significantly on 40km/h roads since 2016. In contrast, the frequency of speeding has remained particularly high in speed zones of 80km/h and above.

We measure the frequency of speed compliance, defined as the number of hours per year in which the speed limit on a given road is obeyed, on a number of major highways and motorways surrounding metropolitan Brisbane in 2022. We observe that the level of compliance remained lower than 20 per cent in most segments of these highways and motorways, which are major routes for heavy vehicles in south east Queensland.

Conclusions

The dynamism of speeding across the Queensland road network requires close monitoring at a road level in order to direct road safety measures to areas with frequent occurrences of speeding. Leveraging GPS speed probe data, our analysis has helped inform overall trends in speeding across Queensland as well as those at a more detailed road level. This analysis has enabled us to inform policymaking using data-driven insights. As an extension, such analysis can provide ex-post assessment of the effectiveness of road safety programs.

Project Velograph: mass collection of naturalistic cyclist-vehicle passing events

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Abstract

To address the limited improvements in cyclist safety over the last decade, in addition to stagnating cycling participation rates, every jurisdiction in Australia has introduced minimum passing distance laws. While much research has been conducted on cyclist-vehicle passing distances, there is little consensus, and even some conflicting findings, on how various factors influence passing distances. Project Velograph seeks to collect naturalistic data on cyclist-vehicle passing distances on a mass scale. Through this process, empirical evidence on the passing distances that typical cyclists are experiencing across a broad section of the road network will be gathered for analysis. A bespoke data collection device, simple to operate and suitable for various styles of bicycle was designed. Over 120 'Velograph' devices were manufactured and are in a continuous cycle of deployment and re-deployment for four-week periods among volunteer cyclists in Adelaide, Canberra, and Melbourne.

Background

The number of cyclist fatalities and serious injuries on our public roadways has increased during the last decade (BITRE, 2020). While some casualties are the result of single-cyclist crashes, higher severity injuries are more likely to be the result of cyclist-vehicle collisions (Beck et al., 2017). Furthermore, crashes resulting from a vehicle passing a cyclist too closely are more likely to result in severe injuries compared to other types of crash between cyclists and vehicles (Stone & Broughton, 2003; Raslavičius et al., 2017). The perception that cycling on the road is dangerous is also acting as a major deterrent to the uptake of cycling (Munro, 2017; Pooley et al., 2013).

To improve cyclist safety and lower injury frequency, road authorities require an evidence base to inform and prioritise their resource allocation decisions, and to evaluate the effectiveness of any safety interventions they deploy. Project Velograph aims to deliver a platform capable of providing the necessary evidence for infrastructure planning and investment targeted at improving safety for cyclists.

Method

Based on learnings and feedback from a prior investigation on cyclists passing distances (Mackenzie et al., 2019), a new passing distance measurement device that is robust, fit for purpose, simple to use and suited to a variety of bicycle types was designed (Figure 1, top). The device constantly logs data from a GPS receiver and two infrared sensors that are directed to measure the lateral distance of any objects that pass on the righthand side.

Next, a project website (https://project.velograph.app/) was designed and deployed which provides the means for describing the project, allowing interested cyclists to sign up for participation, and facilitate the upload of data. The data upload facility also included an automatic data processing pipeline that ensures participants can remain anonymous while enabling them to visualise the data they collect and see any passing events that occurred (Figure 1, middle).

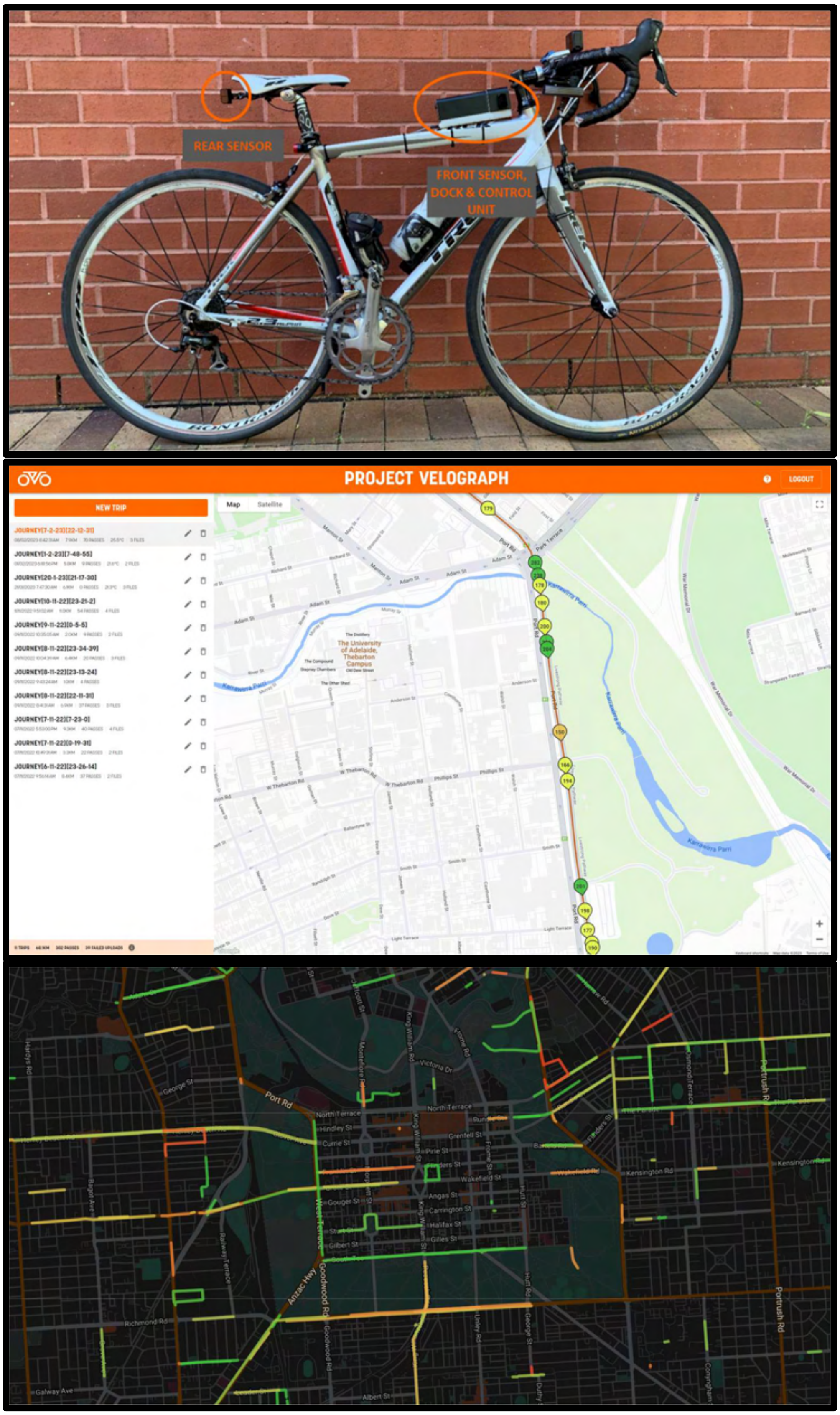

Figure 1. Data collection device (top); an example of participant data portal experience (middle) with list of uploaded trips in the left column and passing events on the selected journey shown as coloured icons in the main area, and example of aggregated data map (bottom) showing coloured lines indicating the mean passing distance detected along various parts of the road network

After manufacturing over 120 of the newly designed passing distance measurement devices, the process of recruiting volunteer cyclist participants was initiated (with ethics approval) through the deployment of advertising in the cities of Adelaide, Canberra, and Melbourne.

Each volunteer participant undertakes an induction process where they mount a data collection device to their bicycle. They are also provided with detailed instructions on how to operate the device and upload the data they collect. After a period of approximately four weeks participants are asked to return their allocated device so it can then be reconditioned and provided to a new participant.

Results

As a result of constantly circulating the available devices through a growing pool of volunteer cyclists, a significant passing distance database is being generated with continually expanding coverage of the road networks in the cities where data collection is occurring. Initial feedback from participants has been enthusiastic and generally positive.

Data collection has been occurring since 3 February 2023 and is continuing. Table 1 shows a summary of the data collected to date (over a five-month period), indicating approximately 1.8 passing events are occurring per kilometre of bicycle travel. An example of aggregating data from all cyclists travelling in the Adelaide CBD is shown in Figure 1 (bottom).

Table 1. Summary of data collection to 15 June 2023 (data collection is continuing)

Number of participants	Journeys uploaded	Kilometres of travel uploaded	Passing events detected
135	4,324	37,101	66,144

Acknowledgements

This project was supported through a Road Safety Innovation Fund grant from the Australian Government and a grant from the ACT Government Road Safety Fund.

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Open-label medicinal cannabis use effect on simulated driving performance

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Abstract

Despite increasing medicinal cannabis use, research has yet to establish whether and to what extent prescribed medicinal cannabis containing delta-9-tetrahydrocannabinol (THC) impacts driving performance. In a semi-naturalistic study, 40 medical cannabis patients consumed their own prescribed medical cannabis product in a laboratory setting, with simulated driving performance evaluated at baseline, 2.5- and 5-hours post-dosing. Standard deviation of speed significantly decreased at 2.5- and 5-hours ($p = .028$) relative to baseline, while mean speed significantly increased at 5-hours compared to baseline and 2.5-hours ($p = .008$). Standard deviation of lateral position and steering variability did not differ significantly at any time-point (all $p > .05$). Oral fluid THC concentrations were detectable for up to six-hours. This study suggests that medicinal cannabis may have little to no impact on driving performance when used regularly and as prescribed, although larger, controlled trials are required to confirm this finding.

Background

The impact of therapeutic doses of delta-9-tetrahydrocannabinol (THC) on driving performance is uncertain, with measures to discern drug presence from impairment often limited (Pearlson et al., 2021). As the use of cannabinoid-based medications increases it is crucial to evaluate their impact on driving ability (Ruheel et al., 2021). Prior studies have primarily examined the effects of THC at intentionally intoxicating doses on healthy volunteers (McCartney et al., 2021); however, it is unclear whether such findings can be applied to patients who differ in terms of their medical conditions and medicinal cannabis use (Arkell et al., 2020; Hartman & Huestis, 2013). Understanding the impact of therapeutic cannabinoid products on driving performance is crucial in better understanding potential risks to the driver and other road users and preserving road safety (Tement et al., 2020).

Methods

In a semi-naturalistic study, 40 adults including 22 males and 18 females aged between 23 and 80 years (M = 41.38, SD ± 12.65), consumed their own prescribed medicinal cannabis product (containing > 1 mg of THC) in a laboratory setting. Participants driving performance was assessed using a high-fidelity driving simulator (Forum8) during a practice session and at three different time points: baseline, 2.5- and 5-hours post self-administration. Driving outcomes including standard deviation of lateral position (SDLP), standard deviation of speed (SDS), mean speed, and steering variability were evaluated during a 20-minute simulated highway drive. Oral fluid samples were collected at baseline, as well as at one, two, four, and six-hours after dosing, and subsequently analysed to the Australian/New Zealand Drug testing standard (AS/NZS 4308:2008) with a confirmatory cut-off point of 13 ng/mL.

Results

A significant decrease in SDS relative to baseline (M = 2.04, SD ± 1.07) was seen at 2.5-hours (M = 1.85, SD ± .89), and 5-hours (M = 1.77, SD ± .73), indicating a small reduction in speed variability over time ($F_{(2,77)} = 3.741$, $p = .028$). A significant but marginal increase in mean speed was observed at 5-hours (M = 97.7, SD ± 2.87), compared to baseline (M = 96.88, SD ± 3.41) and 2.5-

hours (M = 96.88, SD ± 3.31). This increase in mean speed did not breach the imposed speed limit of 100km/hour, reflecting a decreased tendency to overcompensate via a reduction in speed across time ($F_{(2,77)} = 5.145$, $p = .008$). No significant differences in SDLP or steering variability across any time-point were observed (all $p > .05$). Although we found no evidence of driving impairment at either timepoint, patients had detectable concentrations of THC in their oral fluid for up to six-hours.

Conclusions

Overall, this semi-naturalistic study suggests that medicinal cannabis may have limited impact on driving performance when used as prescribed. Larger and more controlled trials are necessary to validate and confirm these findings in establishing more definitive conclusions regarding road safety.

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The impact of acute alcohol intoxication on hazard perception performance

Jessica Marigold[a], Grégoire S. Larue[a], Andrew Hill[b], Mark S. Horswill[c], Mathew Summers[d] and Kayla B. Stefanidis[a]

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Abstract

Acute alcohol intoxication and deficient hazard perception skill have been independently implicated in road crashes. However, few studies have examined the extent to which different levels of alcohol intoxication affect hazard perception skill, particularly among young and novice drivers, who are a high crash-risk cohort. The effects of alcohol dosage on hazard perception can serve as a reference when assessing the effects of other psychoactive substances on driving-related skills. This study will recruit young drivers (aged 20–24 years) with an open Queensland driver's licence to participate in a placebo-controlled double-blind, within-subjects experiment. Participants will be asked to attend three separate sessions and consume alcohol to produce three target blood alcohol concentration (BAC) conditions: 0.00 percent (placebo), 0.05 percent, and 0.08 percent. Ethics approval has been granted and data collection has commenced.

Background

The relationship between hazard perception and road crashes is well-established (Horswill & Hill, 2021). Likewise, acute alcohol intoxication is a known major contributor to driving-related morbidity and mortality (Chikritzhs & Livingston, 2021). Young and novice drivers have been found to exhibit both inferior hazard perception skill (Horswill, 2016) and a greater propensity to engage in risky drink-driving behaviour (Senserrick et al., 2003), both of which increase the risk of crashing. Specific *per se* BAC limits are commonly either 0.05 percent (Australia) or 0.08 percent (United Kingdom). However, the extent of impairment seen at these predetermined *per se* limits remains unclear for hazard perception, particularly at 0.08 percent, which is yet to be studied. Therefore, the aim of this study is to determine the effects of alcohol on hazard perception performance among young drivers, using the pre-established legal benchmarks. It is predicted that performance will decline with increasing BAC levels. Characterising the effects of these BAC limits on hazard perception will be a necessary reference point for determining how other psychoactive substances (e.g., cannabis) affect a driver's capacity to detect and respond to hazards, relative to established legal benchmarks of alcohol impairment.

Method

This study will employ a placebo-controlled double-blind, crossover design. We intent to recruit healthy adults aged 20 to 24 years who hold an open/unrestricted Queensland driver's licence. Participants will attend three sessions, spaced approximately seven days apart, and will receive a $100 gift card at the conclusion of the final session. Each participant will undergo the three experimental conditions: 0.00 percent (placebo), 0.05 percent, and 0.08 percent target BAC. Performance will be measured using a 20-minute video-based hazard perception test, in which participants watch a series of driving scenarios. The footage is presented on a computer monitor and participants are asked to respond, using a computer mouse, the moment they predict that a traffic conflict is likely to happen. A priori power calculations indicated that, to detect medium effects ($f = .25$; Kang, 2021), a sample size of at least $N = 28$ would be required (G*Power, $p = .05$ and power $= .80$, for a repeated-measures ANOVA). However, the order in which participants complete the sessions, and the assignment of alternate forms of the HPT to each dosage testing order will both be counterbalanced, increasing the minimum sample size required to $N = 36$ (6 dosage testing orders × 6 HPT orders). Ethics approval was granted by the University of the Sunshine Coast Human Research Ethics Committee (A221837).

Analysis

A repeated-measures ANOVA will be used to determine whether changes in hazard perception performance (response latency) vary with increasing BAC levels. Analyses will be conducted prior to the conference.

Conclusions

This study will examine the extent to which different legal driving limits for blood alcohol level impair the hazard perception performance of young novice drivers. These data will provide a benchmark, allowing alcohol effects to be potentially compared with impairment by psychoactive substances, such as cannabis.

Acknowledgements

This project was supported by the Motor Accident Insurance Commission (MAIC).

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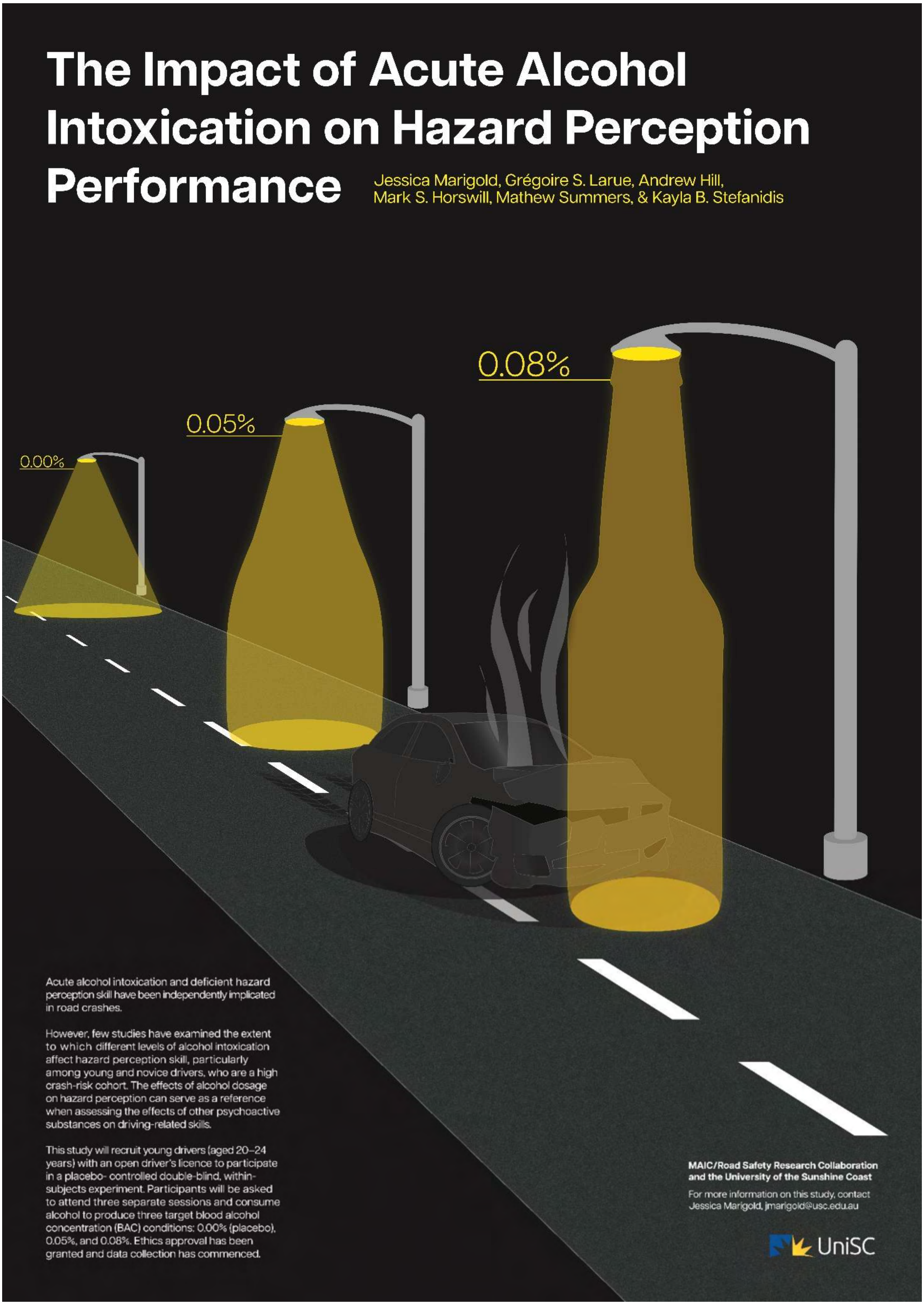
The Impact of Acute Alcohol Intoxication on Hazard Perception Performance
Jessica Marigold, Grégoire S. Larue, Andrew Hill, Mark S. Horswill, Mathew Summers, & Kayla B. Stefanidis
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This study will recruit young drivers (aged 20–24 years) with an open driver's licence to participate in a placebo- controlled double-blind, within-subjects experiment. Participants will be asked to attend three separate sessions and consume alcohol to produce three target blood alcohol concentration (BAC) conditions: 0.00% (placebo), 0.05%, and 0.08%. Ethics approval has been granted and data collection has commenced.
MAIC/Road Safety Research Collaboration and the University of the Sunshine Coast
For more information on this study, contact Jessica Marigold, jmarigold@usc.edu.au
UniSC

Can a single day alcohol education programme change recidivism rates?

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New Zealand Police

Abstract

Alcohol impairment is the second biggest contributing factor to road crashes in New Zealand, accounting for 21 percent of fatal crashes in 2020. A one-day educational program, which highlights the human and societal impact of impaired driving has been used by the courts as an intervention with recidivist drivers, but little is known of its effectiveness. We compared attendees of an Alcohol Education Intervention Program (AEIP) (past offending rate 82%) with a propensity score-matched control group (past offending rate 66%). There was no difference in detected reoffending between groups during the 18-month period following attendance of the course. Further investigation of the data using difference-in-difference analysis showed a significant reduction in the treatment group's detected recidivism rates. These findings suggest that attending an educational program can contribute to reducing detected offending levels, however further work is needed to examine the mechanisms behind this effect.

Background

Educating people to be aware of the effects of their driving behaviour is one intervention relied upon by the Courts to reduce recidivism. Community-based intervention programmes are used worldwide with varying effect (Wells-Parker et al., 1995). Programs focus on multiple aspects of drink driving including increasing awareness of the specific effects of alcohol use on driving ability, changing behaviours with alcohol, strategies to avoid driving if drinking, and the impact to community. These aspects were specifically focused on by the Tasman Alcohol Education Intervention Program (AEIP). However, research has demonstrated that for some people repeat drink driving is a manifestation of serious and enduring substance use problems (Nelson et al., 2019; Zhang & Sloan, 2014) and are unlikely to be solved through a one-day intervention. Some research notes that for many recidivist offenders, driving under the influence is embedded in a larger criminal history and also that treatment for substance abuse problems alone is unlikely to stop reoffending (LaBrie et al., 2007). In this analysis we examined the effect of participant reoffending after attending a one-day AEIP.

Method

We reviewed driving offences five years prior and 18 months after participation in AEIP between May 2019- May 2021. Attendance date was used as the index offence date to select the control samples. Controls resided in the AEIP catchment area and had an alcohol-related driving offence between one month either side of a AIEP session. Propensity score matching using 1:1 matched all treatment participants with a control. Some AEIP course participants were instructed by the court to attend the AEIP, as they had been charged with their third or subsequent alcohol offence. Difference in difference analysis was used to project expected number of offences after treatment.

Results and Conclusion

A total of 105 treatment and controls were analysed (77% males and 33% females). The treatment group had a higher mean of total prior and alcohol-related offences in the past five years. No difference was seen in offending between groups at any time point after the AEIP.
While AEIP participants had higher past offending (82%) compared to the control group (66%), difference-in-differences analysis AEIP course showed a treatment effect in all analysed measures. Impairment offences showed the treatment group had 10 less people offending, while the offences

per year improved by an average of 6.6 offences see Figure 1. Other traffic offences showed the treatment group had 22 less people with offences than expected, while the offences per year improved by an average difference of 49.3 offences.

Attending the AEIP influences detected recidivism rates for all traffic offences including impairment when compared with projected offence rates. However, had recidivism after the intervention only been the measure of the AEIP programme, there was no effect associated with attending this course. We suggest further work on pre and post tracking of cohorts attending such courses, as well as comparison with other educational, social, and medical interventions.

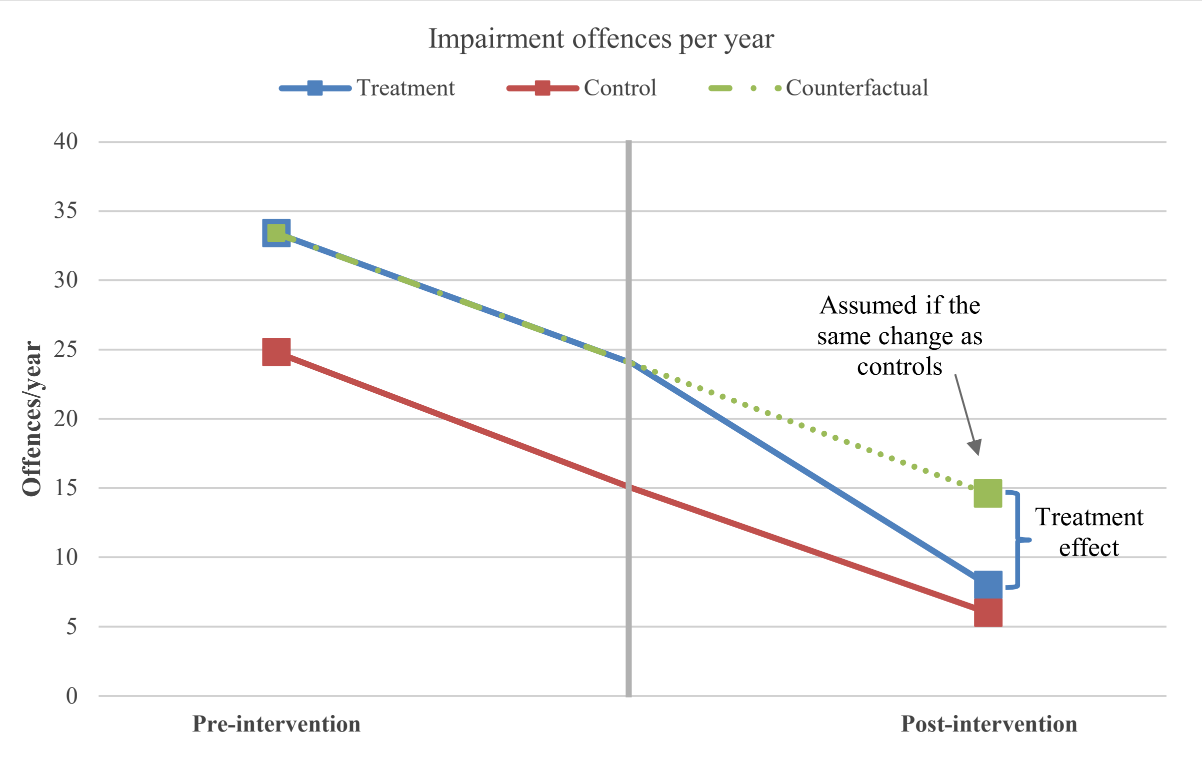

Figure 1. Treatment effect of AEIP course on impairment offences per year before and after the program.

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Perceptions towards elements of the Safe System and driver behaviour

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Abstract

Globally, every year, many people are killed and seriously injured in crashes. These crashes have multiple contributing factors, including road and vehicle design and condition, road user behaviour, and speed, including inappropriate speed limits. In many cases, crashes are entirely avoidable. The current *Decade of Action for Road Safety* aims to reduce the number of crash-related deaths and serious injuries by 50%. The adoption of the *Safe System Approach* by governments is important in reaching this goal. Using survey data collected from 1,277 Australian drivers, this study sought to examine how drivers' perceptions towards the Safe System (safe roads, safe speeds, safe vehicles, safe people), influence driving behaviour, measured using the Driver Behaviour Questionnaire (DBQ). This study found evidence of a relationship between drivers' perceptions of the Safe System and driving behaviour. The results have value in highlighting factors that may influence success in reducing crash-related deaths and injuries.

Background

The United Nations General Assembly has declared 2021-2030 the *Second Decade of Action for Road Safety* (WHO, 2021). By 2030, the target is to reduce, by 50 per cent, the number of deaths and serious injuries resulting from road crashes. A key component to reach this goal is for governments to adopt a *Safe System Approach* in developing road safety strategies. Australia, and each of its jurisdictions, have adopted the *Safe System Approach*, using the framework to underpin their road safety strategies (e.g., Department of Infrastructure, Transport, Regional Development and Communications, 2021).

The approach acknowledges humans make mistakes, but these mistakes should not mean serious injuries and fatalities are acceptable (National Road Safety Strategy, 2021). Four key elements of a safe road system are included: safe roads, safe speeds, safe vehicles, and safe people (Towards Zero, 2023). Unsafe roads, speeds, vehicles and people (behaviour) have the potential to contribute to crashes occurring (e.g., Stanton & Salmon, 2009; Zein & Navin, 2003). However, research has not examined how drivers' perceptions towards the Safe System relates to their driving behaviour. The current research seeks to fill this gap.

Method

An online survey, administered through *Qualtrics,* was used. Driver behaviour was measured through the 28-item *Driver Behaviour Questionnaire (DBQ)* (Reason et al., 1990). No changes were made to any items. Perceptions towards the four elements of the Safe System were measured by asking drivers how safe they feel the roads are, issues they notice on the roads, their attitudes towards speed limits and speed cameras, how much drivers should be able to exceed the speed limit without being infringed, how safe they feel their own vehicle is, their knowledge of vehicle safety technologies, how dangerous they believe illegal driving behaviours are, and how often they engage in illegal driving behaviours.

To be eligible to participate, individuals had to hold a driver's licence in any Australian state or territory and be an active driver. Drivers were recruited through the use of social media advertising (i.e., Facebook, Twitter). The survey was conducted between July-November 2022. Responses were received from 1,277 drivers across Australia. Table 1 provides details on participants' demographic profile.

Table 1. Demographic profile of participants

Demographic Indicators (n=1277)		n (%)
Age	18-24	53 (4.2)
	25-34	55 (4.3)
	35-44	106 (8.3)
	45-54	191 (15.0)
	55-64	379 (29.7)
	65-74	387 (30.3)
	75 and over	106 (8.3)
Gender	Female	248 (19.4)
	Male	1008 (78.9)
	Other	12 (0.9)
	Prefer not to say	9 (0.7)
State or territory of residence	ACT	51 (4.0)
	NSW	374 (29.3)
	NT	7 (0.6)
	QLD	169 (13.2)
	SA	75 (5.9)
	TAS	62 (4.9)
	VIC	447 (35.0)
	WA	90 (7.1)
	Prefer not to say	2 (0.2)
Highest level of education completed	Year 10 or below	97 (7.6)
	VCE/HSC or equivalent (Year 12)	130 (10.2)
	Technical/TAFE (including trade certificate/apprenticeship)/Diploma	417 (32.7)
	Undergraduate degree	293 (22.9)
	Postgraduate degree	309 (24.2)
	Other	22 (1.7)
	Prefer not to say	9 (0.7)
Marital status	Single	213 (16.7)
	Married/Defacto	888 (69.5)
	Separated/Divorced	127 (10.0)
	Widowed	28 (2.2)
	Other	5 (0.4)
	Prefer not to say	16 (1.25)

Results

Significant relationships were identified between all four elements of the Safe System (i.e., safe vehicles, safe roads, safe people and safe speeds) and the errors, violations and aggressive violations factors in the DBQ. For lapses, significant relationships were found with the safe vehicle, safe people and safe speed elements of the Safe System. Drivers with more positive perceptions towards the elements of the Safe System scored lower on all factors of the DBQ, indicating safer driving behaviours amongst these individuals. This presentation will explore these relationships in greater detail.

Conclusions

The results of this study will have value in highlighting the relationships that may exist between drivers' perceptions towards the four elements of the *Safe System Approach*, and driving behaviour. This information may assist with progress towards the targets set out in the *Decade of Action for Road Safety* plan, including a 50 per cent reduction in deaths and serious injuries from crashes. This could happen through education and /or road safety campaigns, for example. It is important to note there are some possible biases in the sample (high proportions of males, drivers aged over 55, and drivers from NSW). These should be taken-into-account when considering the results.

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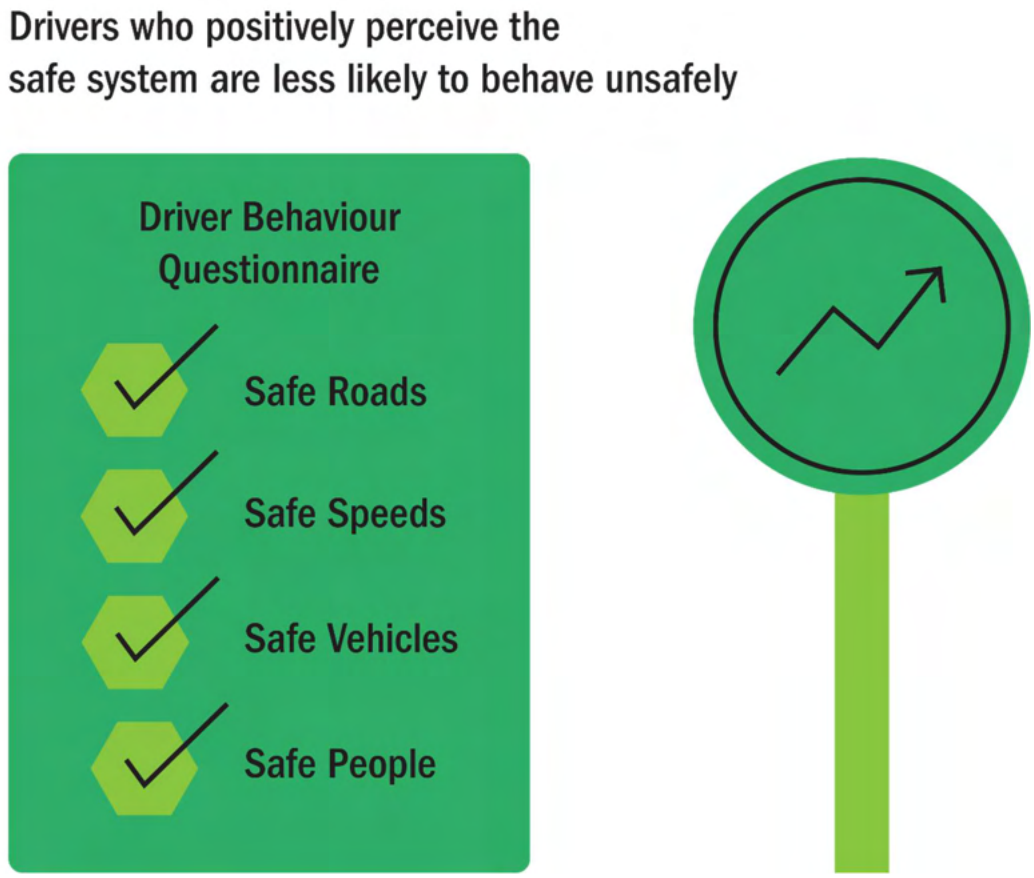
Drivers who positively perceive the safe system are less likely to behave unsafely
Driver Behaviour Questionnaire
Safe Roads
Safe Speeds
Safe Vehicles
Safe People

TAC Clients' Injury Severity and Safe System Road Infrastructure Program

Allison McIntyre[a], Antonietta Cavallo[b], Tandy Pok Arundell[b], Richard Hattam[b], Chris Tredinnick[c], Rebecca Teal-Ireland[c] and Renee Schuster[b]

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Abstract

The severity of injury sustained in road crashes by clients of Victoria's Transport Accident Commission (TAC) was examined before and after safety barriers were delivered by the Department of Transport and Planning under the TAC-funded Safe System Road Infrastructure Program (SSRIP). Among vehicle occupants in run-off road and head-on crashes, yearly rates of fatalities and claims were calculated in the periods before and after barrier installation for the 'Top 20' project routes. Results showed major reductions in severe injury outcomes (77% fewer fatalities, 94% fewer MAIS 3+ serious injury claims) and 74 percent fewer hospital bed days occupied, when comparing the pre and post periods. Percentage reductions were greatest for severe injury outcomes but were observed across all injury severity levels. A small number of residual severe injury cases were identified, highlighting areas for further prevention efforts.

Background

Severely injured clients (those who sustain injuries at a MAIS3+ severity level[8]) account for 16 percent of the Transport Accident Commission's (TAC) hospitalised claims but almost 60 percent of estimated Life Costs, 62 percent of bed days spent in hospital and 74 percent of Years Lived with a Disability for hospitalised TAC claimants (Strandroth et al., 2022). Lane departure crashes in high-speed environments are a key contributor to severe injury burden among TAC clients (Fitzharris et al., 2022). Flexible safety barriers have been shown to be an effective countermeasure for lane departure crashes on high-speed roads (Jurewicz et al., 2014; Candappa et al., 2012; Carlsson, 2016; Chimba et al., 2017).

Comprehensive safety barrier treatment of high-speed routes was undertaken by the Victorian Department of Transport and Planning, under the TAC-funded Safe System Road Infrastructure Program (SSRIP) 'Top 20' Program (Figure 1). It began in 2017 and was completed by October 2022. Roadside barrier and median barrier or wide-centreline treatments were installed across locations.

This project is part of the TAC's internal monitoring of claims. The intention is to explore the claims picture on these roads, including the nature of claims that continue to emerge from locations where SSRIP treatments have been rolled out. This paper shares some interim findings, based on relatively short post treatment periods and is not intended to be an evaluation of the effectiveness of flexible barrier.

[8] MAIS3+ injuries relate to a Maximum Abbreviated Injury Score of 3 to 6 which is a threat to life measure on a scale of 0 to 6, where zero is no threat to life and six is high threat to life (death is almost certain).

Method

An extensive barrier documentation process was undertaken by the TAC project team. It involved making site visits and interrogating existing artefacts from Department of Transport and Planning, yielding:

- Precise barrier locations
- Start and finish dates of on-road works
- Specific treatments installed

TAC claims, linked to police reported crash data (2011-mid 2021), were mapped onto SSRIP Top 20 barrier project extents. GIS specialists were engaged for this process. Claims were assigned to a Top 20 barrier project if they were within 20 metres of a route, excluding adjacent roads and on/off ramps.

In-scope cases included:

- Head-on or run-off road crash types
- Vehicle occupants
- Non-intersection locations

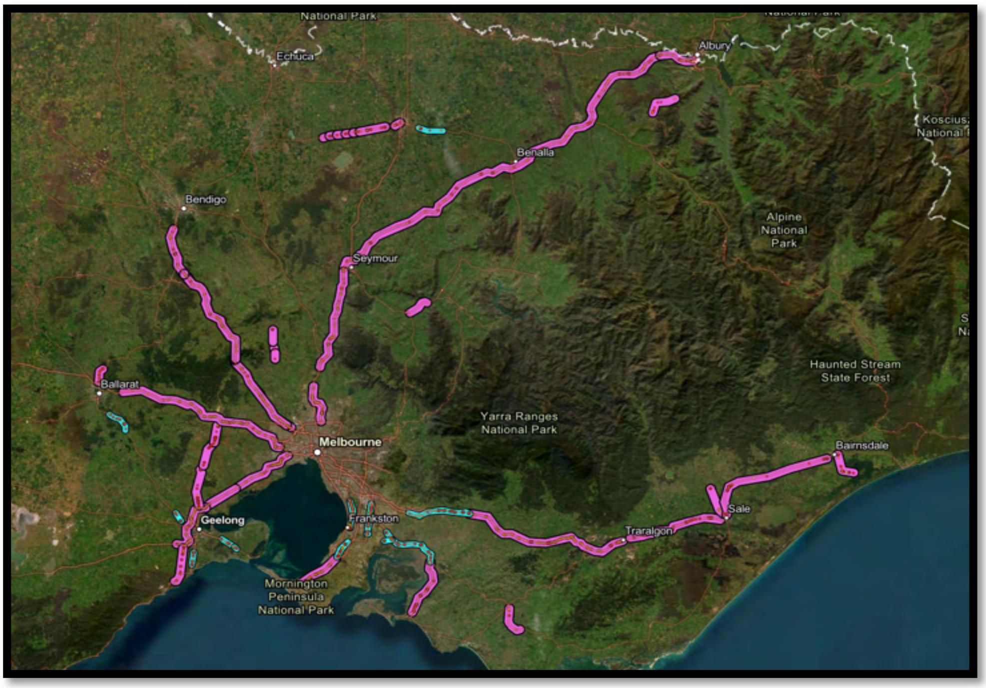

Figure 1. Routes included in the TAC-funded SSRIP 'Top 20' program (highlighted in pink)

Under SSRIP, all divided freeways leaving Melbourne were treated meaning that no equivalent roads were available to serve as controls. Comparison cases were all other crash types across the project extents.

Results

Injury severity data was analysed for the five years before work began at each location and for the period since the location's completion (for routes with 1+ years of available post data). Per year rates were calculated for each route and then aggregated across routes. Findings are indicative only, noting most routes had only one or two years of post-completion data. The data will be updated once another year of post completion data becomes available.

Police reported casualties overall (fatalities, serious and minor injury cases) from lane departures, were found to be 49 percent lower per year after the SSRIP treatments than before. Fatality and injury cases from other crash types showed a .5 percent reduction in the per year rate, when comparing before and after.

TAC claims were explored to take a closer look at the severity of outcomes in lane departure cases. Results showed that, compared to before, there were fewer fatalities and claims in the period after the barrier treatment completion (Table 1). There were:

- 77% fewer fatalities
- 94% fewer MAIS 3+ claims cases
- 74% fewer hospital bed days from TAC claims.
- Severe cases (fatality or MAIS 3+) accounted for 22% of fatalities and hospitalization claims before and 3% after treatments were completed.

Table 1. Program-wide fatalities and TAC claims per year from lane departures before and after the Safe System Road Infrastructure Program's Top 20 barrier treatments

	Per year before	Per year after	Difference	Estimated saving 17-year barrier life
Police-reported fatalities	10.8	2.5	- 8.3	-141.1
Hospitalised MAIS 3+ claims	17.0	1.0	- 16.0	- 272.0
Hospitalised MAIS 2 claims	26.6	16.3	- 10.3	- 174.5
Hospitalised MAIS 0-1 claims	23.4	16.3	- 7.1	- 120.1
Non-hospital claims	48.0	20.7	- 27.3	- 464.7
Hospital bed days	1,006.2	260.2	- 746	- 12,682.7

There were a small number of residual severe cases where flexible barrier was either not present or could not be expected to prevent the crash (e.g., travelling the wrong way on a divided freeway; head-on crash where there was only roadside barrier).

Conclusions

Analysis to monitor the incidence of TAC hospitalised claims and fatalities for vehicle occupants in lane departure crashes shows major reductions across the 'Top 20' SSRIP projects, comparing the five years before with the relevant post periods (to mid-2021). Percentage reductions in yearly rates were greatest for the most severe outcomes, but there were also reductions across all severity levels. TAC claims from these locations will continue to be monitored. These data should not be interpreted as a full evaluation of SSRIP, but rather as interim results which explore injury severity in residual cases.

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Evaluation of an intervention to reduce child pedestrian fatalities

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Abstract

This research evaluated the effects of a knowledge-based intervention suitable for community use to address child pedestrian safety. The objective was to increase awareness of parents/carers of young children about the risk of child pedestrian fatalities and about their role in limiting children's exposure to risks around roads and vehicles. The intervention was based on an earlier in-depth investigation of the causes of child pedestrian fatalities. It included posters, signage and information booklets for parents/carers containing messages about managing safety risks for children around vehicles. The evaluation involved pre and post intervention surveys of parents/carers of children who attended daycare or preschools in seven Local Government areas in NSW, Qld and Victoria. The results will provide evidence on the effectiveness of knowledge and awareness campaigns in raising awareness of parents/carers about their role in keeping child pedestrians safe.

Background

This research is the second stage of a study of child pedestrian fatalities, where the first stage was an in-depth analysis of the causes of child pedestrian fatal crashes. The in-depth study confirmed the importance of supervision of young children in keeping them safe around roads and vehicles as suggested by other research on child pedestrian safety (eg., Soole et al 2011; MUARC, 2010). The objective of this part of the research was to investigate changes in awareness of parents/carers, of the risk of child pedestrian injury before and after exposure to a knowledge-based campaign on child pedestrian safety. This research is significant as it involves an evidence-based intervention in an area where there have been comparatively few formal evaluations of strategies to reduce preventable deaths involving child pedestrians.

Method

This project used a quantitative research methodology that included brief online pre and post intervention surveys. The intervention was conducted in preschool and day care centres in seven Local Government Areas (LGA's) from NSW, Victoria and Queensland. These were selected as they were in the top 20 LGA's in Australia for child pedestrian fatalities. In each LGA, the Road Safety Officer was approached to participate, and all accepted the invitation. The Road Safety Officer then, independently of the research team, recruited 10 daycare centres and/or preschools in their area to take part in the project.

The intervention involved a variety of media provided by the Little Blue Dinosaur Foundation including electronic, print and signage conveying short messages relating to child pedestrian safety. It was disseminated by the daycare/preschool.

The evaluation used a multiple baseline approach in which the intervention occurred in a staggered fashion with a randomly selected pair of LGA's participating first, followed by a further two rounds involving the next two then three LGA's. The evaluation commenced with a short online survey of community awareness of child pedestrian fatality risk which was advertised by the preschool/daycare centre in media relevant to their parents/carers. The survey was open for two weeks then the intervention commenced and posters, signage erected and information provided to parents/carers. Two weeks later, while the intervention materials were availble, a post-survey was conducted to evaluate changes in awareness of child pedestrian safety following the intervention.

The post-survey was available for a two-week period. The same approach was used for the next LGA's. Participation was voluntary and the surveys anonymous. The study was approved by the UNSW Human Research Ethics Committee (Approval number HC220742).

Results and Conclusions

The results of surveys will be available in mid-May. Analysis using appropriate statistical methods will investigate differences between pre and post exposure to the intervention in parents/carer's estimates of risk for children around road and vehicles, their judgements of the age at which children should be independent around roads and their views about appropriate strategies for keeping children safe around vehicles. The results will direct further efforts to enhance the knowledge and awareness of parents/carers about child road safety.

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Findings from NZ Prospective Older Adult Transport and Health Study

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Abstract

Increasing transport dependence can be difficult for older adults and responsibility often falls on families to aid their out-of-home mobility needs. The New Zealand Prospective Older Adult Transport and Health Study (NZPATHS) is a longitudinal cohort study of 1181 older drivers (48% female; mean age 75y at baseline) and 675 family members (94% daughter/son). Participants identified gaps in service provision that could improve outcomes for older drivers and concerned family members, including accessible community-based information services and alternative affordable transport options. Many older adults reported driving anxiety and changed their driving patterns, but planning for stopping driving was uncommon. Families considered loss of independence and identity, and a reluctance to rely on family as important barriers to stopping driving. NZPATHS aims to inform the development of evidence-based policy on out-of-home mobility among older adults to maintain mobility and independence, while minimising injury risk, and contributing to safe travel for all.

Background

Despite the accessible transport gains achieved through age-friendly environments, many jurisdictions with ageing populations remain heavily reliant on the private car to meet the needs of daily living. Without suitable transport options for older adults, out-of-home mobility can become limited and impact health and wellbeing. A substantial body of evidence indicates that stopping driving can result in depression, declining health, and social isolation (Edwards et al., 2009; Edwards et al., 2009; Mezuk & Rebok, 2008; Ragland, 2005). Adapting to driving cessation and alternative transport can be difficult for older adults and not all families can bridge the gaps resulting from car-dependent transport systems. The New Zealand Prospective Older Adult Transport and Health Study (NZPATHS) is a prospective cohort study of older drivers and their whānau/families and is a world first, using a unique methodology to examine older adult and family roles in the transition from independence to transport dependence, and to identify factors facilitating positive outcomes for older people after driving cessation. This paper summarises findings to date.

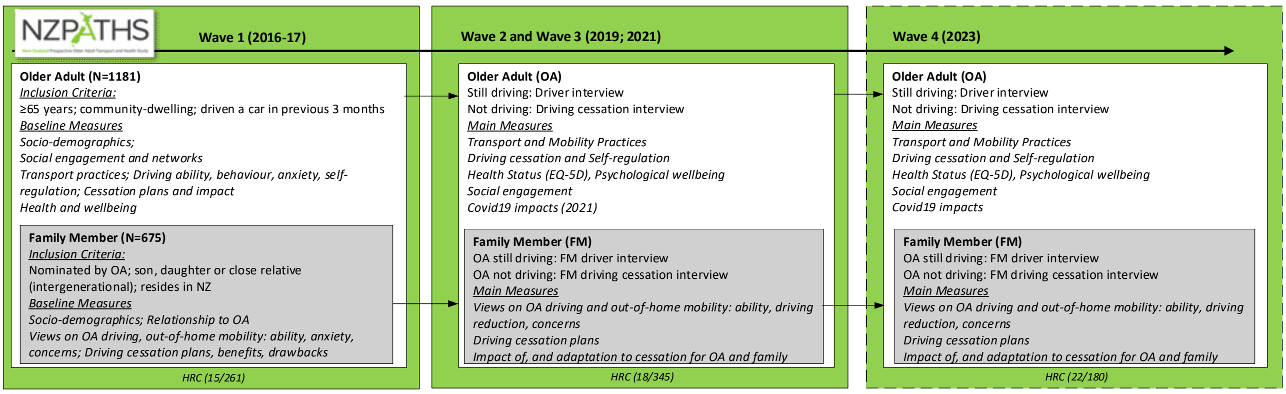

Figure 1. NZPATHS Design and Key Measures

Method

NZPATHS is a population-based cohort study of 1181 community dwelling older drivers, aged 65 years and older, and 675 family members. Cohort recruitment and baseline interviews occurred from 28 July 2016 to 23 May 2017. Follow-up waves were completed in 2019 and 2021, with a fourth wave scheduled in 2023. Figure 1 shows study design and key measures at each wave.

Table 1. Baseline characteristics for NZPATHS participants

	Māori		Non-Māori	
Older Adult (OA) Cohort (N=1181)	n=173		n=1008	
Age	n	%	n	%
65-69 years	52	(30.1)	258	(25.6)
70-74 years	35	(20.2)	267	(26.5)
75-79 years	52	(30.1)	264	(26.2)
80 + years	34	(19.7)	219	(21.7)
Female	82	(47.4)	475	(47.1)
Living with Spouse/Partner	111	(64.2)	698	(69.2)
Retired	112	(64.7)	731	(72.5)
Driving frequency (≥ 5 days/week)	112	(64.7)	636	(63.1)
Reduced driving due to health (past year)	16	(9.2)	88	(8.7)
Good or better general health	155	(89.6)	940	(93.3)
Chronic conditions (2+)	48	(27.7)	246	(24.4)
Family Member Cohort (N=675)	n=105		n=570	
Age (Mean -yrs)	45.6	(8.0)sd	46.9	(7.8)sd
	n	%	n	%
Female	73	(69.5)	362	(63.5)
Full-time Employed	68	(64.8)	372	(65.3)
Child of older adult	96	(91.4)	557	(97.7)
Live same town/city as OA	61	(58.1)	333	(58.4)
Comfortable as passenger with OA	75	(71.4)	378	(66.3)
Comfortable with children as passengers	74	(70.5)	349	(61.2)

Results and Discussion

Table 1 shows the characteristics of the older driver and family member cohorts at baseline. The older driver cohort is generally representative of the age and gender distributions of the NZ population over 65 years, with appropriate sampling to ensure relevant results for Māori and those over 75-year-olds. The geographical distribution of non-Māori also reflects the demographic characteristics of the general population 65+years. Sons and daughters made up the majority of the family member cohort and 58% lived in the same town/city as their older driver.

Published findings have identified gaps in service provision that could improve outcomes for older drivers and concerned family members, including accessible community-based information services and alternative affordable transport options (Connor et al., 2021). Many older adults reported driving anxiety at baseline and changed their driving patterns in response (Taylor et al., 2018; Taylor et al., 2022). However, planning for stopping driving was uncommon, and centred on investigating alternatives such as public transport (McLean et al., 2021). Families considered loss of independence and identity, and a reluctance to rely on family as important barriers to stopping driving (Connor et al., 2021)

Follow-up continues and will document transport practices over time, the development and role of self-regulation in driving reduction and cessation. Post driving cessation, out-of-home mobility practices and the impact of transport dependence on health and wellbeing will be assessed. NZPATHS is supported by a multi-agency advisory group, with representatives from Ministry of Social Development, Ministry of Transport, NZ Police, Waka Kotahi, Age Concern NZ and Turanga Health. Findings will inform evidence-based policy on out-of-home mobility among older adults to maintain mobility and independence, while minimising injury risk - contributing to improved health and wellbeing outcomes and safe travel for all.

Funding and Ethical Approval

NZPATHS is funded by the Health Research Council of New Zealand. Ethics approval was granted by the University of Otago Human Ethics Committee (H15/080).

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ESRA3 Survey: comparing the evolution of Australian road safety performance

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Abstract

ESRA (E-Survey of Road Users' Attitudes) is a joint initiative of research organisations and road safety institutes, featuring 36 partners and carried out in 60 participating countries (Vias Institute, 2022). The project aims to collect and analyse comparable (inter)national data on road safety performance, in particular road safety culture. The overall aim is to provide a solid contribution to a joint monitoring system on road safety attitudes and behaviours for policy measures. The latest edition (ESRA3) of the research survey was launched in 2022. Data collection will occur between April-June 2023 and data results available from August 2023. This presentation will focus on new (2023) Australian results with comparison of how Australia has performed over time and how we compare with European and other selected country results (benchmarking). Trend reviews with previous Australian performances (ESRA1 (Belgium Road Safety Institute, 2017) and ESRA2 (Vias Institute, 2021)) will also be investigated.

Background

ESRA is a joint initiative of road safety institutes, research organisations and authorities to establish comparable and reliable road safety performance indicators based on attitudes and self-declared behaviours of road users. The initiative is coordinated by the Vias institute (Belgium), overseen by a steering committee (Vias Institute, 2022), and funded by the partners' own resources. A first edition of ESRA survey (ESRA1) was conducted between 2015-2017 (Meesman et al, 2018) and participation expanded for the second edition (ESRA2) with 39 partners from 48 countries participating in ESRA2 survey (Meesman et al., 2022). Data collected between 2018-2020 (ESRA2 survey) has been collated into a dashboard (Vias Institute, 2018-2022) to compare country and regional performances and international benchmarking on road safety (see Figure 1).

Method

ESRA3, launched in 2022 will see field data collection from April-June 2023. It is an extensive survey that will be undertaken with a representative sample of the adult population in 39 participating countries (using online access panels). The 20-min survey addresses over 300 items (see Figure 2) and the commonly developed questionnaire was translated into 46 language versions reviewed by country-partnering organisations. The subjects covered in the survey are amongst others: 'self-declared road behaviour', 'attitudes and opinions towards unsafe traffic behaviour', 'enforcement experiences' and 'support for policy measures.' ESRA3 is anticipated to garner similar response data as previous survey editions. In total, the previous edition (ESRA2) covered more than 45,000 respondents from 48 countries across six continents, including 968 respondents from Australia and 25,987 respondents from 24 European countries (Meesmann et al., 2022).

Figure 1. ESRA2 Dashboard. AsiaOceania Regional Results on expectation of police enforcement for use of hand-held mobile phone to talk or text while drive (Australia 21.1% of drivers in previous survey reported expecting enforcement for this illegal activity)

Figure 2. E-Survey of Road users' Attitudes (ESRA2) Survey Features

Results

This presentation will highlight Australian results from the latest survey (ESRA3) in comparison to results of 20 countries in Europe and selected other countries (benchmarking). The main focus will review results based on Australia's country fact sheet for ESRA3. Previous ESRA2 comparative results (Meesman & Torfs, 2019), identified differences with self-declared behaviour and enforcement between Australia and European countries were striking. The largest difference between the two regions was observed in the number of reported alcohol checks. In Australia, 47.1% of car drivers previously reported being checked for alcohol compared to European reporting rate of 18.4%. Tracking of these potential country differences in post-covid operating environment will be reviewed for ESRA3. Of note, in ESRA2 (Vias Institute, 2018-2020) Australia ranked 27 from 48 countries in car driver expectation of likelihood to be checked by police for use of hand-held mobile phone to talk or text while driving. A relatively low ranking (21.1%), that will also be tracked in ESRA3 results with survey wording adjusted to account for introduction of mobile phone detection camera deployment used in many Australian jurisdictions.

Conclusions

ESRA initiative has grown to a global level, demonstrating feasibility and added value of joint data collection by a network of road safety organisations. In total, ESRA survey was already conducted in 67 participating countries covering 6 continents, the second edition (ESRA2) resulted in 64 country fact-sheets, a results dashboard and 15 thematic reports[6]. ESRA's aims, to develop a series of reliable, cost-effective, and comparable road safety performance indicators and time-series data on road safety performance are being realized with the latest survey edition (ESRA3). More information can be found at: www.esranet.eu

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Application of geographical information systems in blackspots identification: a systematic review

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Abstract

The aim of this literature review was to review past research that used GIS and machine learning/statistical applications to build models for the identification of blackspots using a variety of predictor variables. No consistent definition of a blackspot was found with study areas separated only for metropolitan and rural regions. In addition, there was only a limited selection of independent variables and little feature engineering using geographical information systems, resulting in insufficiently comprehensive data for blackspot modeling. Spatial clustering techniques and Poisson regression were most commonly used for this purpose.

Background

Blackspots are synonymous with accident hotspots and are defined as an area with a high concentration of accidents. An understanding of the spatial variation in blackspots has resulted in a significant reduction in accidents in the past. However, current research is only now starting to use GIS and machine learning for blackspot identification, and there is still only a very limited selection of independent variables under consideration (Al-Aamri et al., 2021; Fiorentini & Losa, 2020; Mansor et al., 2021).

Method

The ScienceDirect, EBSCOHOST Business Source Ultimate and ProQuest Central databases were searched using the criteria: ("blackspot" OR "black spot") AND ("road crash" OR "road accident" OR "traffic accident" OR "traffic crash") AND ("gis" OR "geographic information system") AND (model+), for full-text journal articles published in English but with no limitation for the date of publication. Among the 246 eligible papers, only 36 met the requirements of this review. The quality of these papers was assessed based on the Statistical Analyses and Methods in the Published Literature (SAMPL) guidelines (Altman & Sculz, 2014) as modified by Slikboer et al. (2020).

Results

Using the modified SAMPL guidelines, the papers were given a quality score between 0 and 1, and the average score across all 36 papers was 0.64. Overall 72% of the papers used at least one of three spatial clustering techniques to define blackspots, namely: Kernel Density Estimation (KDE), Getis Ord Gi*, and Morans I. Accident counts were the only variable used for this purpose.
Many studies used traffic counts, known as Average Annual Daily Traffic (AADT), to predict blackspots, mostly using Poisson regression. Other than AADT, the most common variables used for this purpose were road characteristics, demographics for road users and drivers, and points of interest. However, few papers allowed for a comprehensive selection of these variables and few reported their model performance measures, mostly failing to validate their models.

Conclusions

Currently, most research currently and in the past use KDE, Getis Ord Gi* and Morans I for blackspot identification. Future research should focus on a comprehensive modelling approach with robust data that incorporates larger geographic areas will also be beneficial in obtaining a better understanding of blackspots. In addition, it might be possible for new technologies such as telematics and computer vision methods to be used to identify blackspots using near misses in the future (Ryan et al., 2020).

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Evaluation of the Safe Driving Program for hoon drivers

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Abstract

The VicRoads Safe Driving Program (SDP), which was introduced in 2013, is a group behaviour change program designed to reduce the likelihood of participants engaging in unsafe driving/riding offending and public nuisance behaviours, commonly referred to as hoon offending. A rigorous evaluation of this program required the comparison of offending behaviour before and after an SDP order for hoon offenders who had completed the program in comparison with suitable control groups. In particular, a comparison in regard to hoon offending, other serious offending and overall offending was required, in addition to the incidence of bans, vehicle impoundment penalties and crash involvements. The aim of the project was to determine if any reduction in these outcomes could be attributed to SDP completion. SDP orders have served to reduce hoon offending even when the SDP is not completed, due perhaps to the additional impoundment orders and fines.

Background

Hoon offences include exceeding the speed limit by 45 km/h or more or travelling at 145 km/h or more in a 110 km/h zone, loss of traction and careless or dangerous driving, or causing excessive noise or smoke by improper use of a motor vehicle. Since 20 February 2013, hoon offenders are required to complete a SDP consisting of a 5-hour facilitated group discussion. The goal is for participants to develop an understanding of their motivations and triggers for high risk and anti-social driving, developing strategies to avoid these behaviours in the future.
The aim of this study was to determine whether the incidence of hoon offences, other serious offences *(resulting in a ban),* all offences, bans and impoundments, as well as crashes and the resulting numbers of fatal and serious injuries, were statistically significantly reduced from participation in the SDP compared to a suitable control group.

Method

Two control groups were chosen for comparison with the group of offenders who completed the SDP (Group 1, N=3,324). The first control group (Group 2, N=1,063) consisted of drivers/riders who had been ordered by the magistrate to complete an SDP but had failed to do so. The second control group (Group 3, N=30,678) consisted of offenders who had been convicted of a hoon offence but had not received an SDP order. For the period 2007-2020, offence, crash and impoundment data were collected for these offenders. For Groups 1 and 2 the SDP order date was chosen to separate the before and after time periods, while the date of the first hoon offence was used for this purpose in the case of Group 3. Generalised Estimating Equation models were used to compare the groups, while controlling for age, Major City/Other residence, Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD) decile and time at risk of offending.

Results

Table 1 shows some important differences between the groups. Groups 1 and 2 exhibited 19% and 3% greater declines in hoon offences, 23% and 22% greater declines in other serious offences and 14% and 30% greater declines in all offences than Group 3. However, while Group 1 showed a 19% greater decline in hoon offences and a 10% greater decline in other serious offences than Group 2, higher offence rates for speeding, illegal mobile phone usage and L-Plate/P-Plate offences were observed for Group 1 than Group 2 after their SDP order. Although the number of crashes and the number of fatal and serious injuries (FSIs) declined for all three groups, no statistically significant differences in these declines were found between the groups.

Table 1: Group Comparison Mean Values and Percentages

	Group 1		**Group 2**		**Group 3**	
Variables at Cut-Point	**SDP Completed (N=3,324)**		**SDP order but no completion (N=1,063)**		**No SDP order (N=30,678)**	
Male (%)	94.4		91.6		87.6	
Major City Residence (%)	74%		69%		74%	
Lower IRSAD (%)	55%		61%		62%	
Mean Age (years)	26.4		28.3		28.0	
Variables of Interest	**Before Cut-Point**	**After Cut-Point**	**Before Cut-Point**	**After Cut-Point**	**Before Cut-Point**	**After Cut-Point**
Hoon offence rate p.a.	0.196	0.021	0.198	0.030	0.253	0.016
Other serious offences p.a.	0.240	0.157	0.632	0.480	0.276	0.183
All offence rate p.a.	1.891	1.019	3.302	1.526	2.165	1.183
FSIs p.a.	0.010	0.007	0.014	0.012	0.009	0.007
Crashes p.a.	0.021	0.014	0.028	0.015	0.019	0.013
Time at risk of offending (years)	6.26	4.26	6.82	3.69	4.31	7.72
Offenders with bans (%)	85.4	29.3	94.0	37.9	86.5	41.0
Offenders with impoundments (%)	77.3	17.2	57.9	21.5	23.7	16.4

Cut-point = Date of SDP order for Groups 1 and 2, Date of first hoon offence for Group 3
Lower IRSAD = Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD) below 5th decile
FSIs p.a. = fatal and serious injuries per annum as a result of involvement in crashes
Other serious offences include other speeding offences, drink/drug offences and many other offences if they result in a ban
Time at risk of offence = length of the time period during which offending was possible

Conclusion

SDP orders have served to reduce hoon offending *(relative to Group 3)* even when the SDP is not completed *(Group 2)*, due perhaps to the additional impoundment orders and fines often associated with SDP orders. However, SDP completion served to reduce serious offending, leading to a smaller proportion of offenders with vehicle impoundments. Nevertheless, a small number of repeat offenders remain and for these offenders repeat SDPs are worthy of consideration, perhaps with SDP completion encouraged through the use of online programs in rural areas.

Supporting Local Governments to set their road safety targets

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Western Australian Local Government Association

Abstract

Road safety targets are a familiar aspect of road safety strategies at an international, national and state level. Targets help to focus attention, enable appropriate resourcing and provide accountability and transparency, all components which help move towards Safe System implementation (International Transport Forum, 2016). It is argued that to achieve the vision of zero deaths and serious injuries the support and participation of Local Government is essential (Woolley et al., 2018). The Local Government road network in Western Australia makes up 87 percent of the total road network (WALGA, 2021). An estimated 35 percent of travel takes place on local roads, but more than half (57%) of deaths and serious injuries occur on these roads (Road Safety Commission, 2020). Local Governments are a diverse group of organisations, all with their own strategic directions and competing priorities. The Western Australian Local Government Association (WALGA) has developed a process, using a co-design approach, to enable Local Government to set their own road safety targets that are relevant to their individual context and take into account identified priority treatment areas. The process embeds targets within the existing organisational framework with the goal of making road safety a genuine part of business as usual as recommended by Woolley et al. (2018). WALGA is currently early in the implementation stage, with evaluation planned to be the subject of a future paper.

Background

Since 2020 WALGA's RoadWise Program has been producing Local Government Road Safety Performance Reports using data primarily sourced from the Western Australian Road Safety Commission. These reports provide Local Governments with a regional summary of data specifically relevant to improving safety on local roads, highlighting priority treatment areas based on crash types.

Purpose of Process

This process was developed to support Local Government to set their own specific targets and performance measures for road safety. It is intended to provide a framework for Local Government practitioners to combine internal corporate and local knowledge with crash data and best practice treatment solutions to produce meaningful targets and a pathway to achieving them.

Description of Process

The process developed is shown in Figure 1. Local Governments will use crash data, local context, and scope to set bespoke road safety targets and corresponding performance measures that align with their overarching strategic direction. The process is intentionally collaborative and is designed for Local Government practitioners to set targets that will focus attention and create accountability. Funding is taken into account as one of the considerations influencing the targets set, but there is no requirement for additional funding commitments to be made to undertake this process.

Stage 1 - Development

A review of the relevant literature was undertaken, informing the content and development of the process. The approach taken has influenced the creation of the process to ensure that the knowledge, experience, and context of each Local Government is a major contributor to the targets that are set. It is important to the process that this is done with and by Local Government, not for them. The core principles and guidance for setting targets is taken from Bliss and Breen, (2013) with a focus on a continual improvement process whereby targets are refined over time.

Stage 2 - Planning
Tools and resources listed in Table 1 were developed to enable Road Safety Advisors to be equipped to undertake the process with Local Government.

Table 1. Project tools and resources

Tool/resource	Purpose
Facilitator Guide	Internal use by Road Safety Advisors delivering the process
Continual Improvement Process	Communication tool showing Local Government the process as a whole so they can understand what is involved and the linkages to other parts of the WALGA's road safety services and products (Figure 1.)
Preliminary Worksheet	Document strategic priorities of the Local Government and existing relevant policies and processes
Workshop PowerPoint	For the facilitator to utilise, depending on the context of the delivery of the workshop element of the process.
Workshop Worksheet	Template to guide the process of setting targets, using priority treatment areas, identifying corresponding performance indicators, documenting local context and scope, setting relevant targets and embedding those targets into Local Government policies and practices.

Stage 3 - Implementation
WALGA has a team of road safety advisors across the state who will work in collaboration with Local Governments to undertake the process outlined in Figure 1.

Stage 4 - Evaluation
Evaluation will look at the number of Local Governments engaged and involved, the number and type of targets set and longer term the achievement of those targets and the process of refining targets over time.

Next Steps

Implementation is currently underway across Western Australia with road safety advisors approaching Local Governments offering to facilitate the process. Once the process has been used by Local Governments, we will develop case studies and include them in the material provided to encourage further uptake of the target setting process. Road Safety Advisors will work closely with Local Governments to identify what works well and what needs improvement or changes. Local Governments are a diverse group of organisations and individuals, the aim is to tailor the process to their individual requirements and circumstances, providing an appropriate amount of resourcing while embracing the framework for a co-design approach.

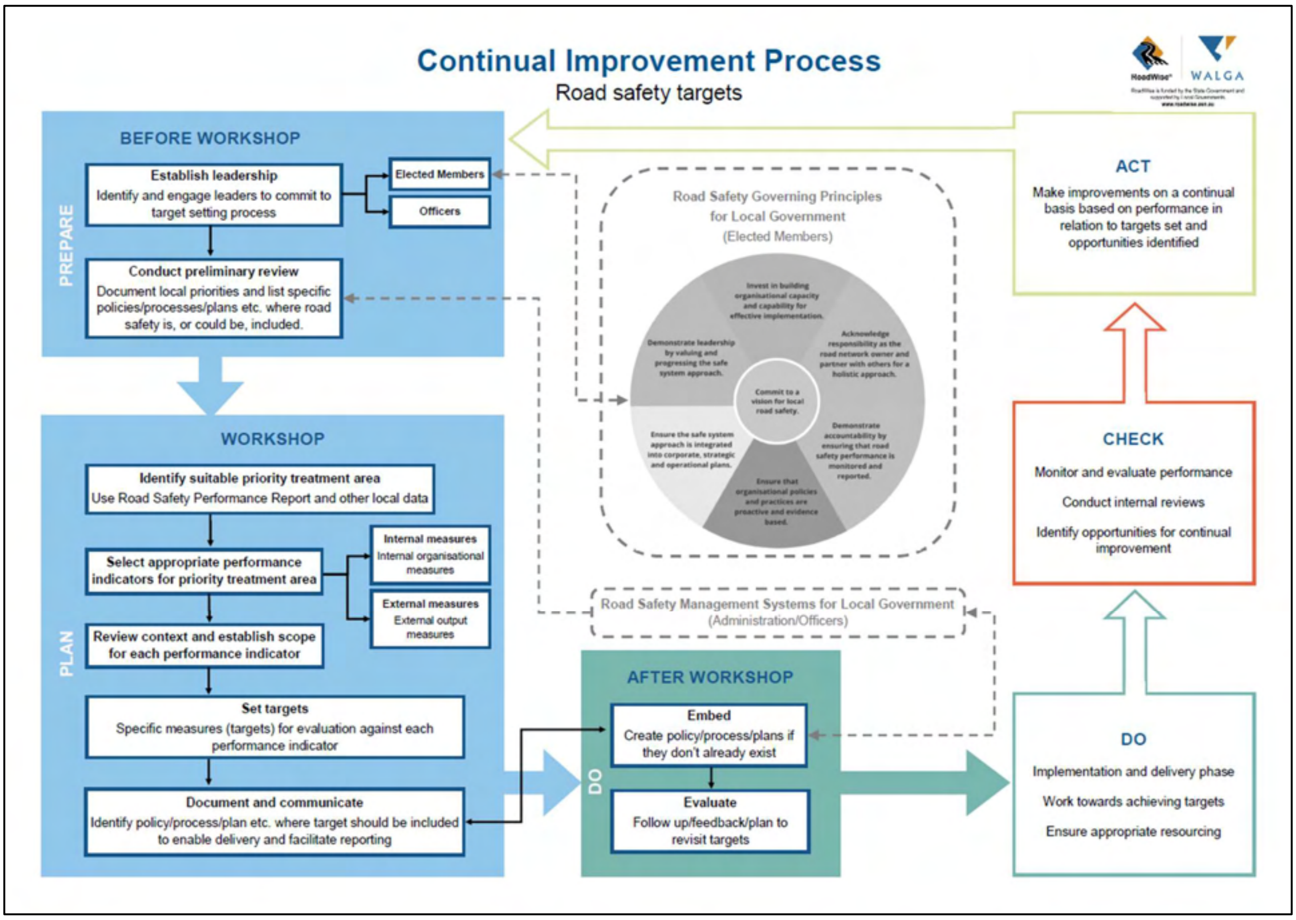

Figure 1. Continual Improvement process for setting road safety targets with Local Government

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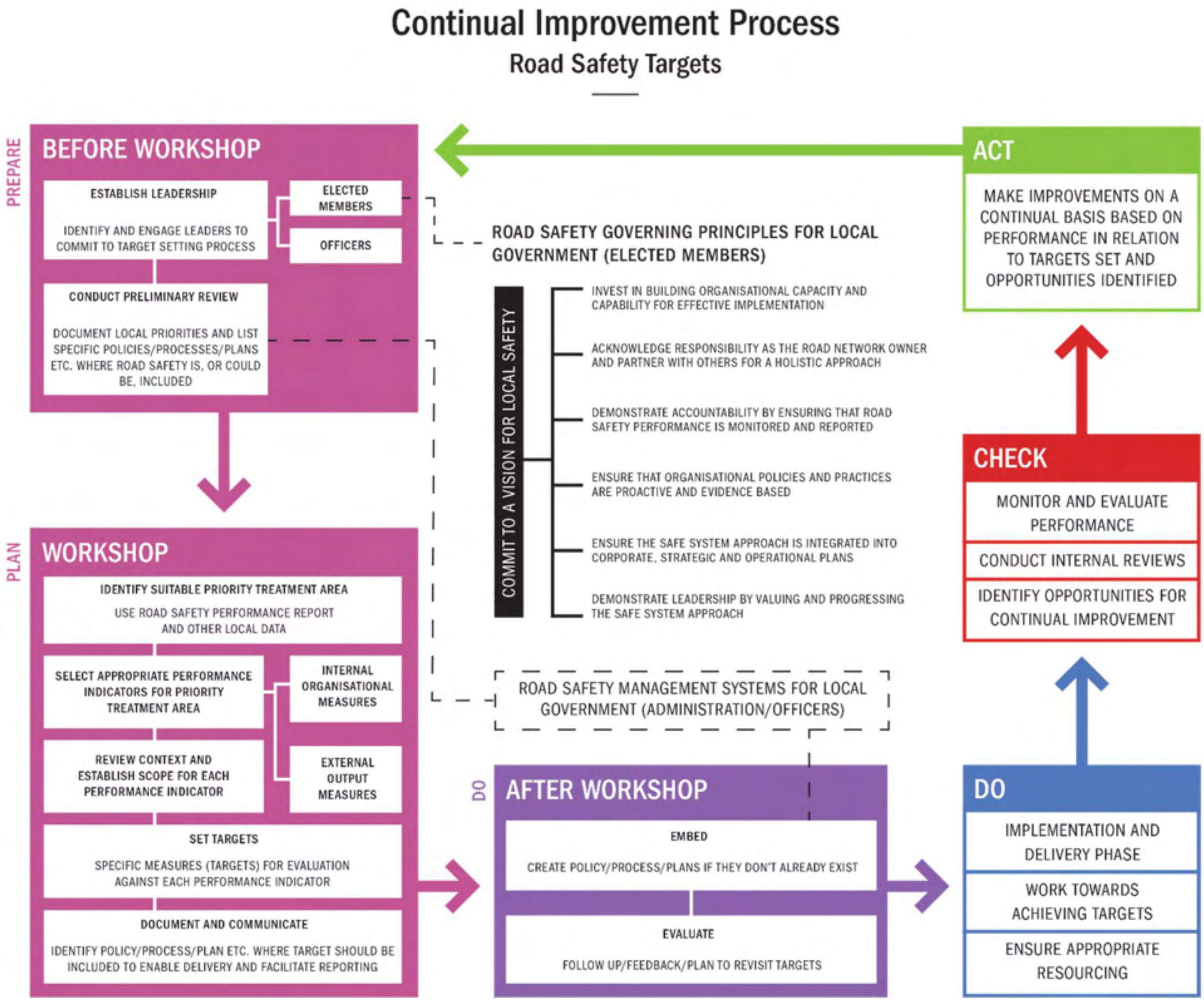
Continual Improvement Process
Road Safety Targets
PREPARE
BEFORE WORKSHOP
ESTABLISH LEADERSHIP
IDENTIFY AND ENGAGE LEADERS TO COMMIT TO TARGET SETTING PROCESS
ELECTED MEMBERS
OFFICERS
CONDUCT PRELIMINARY REVIEW
DOCUMENT LOCAL PRIORITIES AND LIST SPECIFIC POLICIES/PROCESSES/PLANS ETC. WHERE ROAD SAFETY IS, OR COULD BE, INCLUDED
PLAN
WORKSHOP
IDENTIFY SUITABLE PRIORITY TREATMENT AREA
USE ROAD SAFETY PERFORMANCE REPORT AND OTHER LOCAL DATA
SELECT APPROPRIATE PERFORMANCE INDICATORS FOR PRIORITY TREATMENT AREA
INTERNAL ORGANISATIONAL MEASURES
REVIEW CONTEXT AND ESTABLISH SCOPE FOR EACH PERFORMANCE INDICATOR
EXTERNAL OUTPUT MEASURES
SET TARGETS
SPECIFIC MEASURES (TARGETS) FOR EVALUATION AGAINST EACH PERFORMANCE INDICATOR
DOCUMENT AND COMMUNICATE
IDENTIFY POLICY/PROCESS/PLAN ETC. WHERE TARGET SHOULD BE INCLUDED TO ENABLE DELIVERY AND FACILITATE REPORTING
ROAD SAFETY GOVERNING PRINCIPLES FOR LOCAL GOVERNMENT (ELECTED MEMBERS)
COMMIT TO A VISION FOR LOCAL SAFETY
INVEST IN BUILDING ORGANISATIONAL CAPACITY AND CAPABILITY FOR EFFECTIVE IMPLEMENTATION
ACKNOWLEDGE RESPONSIBILITY AS THE ROAD NETWORK OWNER AND PARTNER WITH OTHERS FOR A HOLISTIC APPROACH
DEMONSTRATE ACCOUNTABILITY BY ENSURING THAT ROAD SAFETY PERFORMANCE IS MONITORED AND REPORTED
ENSURE THAT ORGANISATIONAL POLICIES AND PRACTICES ARE PROACTIVE AND EVIDENCE BASED
ENSURE THE SAFE SYSTEM APPROACH IS INTEGRATED INTO CORPORATE, STRATEGIC AND OPERATIONAL PLANS
DEMONSTRATE LEADERSHIP BY VALUING AND PROGRESSING THE SAFE SYSTEM APPROACH
ROAD SAFETY MANAGEMENT SYSTEMS FOR LOCAL GOVERNMENT (ADMINISTRATION/OFFICERS)
DO
AFTER WORKSHOP
EMBED
CREATE POLICY/PROCESS/PLANS IF THEY DON'T ALREADY EXIST
EVALUATE
FOLLOW UP/FEEDBACK/PLAN TO REVISIT TARGETS
ACT
MAKE IMPROVEMENTS ON A CONTINUAL BASIS BASED ON PERFORMANCE IN RELATION TO TARGETS SET AND OPPORTUNITIES IDENTIFIED
CHECK
MONITOR AND EVALUATE PERFORMANCE
CONDUCT INTERNAL REVIEWS
IDENTIFY OPPORTUNITIES FOR CONTINUAL IMPROVEMENT
DO
IMPLEMENTATION AND DELIVERY PHASE
WORK TOWARDS ACHIEVING TARGETS
ENSURE APPROPRIATE RESOURCING

What do Facebook Police location groups mean for road safety?

Lauren Mills, James Freeman and Verity Truelove

UniSC and MAIC Road Safety Research Collaboration

Abstract

Facebook police location communities (PLCs) refer to groups and pages on Facebook where users can share the locations of roadside police traffic enforcement, potentially enabling motorists to offend without detection. The current study aimed to explore how and why PLCs are used, with a focus on 30 Queensland motorists who consume illicit drugs and/or medical cannabis and use PLCs for obtaining information regarding Roadside Drug Testing (RDT) locations. Interviews were conducted with each participant. A thematic analysis revealed that participants used PLCs to avoid RDT and perceived drug driving laws to be unfair. Participants reported that they would delay driving or take a different route upon seeing a RDT location online but acknowledged that PLCs were not entirely accurate in posting all RDT operations that are occurring on the road. These results have policing and road safety implications.

Background

Police conduct thousands of roadside drug tests every year (57,749 in Queensland in 2021, BITRE, 2021) in an attempt to detect drug driving and increase motorists' perceptions regarding the likelihood of being caught. Despite police testing efforts, studies suggest that among individuals who consume drugs, the perceived likelihood of detection is low (Mills et al., 2022; Love et al., 2022). Some individuals even employ strategies to further reduce the likelihood they will be detected, such as using Facebook PLCs (Mills et al., 2022). PLCs refer to both pages and groups on Facebook where users can share and view the locations of traffic enforcement operations, including drug testing. With an opportunity to become aware of these operations before driving past them, motorists may be able to avoid detection. Despite several PLCs existing across Australia, research has yet to directly explore the use of these sites with those who use them. An interview study was conducted to fill this gap, with the overall aim being to explore how and why these sites are used, with a focus on individuals who: (1) drove on Queensland roads on a weekly basis, (2) used illegal drugs (or medical cannabis), and (3) used Facebook PLCs for information regarding RDT.

Method

A total of 30 individuals participated in this study which involved a zoom or phone interview (interviews took 25 minutes on average). Each interview started with questions assessing demographic and drug consumption characteristics and certainty of apprehension perceptions (Table 1), followed by open-ended questions assessing their use of PLCs (e.g., "for what purpose do you use PLCs"). All interviews were recorded and later transcribed. Participants' responses were thematically analysed.

Results

Six themes were identified which highlighted that participants:

- Used PLCs to avoid RDT operations.
- Perceived drug driving laws to be unfair which fueled their use of these sites (to avoid an "unfair penalty").
- Perceived the drug driving penalty to have a range of implications for their life including consequences for their career and relationships.
- Changed their behaviour upon seeing relevant RDT locations or high drug testing activity - some reported taking a different route, and others reported delaying driving.
- Would be affected differently if they could not access these sites (some expressed they would feel anxious without this information).
- Acknowledged these sites were not entirely accurate in posting all operations occurring on the road.

Table 1. Demographic and drug consumption information, and certainty of apprehension perceptions related to the use of Facebook police location communities

Continuous variables	**M**		**SD**		**Range**
Age	39.53		13.28		20 - 71
"What do you perceive is the likelihood of being caught (on a scale of 0% to 100%) with your current use of Facebook PLCs"	41%		32.6		0 – 100%
"What do you perceive is the likelihood of being caught (on a scale of 0% to 100%) if you could not use Facebook PLCs"	56.3%		31.36		0 – 100%
Categorical variables, N (%)					
Gender	**Male**			**Female**	
	16 (53.3%)			14 (46.7%)	
Facebook PLC type	**Group**		**Page**		**Both**
	4 (13.3%)		6 (20%)		20 (66.7%)
Drug used last 12 months	**Cannabis**	**Meth**		**MDMA**	**Cocaine**
	26 (86.7%)	11 (36.7%)		8 (26.7%)	12 (40%)

Conclusions

The study is the first to explore how and why PLCs are used and may be useful for designing more effective policing strategies. The finding that some participants delayed driving during high police activity highlights that broadcasting drug testing activity may be effective for preventing drug driving events. There may also be a need for greater use of 'random patrol' style enforcement activities which cannot be revealed by Facebook PLCs and may assist in detecting drivers trying to evade RDT locations on back roads.

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Young drivers co-designing campaigns for young drivers

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Department of Transport and Main Roads, Queensland

Abstract

'You're no dummy' was an initiative of the Department of Transport and Main Roads (TMR), to encourage young people to consider safety as a key priority when buying a vehicle. The campaign creative was delivered under TMR's road safety program 'Streetsmarts' and developed as part of the fourth Co-Lab Youth Road Safety Challenge (Co-Lab). Co-Lab is a co-design event where teams of young people pitch an idea for a road safety campaign aimed at their peers, on a pre-determined topic. As the winning concept, 'You're no dummy' was developed into a campaign for online and social media channels. The campaign was also supported by a web application - SafeCars. The SafeCars webtool draws upon crash testing and real-world crash data of vehicles and links it to their current market value. This allows people to quickly search for the safest cars available in their price range.

Background, purpose, description and effectiveness

Young drivers aged 17 to 24 years are at a greater risk on the road, especially in their first few years of driving. Young people are also driving some of the oldest cars on Queensland roads, with their average vehicle age between 10 and 14 years.[9] Research indicates older vehicles are consistently over-represented in serious injury crashes, with cars more than 10 years old unlikely to be fitted with safety features such as electronic stability control or side curtain airbags (Whelan et al., 2009). Market research conducted by TMR highlighted that many people did not rate safety as a priority when purchasing a vehicle, and did not know what to look for, or where to find that information easily (RSPAT Research, 2012). Young drivers were not prioritising safety as a key factor when buying their first car, instead focusing on price, type of vehicle and running costs. Their parents also rated price as their key consideration (RSPAT Research, 2012).

The goal of the 'You're no dummy' campaign was, therefore, to encourage young people to consider safety as a key priority when buying a vehicle. The campaign objectives were:

- For young drivers to check vehicle safety ratings when buying a car.
- For parents of young drivers to encourage their children to check vehicle safety ratings when buying a car.
- To encourage more young drivers to give greater priority to vehicle safety when buying a car.

[9] Department of Transport and Main Roads, Data Analysis Unit 1. As at 15 July 2019, the average age of vehicles owned by those aged 16 – 20 years in Queensland ranged from 11.65 to 14.64 years

The project consisted of three key elements:

1. A co-design event where young people were tasked with coming up with an idea for an online campaign encouraging their peers to prioritise safety when purchasing their first car.
2. The development and delivery of a targeted online campaign.
3. The provision of a web utility allowing young drivers, and their parents to search for the safest car they could afford, by linking vehicle market value data with ANCAP and used car safety ratings.

Findings

Evaluation highlighted that the campaign resonated with audiences, and positively impacted both attitudes and behaviours. Young drivers responded positively to this campaign, achieving 23,317,853 impressions, 48,056 clicks, and 6,153,190 completed video views online.
Post campaign market research highlighted that of those young people who recalled seeing the advertisement, 77 percent stated that they are now more likely to check vehicle safety ratings when buying a car (target 50%). 77 percent are now more likely to buy a car with a higher safety rating (target 50%), and 71 percent now know where to go to check vehicle safety ratings (target 60%).

This approach, drawing upon co-design theory, and anchored by rigorous road safety research and crash data has continued to deliver successful social marketing campaigns, generating successful engagement and delivering significant impact on the youth target audience. To date, TMR has collaborated with over 375 young people over four campaigns, reaching over 13.5 million people.

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Deep Learning-Based pavement defect detection

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Abstract

Pavement defects can significantly impact road safety, and detecting and repairing these defects is important. However, pavement defects detection by humans is time-consuming. With the advances in information and communication technology, many vehicles on the road are fitted with cameras, generating massive, crowdsourced data. This study demonstrates the usage of deep learning and computer vision to identify and classify pavement defects. We used the Road Damage Dataset 2022 (Arya et al., 2022) to train and test different object detectors, ensuring accurate and reliable detection. The initial results showed that it is possible to identify and classify pavement defects efficiently with results of 80% mAP50, reducing the risk of accidents, in addition, using these methods can lead to cost savings in maintenance and repair expenses, as well as reduce the environmental impact of routine road surveys.

Background, Method, Results and Conclusions

The primary goal of pavement defect detection is to identify and locate road damages such as cracks, potholes, and other types of pavement distress that can cause accidents and increase vehicle maintenance costs. Detecting and addressing these defects promptly is important to maintaining safe and efficient roadways.

This study proposes using Deep Neural Network object detection models including YOLOv5 (Ultralytics, 2021), YOLOv8 Jocher et al., 2023), as well as semantic segmentation techniques to identify and locate pavement defects in high-resolution images from the Road Damage Dataset 2022 (RDD2022) (Arya et al., 2022).. The dataset includes observations from six countries using road images that include damaged parts. The countries included are India, Japan, the Czech Republic, Norway, the United States, and China. However, we specifically used the dataset from India, which contains about 9000 images with various road conditions, including potholes, cracks, and bumps. The dataset was divided into training, validation, and testing. The dataset includes annotations (i.e., labels) for each image making it suitable for supervised learning. To prepare the RDD2022 dataset for Deep Learning, we converted the annotations into the required labels for each model. We verified the labels using automated and manual methods and conducted regular quality checks to ensure accuracy and consistency. Challenges encountered during this process included dealing with imbalanced data where the distribution of classes in a dataset is inconsistent. In other words, more than one class may have significantly more or fewer examples than the other classes, so we implemented the data augmentation technique and merged similar small classes during the data preprocessing phase. Another significant challenge was detecting defects only present in a small segment of the image while the rest was composed of a background.

Table 11: Road damage types of RDD2022

Damage Type			Detail	Class Name
Crack	Linear Crack	Longitudinal	Wheel mark part	D00
			Construction joint part	D01
		Lateral	Equal interval	D10
			Construction joint part	D11
	Alligator Crack		Partial pavement, overall pavement	D20
Other Corruption			Rutting, bump, pothole, separation	D40
			Crosswalk blur	D43
			White line blur	D44

To overcome this, a segmentation technique was implemented specifically for pavement insulation, which served as an important step in achieving a more accurate outcome from the detection.

We trained the models. This involves feeding the model with many pavement images and corresponding labels. Once the model has been trained, the results demonstrate the ability of the models to detect and classify pavement, results refer to the possibility of achieving good detection, but we are still working on it. The results are shown in Table 12. Outputs are a set of bounding boxes that indicate the location of pavement damage within the image, as shown in Figure 5. These bounding boxes can be used to highlight the areas of pavement damage, making it easier for road maintenance crews to identify and repair the damage.

Figure 5: Bounding Boxes

Table 12: detection results

Model	mAP50	Precision	Recall
Yolov5	61.0%	66.0%	67.0%
Yolov8	80.0%	80.0%	80.0%

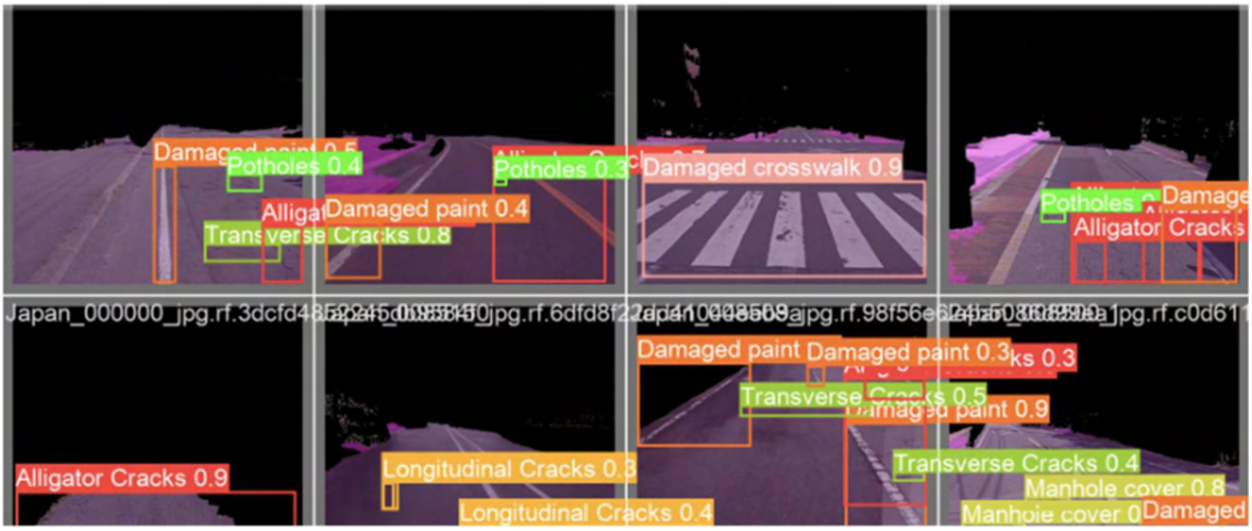

Figure 6: Sample from the detection task after blacking the background

In conclusion, YOLOv5, YOLOv8, **are showing promising results for pavement detection.** We are still working on comparing the two models, but initial results suggest that they can both accurately detect and locate pavement damage areas. Semantic segmentation is another technique we are exploring, and we believe that it can potentially improve the accuracy of pavement detection even further.

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Perceptual countermeasure for improving motorcyclist safety on rural curves

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Abstract

An evaluation was conducted on whether a suitable road-based Perceptual Counter-Measure (PCM) could induce motorcyclists to choose safer speeds and lane positions when negotiating curves. A peripheral transverse line marking was designed and trialled at two curves along a popular motorcyclist route. Results were compared against control curves. Given the PCM specific aim of reducing intentional centreline crossings along the curve chord, onply the right-bending lane was treated and evaluated. Post-treatment, motorcyclists tended to position further away from the centreline compared to before the treatment. Motorcycle travel speed at the apex of both treated curves tended to decrease. Moderate reductions in travel speed were also observed for light and heavy vehicles. The PCM design has potential to enhance motorcyclist safety along popular riding routes. Additional research is required to confirm long-term effects and investigate potential additional benefits or side effects.

Background

Single-vehicle motorcycle crashes often occur on curved sections of road. Enhancing curve delineation is one countermeasure with the potential to reduce the likelihood of motorcyclists failing to maintain lane position on curves (Hirsch et al., 2018; Mulvihill et al., 2008). Reducing travel speed is another means for addressing motorcycle crash risk on curves (McCauley et al., 2002). In this project, a specifically designed lane marking layout was trialled to test if it could alter travelling speed and/or lane position of motorcyclists when negotiating curves along a popular recreational riding route. This project was commissioned by Austroads and managed by Queensland's Department of Transport and Main Roads.

Method

A controlled before -after evaluation was conducted to assess the safety effect of the PCM during the trial. A suitable design for a motorcyclist Perceptual Counter-Measure (PCM) (Godley et al., 1999, Fildes & Lahausse, 2008) was initially identified through a literature review and subsequently refined based on engineering judgement and feedback from stakeholders. The selected design was a peripheral transverse line marking treatment with incrementally wider centreline painted blocks through the apex of the curve, as shown in Figure 1.

The trial was conducted on Mt Mee Road (Queensland), a popular riding route with a known crash history. The PCM was trialled at two curves characterised by a large and small radius of curvature, respectively. Two additional curves matched to each of the treated curves were used as controls. Given the PCM specific aim of reducing intentional centreline crossings through the curve chord, only the travel lane curving to the right-hand side was treated and evaluated.

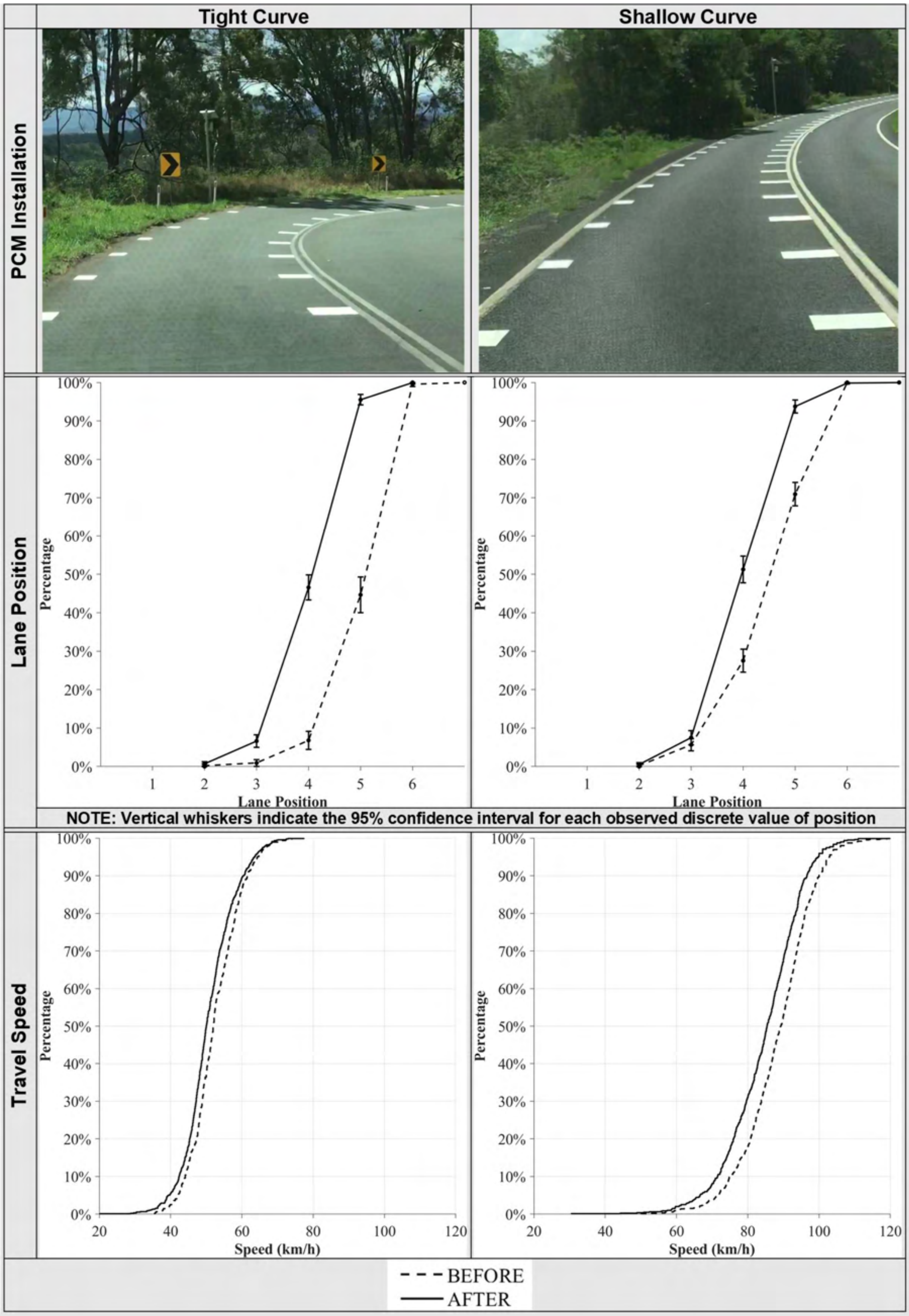

Figure 1. Installed PCM (top) and cumulative distributions of speed (middle) and lane position (bottom) at the curve apex

Travel speeds at the curve apex and motorcycle lane position at both the entry and the apex of each trial curve were measured and analysed. The following filter criteria were considered in the analysis: (a) dry road surface, (b) free travelling speed, and (c) no oncoming traffic.

Results and Conclusions

The major trial results are summarised in the graphs of Figure 1 and in Table 1. A larger proportion of motorcyclists tended to position further away from the centreline compared to before the treatment. After accounting for the controls, the before-after variation in the proportion of motorcyclists riding in the monitored lane segment closest to the centreline at the curve apex was -43.1 and -17.2 percentage points at the tight and shallow curves, respectively. Motorcyclists also tended to position themselves conservatively within the lane, as indicated by a considerable post-treatment increase in the proportion of motorcyclists riding within the left most 2/3 of the lane at the curve apex (+40 and +23.8 percentage points after adjusting for the controls at the tight and shallow curves, respectively).

Motorcycle travel speed at the apex of both treated curves tended to decrease. Moderate reductions in travel speed at the apex of the treated curves were also observed for light and heavy vehicles. Note that this trial was limited to a small sample size of two treated curves, which did not allow for tests of statistical significance of the effects observed across sites. Nonetheless, the number of observed motorcycles over the before and after 4-week periods was large enough to guarantee a robust statistical evaluation at each site (varying between 756 and 992 observations across all the sites and trial periods).

Table 1. Proportion of motorcyclists riding within or below each of the six defined lane positions before and after PCM installation

			Percentage of motorcycles (Lane position* measured at Curve Apex)					
			<=1	***<=2***	***<=3***	***<=4***	***<=5***	***>=6*** +
Tight Curves	**Treatment**	**Before**	0.0	0.2	0.9	6.8	44.7	55.3
		After	0.0	0.7	6.6	46.6	95.5	4.5
		Variation	0.0	0.5	5.7	39.8	50.8	-50.8
	Control	**Before**	0.0	0.4	0.4	0.6	18.2	81.8
		After	0.0	0.0	0.1	0.4	25.9	74.1
		Variation	0.0	-0.4	-0.3	-0.2	7.7	-7.7
		Controlled Variation	-	0.9	6.0	40.0	43.1	-43.1
			<=1	***<=2***	***<=3***	***<=4***	***<=5***	***>=6***
Shallow Curves	**Treatment**	**Before**	0.0	0.2	5.6	27.5	70.9	29.1
		After	0.0	0.5	7.5	51.3	93.8	6.2
		Variation	0.0	0.3	1.9	23.8	22.9	-22.9
	Control	**Before**	0.3	0.3	0.9	8.0	43.1	56.9
		After	0.0	0.0	1.1	8.0	48.8	51.2
		Variation	-0.3	-0.3	0.2	0.0	5.7	-5.7
		Controlled Variation	0.3	0.6	1.7	23.8	17.2	-17.2

***** Lane width equally divided into 6 sections (1 = most left 6 = closest to centre line)***

+ Lane position > 6 indicates motorcycles crossing the centreline (only 2 events detected)

Generally, results were in line with other recent and past trials on motorcyclist-focused PCMs (Abdelmesseh, 2021; Stedmon et al., 2021; Hirsch et al.,2018; Winkelbauer et al., 2017; Mulvihill et al., 2008). The trialled design has high potential to enhance motorcyclist safety at critical curves along regional and rural routes. Nonetheless, additional research is required to confirm whether the results observed in this trial are sustained in the long term and to investigate potential additional benefits/side-effects. High-friction paint or thermoplastic film is suggested for future implementations of the PCM.

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Methodology for analysing crash data as part of Surf Coast Shire Road Safety Strategy 2022-2027

Daniel Mustata, Duc Phan and Gino Dimacali

Road Solutions

Abstract

The Surf Coast Shire Road Safety Strategy and Action Plan 2022-2027 has been prepared to address the ongoing and emerging road safety issues for Surf Coast Shire. The development of the Plan was underpinned by an in-depth crash analysis where the road safety problems were identified through a thorough understanding of the types, frequency, and locations of crashes. Combining descriptive analysis, spatial analysis, and a crash weighting method, the study has successfully captured the safety issues on Surf Coast Shire roads by identifying 14 categories of concern and ranking major crash types within each category. This information was utilised to support the identification of strategic focus areas, goals, and an action plan for the strategy. The crash analysis presents a comprehensive and robust methodology that can be applied to other road safety strategies. Further developments may consider incorporating a crash prediction model into the analysis.

Background

Located along the Great Ocean Road, Surf Coast Shire (SCS) is a popular holiday/recreational destination in Victoria, particularly during the summer months. The shire also includes several agricultural centres and continues to attract substantial residential growth. The estimated population of the SCS for 2021 is around 36,000 resident population, forecasted to grow to around 41,000 by 2026 and around 45,000 by 2031 (AECOM, 2015). In addition, SCS has an aging population.

The SCS Road Safety Strategy and Action Plan 2022-2027 has been prepared to address the ongoing and emerging road safety issues for SCS over the next five years. The strategic goals are subordinated to the national and state Vision of Zero Deaths by 2050, aiming to reduce the rate of people killed as a result of road crashes in SCS.

Crash analysis

Data and methodology

For this strategy, VicRoads (DTP) made available the data from the DTP's Road Crash Information System (RCIS) for SCS for the period from 2010 to November 2020. Using a GIS tool, crash locations were overlaid on the road network and are classified by the road owners. The strategy focuses on analysing crashes on SCS council-controlled roads.

The crash analysis first introduced an overview and general trend of crashes from 2010 to 2020. Crashes were then divided into two five years periods (2011-2015 and 2016-2020) for comparison. Next, statistics for crashes and casualties were derived based on location, time, infrastructure type, road conditions, road user types, and crash types. Heat maps were produced to understand the spatial distributions. The analysis then indicated 14 categories of concern that highlight the characteristics of crashes on SCS Council roads in the last five years (2016-2020). It is noted that a crash can have multiple characteristics and thus may be captured in several categories. The number of fatalities and share of serious injuries in the total of all serious injuries across all categories are presented for each category.

Finally, crashes on SCS Council roads in each category were weighted to identify a priority list of the most impactful crash types that might require countermeasures. The weighted scores were calculated based on the cost of human capital values (Transport and Infrastructure Council, 2015) for each severity level (fatal, serious injury, and minor injury).

Results

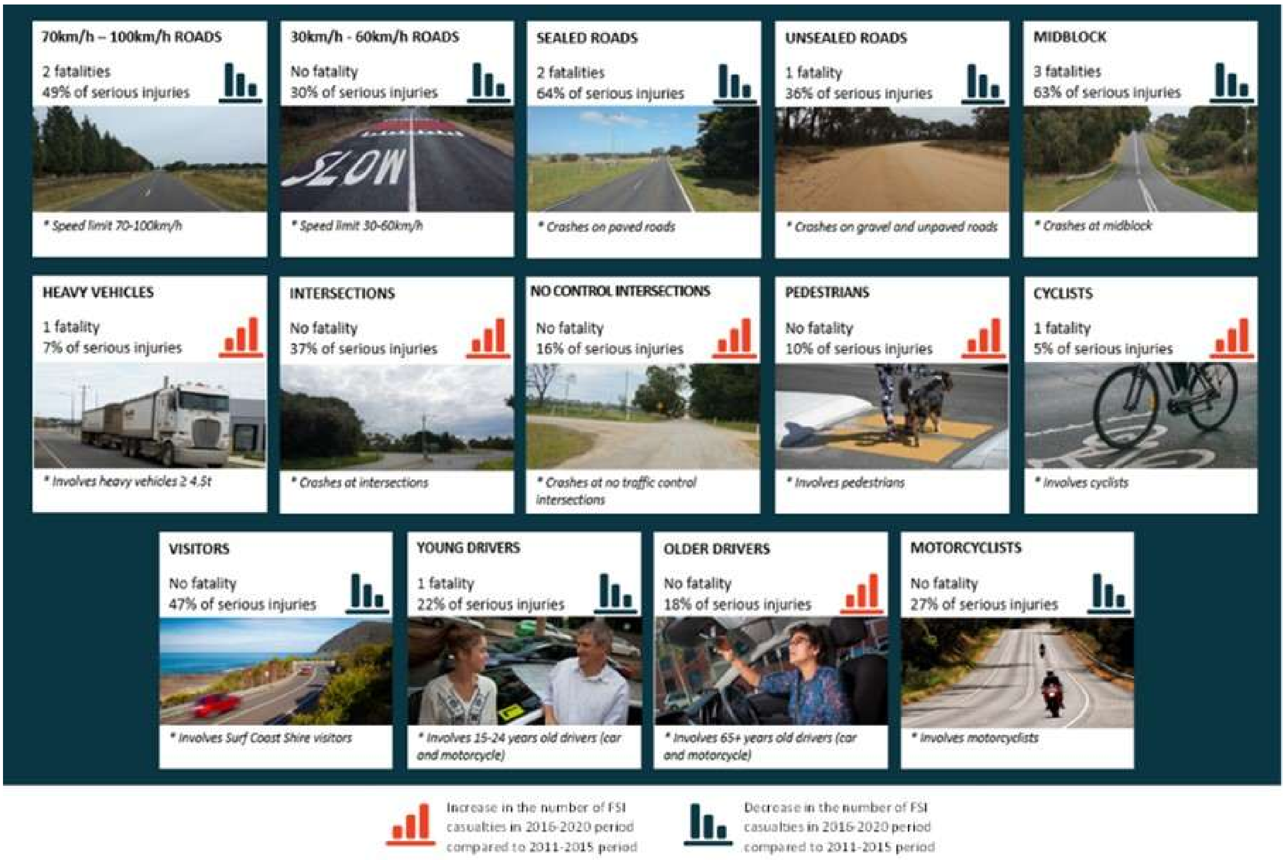

Figure 1. Categories of concern for crashes from 2016 to 2020

In general, the total number of crashes and fatal and serious injury (FSI) casualties reduced over the years. However, there are some concerning increases in FSI casualties related to heavy vehicles, intersections, pedestrians, cyclists, and older drivers. In addition, as a characteristic of a tourism shire, there is a high number of serious injuries related to visitors and motorcyclists.

Using the weighted crash score by severity levels and crash type, the analysis team identified major crash types for each category of concern.

Conclusions

Combining descriptive analysis, spatial analysis, and a crash weighting method, the study has successfully captured the safety issues on Surf Coast Shire roads by identifying 14 categories of concern and ranking major crash types within each category. This information was utilised to support the identification of strategic focus areas, goals, and action plan for the strategy. The crash analysis presents a comprehensive and robust methodology that can be applied to other road safety strategies. Further developments may consider incorporating a crash prediction model into the analysis.

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Motorcycle safety countermeasures for Inner Melbourne

Daniel Mustata, Duc Phan and Gino Dimacali

Road Solutions

Abstract

Melbourne Metro has one of the highest rates of reported motorcycle fatal and serious injury (FSI) crashes in Victoria (TAC, 2021). A three-year plan with motorcycle safety countermeasures for the inner Melbourne Metro is being developed that aims to reduce motorcycle FSI crashes. First, a crash analysis was conducted to identify major motorcycle crash issues in the city. Then, Strategic Focus Areas and Targeted Outcomes for the improvement of motorcycle safety were identified. Next, stakeholder engagement and a literature review were done to explore effective and innovative countermeasures. The study has successfully identified 19 major countermeasures, across 4 groups (infrastructure, vehicle and PPE, education, enforcement, and legislation). Together, proposed countermeasures account for all Strategic Focus Areas and Targeted Outcomes as well as the reduction of all major motorcycle crash types. In addition, the study suggested a list of potential countermeasures for future research opportunities.

Background

Reducing motorcycle FSI has been highlighted in multiple road safety strategies (DITRDC, 2021; DOT, 2021). Given the Melbourne Metro has one of the highest rates of reported motorcycle crashes FSI in Victoria (TAC, 2021), a three-year safety plan for the inner Melbourne Metro, named 'Inner Melbourne Motorcycle Safety Study', is being developed that aims to reduce motorcycle FSI. The content of this paper forms a major part of the developing plan. Figure 1 presents the development process of the plan.

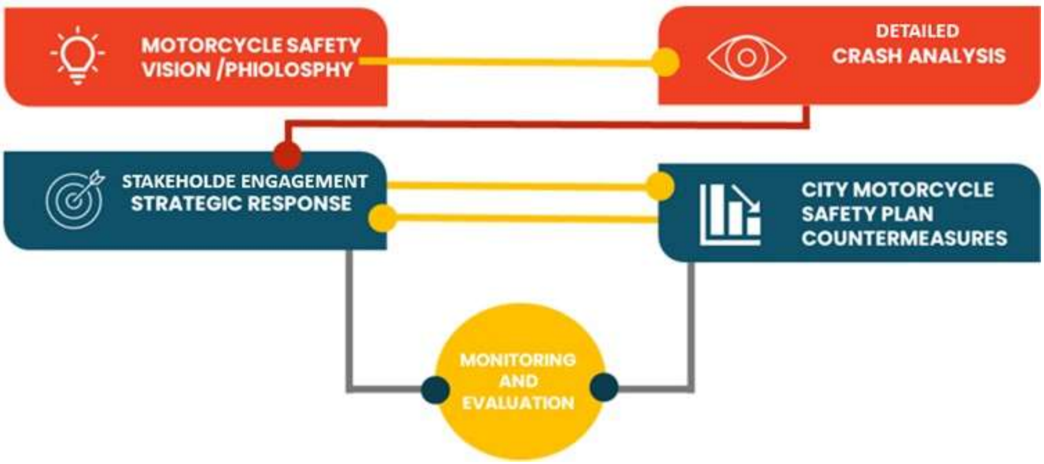

Figure 1. The plan development process

Crash data including all motorcycle-related crashes from 2011 to 2020 in the study area were given by the Department of Transport. To analyse the data, firstly a descriptive statistic was conducted to identify major motorcycle crash types in the city. The authors, then, ranked a crash type by the number of crashes and the severity of crashes. The weights of different crash severity levels were based on the estimated monetary costs of that severity types that were identified in Table 4.6 in the Victorian Human Capital Costs for Urban Roads (Transport and Infrastructure Council, 2015). A list of Priority Level 1 including 9 highest frequency and most severe motorcycle crash types was identified (Table 1).

Table 1. Summary of countermeasures

DCA descriptions (Priority Level 1)		Intersections		Mid-block				Pavement	Road Operations	
		1. FCRT off peak	2. Unsignalised intersection assessment	3. Systemic Risk Assessment Tool	4. Reduce road hazards for motorcycles	5. Barriers	6. Bus Lane Access	7. Improve Skid resistance	8. Routine and proactive road inspections	9. Speed Mgmt
Suitability and strategic alignments	Rating	1	1	1	2	3	2	1	1	1
	Strategic Focus Area	1	1	1	1	1	1	1	1	2
	Targeted Outcome	1	1	1, 2, 8	1, 2	2	2	1, 2	1, 2, 7	3
(174) Out of control on carriageway (on straight)		✗	✗	✓	✓	✓	✓	✓	✓	✓
(121) Right through		✓	✓	✓	✓	✗	✓	✓	✓	✓
(130) Rear end		✗	○	✓	✓	✗	✓	✓	✓	✓
(140) U-turn		✗	✓	✓	✓	✓	✓	✓	✓	✓
(134) Lane change right (not overtaking)		✗	✗	✓	✓	✗	✓	✓	✓	✓
(135) Lane change left (not overtaking)		✗	✗	✓	✓	✗	✓	✓	✓	✓
(110) Cross traffic (intersections only)		✗	✓	✓	✓	✗	✓	✓	✓	✓
(136) Right turn sideswipe		○	✓	✓	✓	✗	✓	✓	✓	✓
(113) Right near (intersections only)		○	✓	✓	✓	✗	✓	✓	✓	✓

Table 1. Summary of countermeasures (continued)

DCA descriptions (Priority Level 1)		Vehicle and PPE				Education			Enforcement		
		10. PPE star safety rating schemes	11. Mandate use of high-visibility clothing	12. Innovative motorcycle technologies	13. Innovative PPE design	14. Rider training	15. Work-related vehicle safety practices	16. Provide high-visibility vests	17. Daytime running lights	18. DUI	19. Mobile phone detection cameras
Suitability and strategic alignments	Rating	1	1	2	1	1	1	1	1	3	1
	Strategic Focus Area	3	3	3	3	3	3	3	3	3	3
	Targeted Outcome	6	6	8	8	6	6	6	5	4	5
All priority 1 crash types		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: ✗ not applicable; ○ potential; ✓ applicable

Based on the above aim and findings, three Strategic Focus Areas have been identified:

1. Intersection and mid-block safety
2. Speed management
3. Legislation and enforcement

In addition, eight Targeted Outcomes are set that aim to:

1. Improve intersection design
2. Increase motorcycle visibility and compliance with the road rules
3. Reduce the impact of speed
4. Reduce alcohol- and drug-related crashes
5. Reduce distracted behaviour
6. Raise risk awareness and riding skill among motorcyclists
7. Increase open communication with stakeholders and motorcycle communities
8. Inform actions through data, research, and evaluation

A literature review was done to explore effective and innovative countermeasures that could be suitable for inner Melbourne contexts. In addition, engagement with several key stakeholders was undertaken such as Department of Transport and Planning, Australian Motorcycle Council, Victoria Police, gig economy (e.g., Deliveroo), European experts, and motorcyclists to deeply understand their needs and preferences on various countermeasures.

Motorcycle Safety Countermeasures

Countermeasures have been classified into the following categories:

- Infrastructure Countermeasure
    - Intersections
    - Mid-block
    - Pavement
    - Road operations
- Vehicle and PPE countermeasures
- Education
- Enforcement and Legislation
- Future research opportunities

For each countermeasure, strengths and weaknesses are identified along with an ideal use case scenario, supported by a case study (where applicable) to further illustrate its effective usage.

A concluding statement on the potential suitability of the treatment is provided, along with a Suitability Rating of 1 (very suitable) to 3 (least suitable). Table 1 and Table 2 summarise the list of identified motorcycle safety countermeasures and their alignment in addressing the Strategic Focus Areas, Targeted Outcomes, and major motorcycle crash types. In addition, the study provided a list of potential countermeasures for future research opportunities (e.g., rider's choices of safety gear, compatibility of applying European standards for safety gear on Australian roads, integration of motorcycles in a future connected mobility system, application of a delineated motorcycle filter lane in the centre of the carriageway, etc).

Conclusions

The study has successfully identified 19 major countermeasures, across 4 groups (infrastructure, vehicle and PPE, education, enforcement, and legislation). Together, proposed countermeasures account for all Strategic Focus Areas and Targeted Outcomes as well as the reduction of all major motorcycle crash types. In addition, the study suggested a list of potential countermeasures for future research opportunities. Based on the findings, an innovative countermeasure is being implemented which will be discussed in the next step of this study.

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Let's redesign our roads NOW

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Abstract

The road environment is complex. The physical infrastructure of our roads and paths host interactions between different road users, vehicles and speeds with road rules an ever present factor. But when combined, all these elements can be difficult to fully comprehend. The aim of this workshop is to demonstrate how to simulate road user interactions at a desktop scale using the Mobility Kit. The Mobility Kit is a refined simulation method using scale LEGO® elements and Road Rule Cards. Mobility Kits will be provided to in-person delegates to use, with instructions for virtual delegates to participate online in breakout rooms. Participants will take away specific know-how in staging simulations and how to adapt the simulations for their local environment. Safe Travel for All is addressed as the Mobility Kit creates an inclusive road user environment and breaks down technical barriers to make road safety accessible to everyone.

Facilitator: A/Prof Robbie Napper

A/Prof Robbie Napper is a senior lecturer in design at Monash University. He has facilitated research workshops for state and federal research projects in road design, and delivered 15 years of interactive classroom experiences for undergraduate and postgraduate education. His facilitation expertise spans in-person and online media.

Workshop leader: A/Prof Marilyn Johnson

A/Prof Marilyn Johnson is a senior researcher at the Cities Institute, University of New South Wales (UNSW, Sydney) and the Editor-in-Chief, Australasian College of Road Safety. Marilyn has two decades of experience in road safety and injury prevention and is responsible for the development and national adoption of the minimum passing distance legislation. She has extensive experience delivering workshops that are innovative, accessible and engage participants attending in-person and online (e.g., Family Feud, Gruen Transfer, Cycle Aware etc).

Workshop leader: Dr Vanessa Johnston

Dr Vanessa Johnston is a senior lecturer in RMIT University's Graduate School of Business and Law. She has led interactive workshops on road design and road rules, and delivered interactive education to undergraduate and postgraduate students for 8 years. Vanessa is an expert in the Australian model road rules and related state road rule legislation. She is highly experienced in bringing her knowledge to a non-legal audience, both road safety and transport practitioners as well as the general public.

Overview of workshop

Having a new tool, and the knowledge to use it, will empower participants in their own work, for example the ability to simulate and redesign streets at scale. The Mobility Kit enables everyone to understand the spatial, temporal and legal aspects of road user interactions with approachable tools (Napper et al., 2021).

This interactive workshop is structured in three parts. First, a presentation of the Mobility Kit, providing the technical, design and legal underpinnings. Second, is a training session which gives conference delegates the opportunity to use the Mobility Kit and share their in-person and online designs. Third, is a final conclusion and wrap-up. The stages of the 90 minute workshop are detailed in Table 1.

Table 1. Workshop stages and timing

<table>
<tr><th colspan="2">Activity</th><th>Timing</th><th>Description</th><th>Resources</th></tr>
<tr><td rowspan="2">Presentation</td><td>Introduction (Napper, Johnson)</td><td>15 mins</td><td>Introduces the need for Mobility Kit and its parts</td><td>Mobility Kits including LEGO® elements, road rule cards (provided by authors). Group tables, chairs, paper and pens. Audiovisual equipment in room (large screen, microphone, speakers etc)</td></tr>
<tr><td>Road rules (Johnston)</td><td>7 mins</td><td>Pre-record presentation of how the road rules interact with road design*</td><td>Audiovisual equipment in room</td></tr>
<tr><td rowspan="2">Interactive</td><td>Design session one (Napper, Johnson)</td><td>25 mins</td><td>In groups, participants build a difficult road user environment from their own jurisdiction through iterative discussion.</td><td rowspan="2">In-person
Mobility Kits including LEGO® elements, road rule cards (provided by authors). Group tables, chairs, paper and pens. Audiovisual equipment in room (large screen, microphone, speakers etc).

Virtual
Instructions will be provided on how to replace the Mobility Kit with access to the road rules cards. Delegates will meet in breakout rooms to complete the same activities.

Facilitation
Napper and Johnson will move between the in-person and virtual groups.</td></tr>
<tr><td>Design session two (Napper, Johnson)</td><td>25 mins</td><td>In groups, participants redesign their road user environment to improve safety through discussion. Participants upload a photo of their completed design to the facilitator for sharing on the big screen.</td></tr>
<tr><td>Discussion</td><td>Share back (all)</td><td>10 mins</td><td>All groups share their results.</td><td>Audiovisual equipment in room.</td></tr>
<tr><td>Presentation</td><td>Conclusion (Napper, Johnson)</td><td>8 mins</td><td>Facilitators share next steps, how to acquire their own materials and thank the audience.</td><td>Audiovisual equipment in room.</td></tr>
</table>

* Vanessa Johnston will be travelling during the conference and is not able to attend. Her legal expertise on the road rules will be pre-recorded and played for both in-person and virtual delegates.

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Napper, R., Johnson, M., & Johnston, V. (2021). Safety, Design and Law: A New Interdisciplinary Approach to Bicycle Rider Road Safety. Advancing a Design Approach to Enriching Public Mobility, 79-101.

Systems Thinking in Action: optimising learnings in workplace road safety

Sharon Newnam[a] and Jerome Carslake[b]

[a] Queensland University of Technology, [b] National Road Safety Partnership Program

Abstract

There is little understanding of best practice approaches for the prevention of incidents involving the operation of work-related light motor vehicles (<4.5 tonnes). To overcome this gap, a system thinking tool was developed to provide a standardised process for reviewing and revising risk controls following the report of an incident involving a work-related light vehicle. This presentation presents a summary of the (i) methodology underpinning development of the tool and (ii) pilot application of the tool for guiding systems thinking investigation of a work-related driving incident involving a light vehicle.

Background

Workers operating light motor vehicles are at significant risk of being injured on the road. However, limited lessons have been learnt for preventing incidents. We have learnt from other safety critical environments (Newnam et al., 2020; Newnam et al., 2021) that a systems thinking approach is needed as a first step to better understand incidents so that feasible and practicable control measures are identified to mitigate the risk of future incidents. A prototype 'systems thinking' tool has been developed to review and revise control measures to prevent and manage light vehicle work-related driving incidents (i.e., defined as any incident resulting in an injury, property damage, or other negative outcomes that directly impact an employee, including a near crash). This presentation (i) describes the methodology underpinning development of the tool and (ii) illustrates application of the tool for guiding systems thinking investigation of a work-related driving incident involving a light vehicle.

Method

Four stages were involved in the development of the tool including:

1. Systematic review of the literature to identify factors associated with work-related driving crashes.

A comprehensive list of search terms was developed to guide the search using the categories (i) *primary context*, including workplace (i.e. workplace, work-related, occupation*, vocation*, professional) AND driving (driv*, transport, fleet, vehicle*, commercial), AND injury / incident (injur* (NOT chemical), safety, risk), (ii) *outcome* focused terms (e.g. crash*, accident*, ticket*, fine*, penalty, infringement*, near miss*, loss of control); and (iii) *Other* terms to help to limit/refine the scope of the literature to papers with a focus on factors contributing to such incidents (e.g. caus*, contrib*, predict*, risk factor*, determin*, predict*). The search was restricted to journal articles published from 2010 through to 2021. Six databases were used to conduct the search (Medline, PubMed, AMED, Scopus, PsycINFO and Web of Science).

2. Workshop with representatives from MUARC, WorkSafe Victoria, industry and the Program Director of the NRSPP

The workshop was to (i) identify and refine risk factors beyond those already identified in the systematic review and (ii) contextualise the wording of the risk factors to ensure relevance to the context.

3. Development of a classification scheme

The risk factors identified in the systematic review and the workshop were consolidated and illustrated at each level (see Figure 1) of Rasmussen's (1997) adapted risk management framework.

4. Creation of the tool

Five templates were developed for pilot application of the tool including (i) Case summary, (ii) Stakeholder consultation, (iii) Review of control measures, (iv) Visual representation of the review using Accimap, and (v) Revision of control measures.

An organisation was recruited to pilot application of the tool. In this organisation, staff are required to drive a light motor vehicle for multiple reasons (e.g., visiting various client locations). Pilot application of the tool was undertaken using an incident which was reported by a worker in the organisation. Data was obtained via interview with the worker involved.

Results

Summary of the incident: The load in the vehicle in front of the worker's vehicle was not secured and came loose. A large tub dropped out the vehicle and went under the worker's vehicle. The side bumper of the worker's vehicle came loose consequently. The incident under investigation resulted in damage to the vehicle but no injury to the worker. Figure 1 shows the complex system of factors (using the Accimap technique; Rasmussen, 1997) that were identified in this investigation.

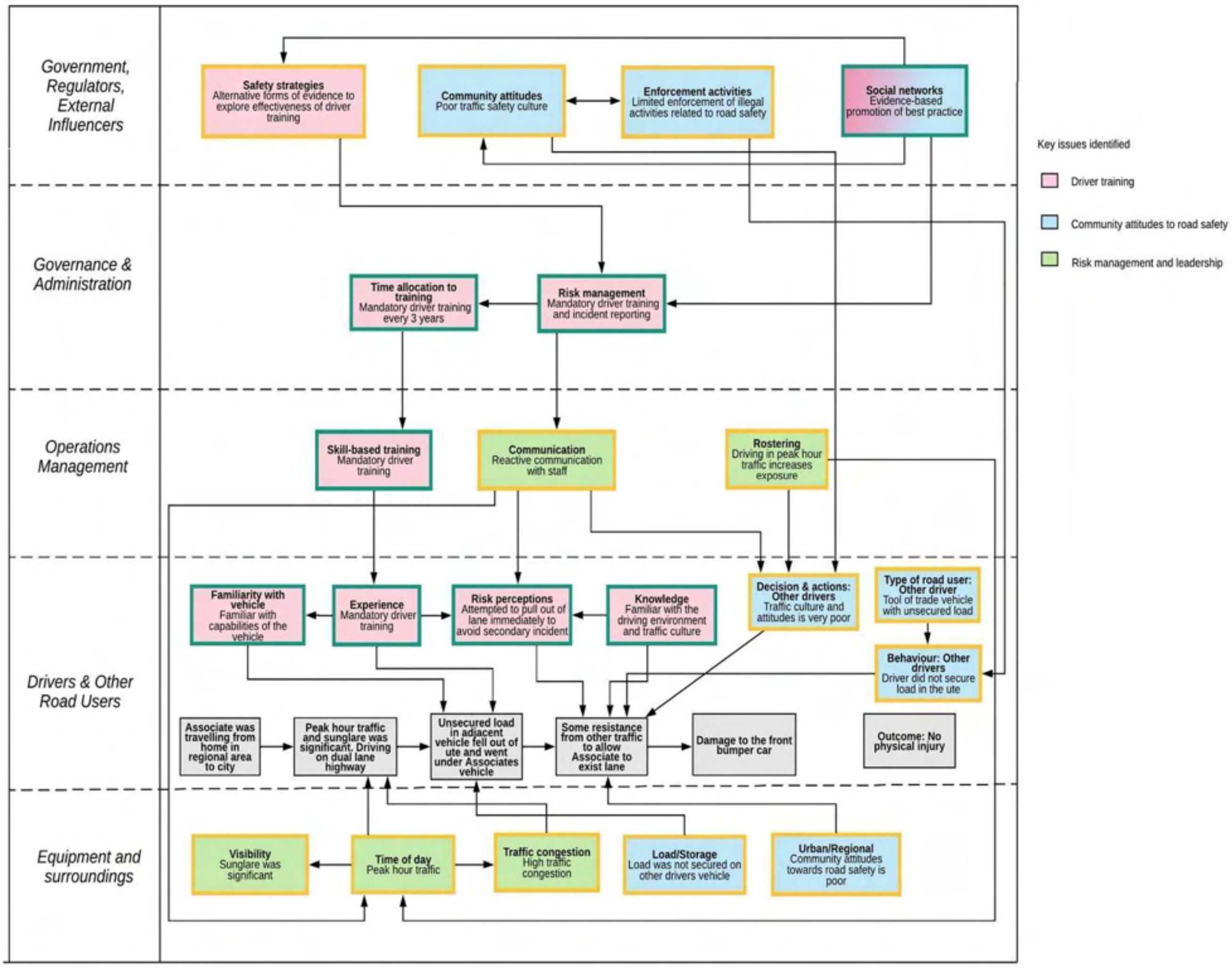

Figure 1. Accimap of light motor vehicle incident

Conclusion

Pilot application of the tool provided evidence that the tool helped guide systems thinking investigation of incidents. Specifically:

1. Risk and protective factors were identified within and across all five levels of the system. There was also a significant number of factors identified at the higher levels of the system, which would not have been identified using a traditional (i.e., linear) approach to investigations.
2. The Accimap method illustrated the complex network of factors that contributed to the incidents under investigation. That is, relationships were identified between factors within and across levels of the system.

This presentation will describe the actions generated from the pilot application and next steps for use of the tool.

Acknowledgement

This project was funded by the Institute for Safety, Compensation and Recovery Research (ISCRR).

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Lane Keep Assist Systems for Light Vehicles: An Australian evaluation

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Abstract

Lane departure crashes on high-speed rural roads in Australia account for 42 percent of fatal crashes involving light vehicles. To assess the potential road safety benefits of active lane keep assist systems (LKAS) in Australian light passenger vehicles, a study was conducted using induced exposure methods applied to crashes in Australia's five largest states from 2013 to 2019. Target crashes for LKAS were lane departure related crashes in speed zones of >70km/h on sealed roads. The analysis estimated LKAS was associated with statistically significant reductions of 22 percent and 16 percent for serious casualty and all casualty target crashes, respectively. If all Australian light vehicles were fitted with LKAS, overall reductions in crashes involving light vehicles of 1.76 percent for all casualty crashes, 3.46 percent for serious injury crashes and 9.09 percent for fatal crashes were estimated. These estimates may be conservative as not all vehicles equipped with LKAS could be identified in the data.

Background and Aims

The Victorian Department of Transport and Planning (DTP) places a significant emphasis on vehicle safety and technology, particularly through its collaboration with the Australian Government to accelerate the regulation of advanced safety systems in vehicles, including lane keeping assistance and warning technology. To support this goal, DTP commissioned MUARC to undertake the project to calculate the potential road safety benefits that can be derived through the mandatory fitment of LKAS in all new light vehicles entering the Australian market.

Methods and Data

Police reported crash data from Queensland, New South Wales, Victoria, South Australia and Western Australia over the years 2013 to 2019 was used to estimate both the annual number of crashes and resulting injuries potentially mitigated by LKAS and the real-world crash effects of LKAS. Makes and models of vehicles recorded in the crash data were identified using a process of Vehicle Identification Number decoding whilst the fitment LKAS was identified using vehicle specification data provided by RedBook. Real-world crash effects were estimated using an induced exposure evaluation design. This design compares the ratio of crashes potentially mitigated by LKAS to those not potentially prevented by LKAS in vehicles fitted with LKAS compared to those not fitted with LKAS. Comparison of these ratios provides an estimate of crash risk reduction associated with the technology.

Results

To identify the crashes that could potentially be mitigated by LKAS in light vehicles a review of the available literature was conducted. The target crashes were identified as single-vehicle and multi-vehicle head-on and sideswipe crashes on roads with speed limits of 70km/h or greater that were not covered in snow or ice and were sealed. Crashes from changing lanes, merging, passing, turning, or backing prior to the crash were excluded from the analysis (Anderson et al., 2011; Ciccino, 2018; Kusano et al., 2014; Sternlund, 2017; Sternland et al., 2017). LKAS sensitive crashes make up 42 percent of all fatal crashes and 15 percent of serious casualty and 11 percent of all casualty crashes involving light vehicles in Australia. These crashes were more prevalent in higher speed areas

(>=100km/h speed zones) with 72-75 percent of target fatal crashes and 80-83 percent of serious injury crashes occurring in these areas.

Analysis estimated LKAS was associated with statistically significant reductions of 22 percent and 16 percent for serious casualty (fatal and serious injury) and all casualty target crashes respectively. If all light vehicles in Australia were fitted with LKAS, savings across all light passenger vehicle involved crashes of 1.76 percent for all casualty crashes, 3.46 percent for serious injury crashes and 9.09 percent for fatal crashes were estimated. The majority of casualty crash savings estimated (60%) were in higher speed areas with the corresponding figure for fatal crashes being 71 percent.

Conclusion

LKAS is an important and highly effective technology for preventing crashes involving unintentional lane departures of light vehicles, particularly on high speed rural roads. Mandating its fitment to all new light vehicles sold in Australia would yield significant road safety benefits. The estimates from this study are likely conservative given not all variants of vehicle models identified as fitted with LKA in the analysis may actually have the technology fitted and some drivers choose to turn the technology off when fitted. To realise the full benefits of LKAS in Australia, supporting infrastructure, including appropriate line marking, must be applied to all roads.

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Older Australian drivers' preferences in purchasing decisions: advanced vehicle technology

Helen Nguyen[a], Kristy Coxon[b], Julie Brown[c], Gian Luca Di Tanna[c,d], Blake Angell[c] and Lisa Keay[a,c]

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Abstract

Advanced vehicle technologies (AVTs) have been shown to reduce the risk of crashing and serious injuries to drivers and pedestrians. Uptake of AVTs, however, remains low amongst older drivers even though current literature shows this age group prioritises "safety" when looking to purchase a new car. A discrete choice experiment was conducted with 133 older Australian drivers to investigate what vehicle features influence purchasing decisions, with a focus on AVTs. Results showed that older drivers preferred cars which were more fuel efficient, had more AVTs in them and were also lower in price. These preferences were robust regardless of socio-economic status. Vehicle choice was not impacted by height of the driver's seat off the ground. This study shows that older Australian drivers are interested in AVTs. Moving forward, this interest may provide guidance on the packaging and pricing of these technologies to meet the needs of older drivers.

Background

Advanced vehicle technologies (AVTs) such as lane departure, speed and forward collision warnings, and autonomous braking systems can reduce the risk of crashing and serious injuries (Chauvel et al., 2013; Chouinard & Lécuyer, 2011; Davis et al., 2018; Fildes et al., 2015). AVT uptake in older drivers, however, remain lower than other age groups. This is despite older drivers ranking "safety" as a higher priority than younger-aged drivers (Koppel et al., 2013; Vrkljan & Miller-Polgar, 2005). However, "safety" would encompass other factors such as vehicle safety ratings and non-AVT features such as airbags. There has yet to be a study focused only on AVTs as an aspect of "safety" that may influence vehicle choice and purchasing decisions in older drivers. This study aims to use a discrete choice experiment (DCE) to investigate what vehicle features influence vehicle purchasing decisions in older Australian drivers, with a particular focus on AVTs.

Method

Older drivers (≥65 years) living in metropolitan and regional NSW, Australia completed a DCE and participant demographic questionnaire either face-to-face or over the phone with research personnel. The structure of the survey was guided by data from semi-structured interviews of 24 drivers from the same population of interest. The final survey had twelve choice sets, with three alternatives (Vehicle 1, Vehicle 2 and Neither) for vehicles described by four attributes: Access (hip or knee height), Fuel Efficiency (poor, average or good), Cost ($30000, $35000 or $40000) and AVTs (Safety Package 1-3). The DCE was created using Ngene software (v1.3). Statistical analyses based on multinomial logistic model adjusting for age and sex were run in R v4.2.2 with odds ratio (ORs) and 95% confidence intervals (Cls) reported. This base model was then extended to include *a priori* interactive terms for socio economic status (Pension Yes/No), mobility limitations (any/none) and sex (male/female) with select attributes.

Results

133 participants (mean age: 73.6 years; 66% males) living in NSW completed the survey. Participants significantly preferred vehicles with better “Fuel efficiency” (OR 1.57, 95%Cl 1.44-1.71) and AVT inclusions (OR 1.29, 95%Cl 1.20-1.40), and were less likely to choose more expensive vehicles (per $5000 increase; OR 0.91, 95%Cl 0.86-0.99) (Table 1). “Access” did not influence choice between the two vehicle options. Those on a pension were more sensitive to purchase and running costs: twice as likely to choose a vehicle with better “fuel efficiency” and were approximately 40% less likely to choose a more expensive vehicle. There were no statistically significant differences in the AVT packages chosen between sex. Mobility issues did not significantly impact “Access” choices, though the OR was increased in participants with mobility limitations.

Table 1. Results of the conditional logit model showing the utility and odds ratio of each attribute and adjusted for selected participant characteristics

Vehicle Attribute	Participant Characteristics	Odds Ratio (95% Cl)
Access: knee vs hip height		1.06 (0.95-1.19)
	Mobility x Access	1.48 (0.91-2.42)
Fuel Efficiency: poor vs average vs good		1.57 (1.44-1.71)
	Pension x Fuel Efficiency	2.11 (1.59-2.80)
Cost: per $5000 increase		0.92 (0.86-0.99)
	Pension x Cost	0.67 (0.47-0.93)
AVT: package 1 vs 2 vs 3		1.29 (1.20-1.40)
	Sex (Male) x AVT	1.31 (1.09-1.60)

Cl, Confidence Interval

Conclusion

Older drivers have multiple considerations which influence their preferences for a new vehicle including price, fuel efficiency and technological features like AVTs. These preferences were consistent regardless of socio-economic status. It is encouraging that this study found a preference for AVTs which offers guidance for pricing and packaging of vehicle features to meet the needs of older drivers. These changes may increase the appeal and uptake of AVTs in older adults to help them continue driving safely in the community for as long as possible.

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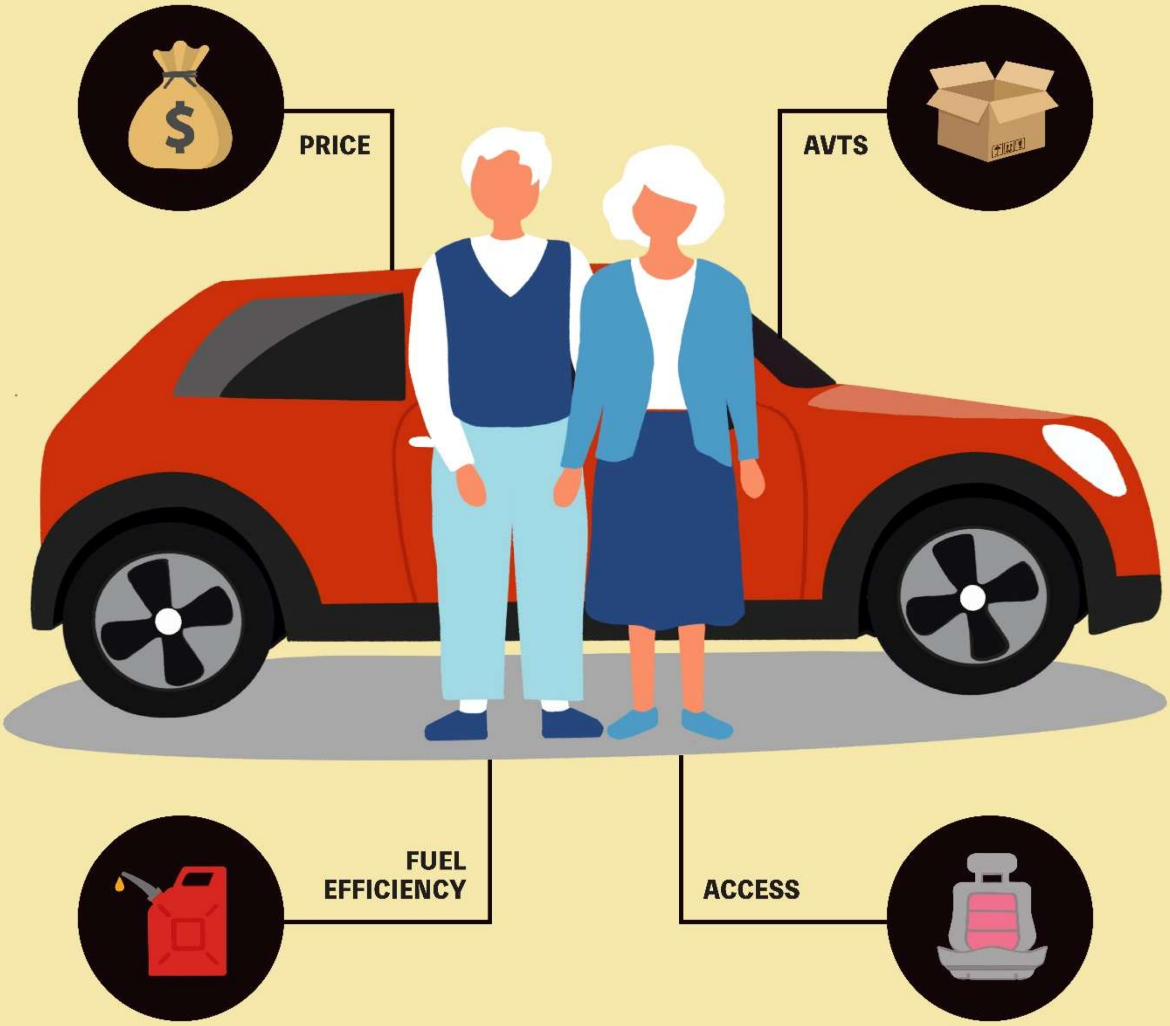
OLDER AUSTRALIAN DRIVERS' PREFERENCES IN PURCHASING DECISIONS: ADVANCED VEHICLE TECHNOLOGY

Helen Nguyen, Kristy Coxon, Julie Brown, Gian Luca Di Tanna, Blake Angell, Lisa Keay



Advanced vehicle technologies (AVTs) have been shown to reduce the risk of crashing and serious injuries to drivers and pedestrians. Uptake of AVTs, however, remains low amongst older drivers even though current literature shows this age group prioritises "safety" when looking to purchase a new car. A discrete choice experiment was conducted with 133 older Australian drivers to investigate what vehicle features influence purchasing decisions, with a focus on AVTs.

Results showed that older drivers preferred cars which were more fuel efficient, had more AVTs in them and were also lower in price. These preferences were robust regardless of socio-economic status. Vehicle choice was not impacted by height of the driver's seat off the ground. This study shows that older Australian drivers are interested in AVTs. Moving forward, this interest may provide guidance on the packaging and pricing of these technologies to meet the needs of older drivers.

The research team would like to acknowledge the Road Safety Innovation Fund for funding this project and the Australian Government Research Training Program (RTP) Scholarship for supporting HN. Importantly, thank you to the individuals who kindly participated and shared their time and experience with the research team.

Can social norm messages reduce phone use while driving?

Michelle Nicolls, Verity Truelove and Kayla Stefanidis

MAIC/UniSC Road Safety Research Collaboration, University of the Sunshine Coast

Abstract

Engagement in hand-held phone use while driving increases when individuals inaccurently perceive their peers' engagment and approval of the behaviour. Therefore, this study explored the utility of six social norm messages (informing individuals of others' actual engagement and attitudes) on hand-held phone use while driving. Further, this study explored drivers' attitudes and opinions surrounding current and previous messaging campaigns. Thirty young drivers (17-25 years) were interviewed. Five themes and one sub-theme were developed following reflexive thematic analysis. Key findings indicated that a) young drivers are rarely exposed to road safety campaigns aimed at phone use while driving, b) their views towards effective messages varied greatly, suggesting there is no one-size fits all solution, and c) a combination of injunctive and descriptive norms was perceived as most effective, while isolated norms would not be as effective. The findings have important implications for campaign design and future research.

Background

Research indicates that perceptions of peers' engagement (descriptive norms) and peers' attitudes (injunctive norms) are inaccurately perceived for hand-held phone use while driving and consequently, are associated with increased engagement in this behaviour (Nicolls et al., 2022). Inaccurate perceptions can be corrected by using the social norm approach. Specifically, the approach informs individuals of other's actual engagement and attitudes towards a behaviour, with the idea that challenging their perspectives will result in behavioural change (Dempsy et al., 2018). The approach has shown to be effective in increasing sun protection and decreasing energy consumption (Reid et al., 2013; Schultz et al., 2007), however less is known about the impact of this approach on risky driving behaviours. Therefore, this qualitative study explored the utility of social norm messages in reducing hand-held phone use. In addition, this study explored young drivers' attitudes and opinions surrounding current and previous messaging campaigns targeting mobile phone use while driving.

Method

Thirty drivers (M_{age} = 20.73 years, *SD* = 2.0; ranging from 17-25 years) participated in this study. Over half of the sample were female (57%) and on average, participants drove eight hours per week (*SD* = 7.60). Before the interview, participants completed a five-minute survey which collected demographic information and asked about their engagement in hand-held phone use while driving. Structured interview questions concerned attitudes and opinions on 1) current messaging campaigns and 2) six social norm messages (see Figure 1). Data was approached with reflexive thematic analysis to allow the most theoretical flexibility (Braun & Clarke, 2022). Ethics approval was obtained by the University of the Sunshine Coast Human Research Ethics Committee (S221723).

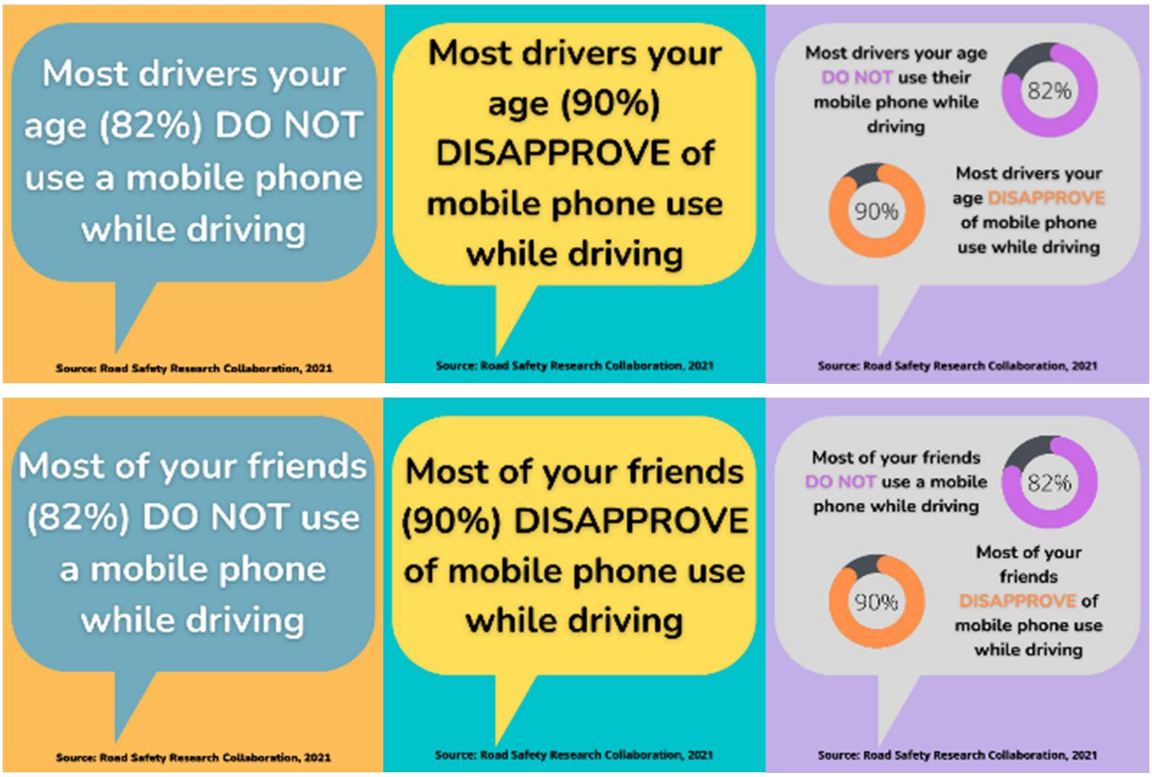


Figure 1. Social norm messages (left: descriptive norms, middle: injunctive norms, right: combined norms)

Results

Five themes and one subtheme were recognised: 1) Road safety messages with minimal impact on hand-held phone use while driving, 2) What constitutes an effective road safety message for hand-held phone use while driving, 3) Comparisons between social norm messages and road safety messages, 4) The potential benefits of combined social norms 4a) Improving and optimising the message, 5) “It’s kinda just numbers on a screen”: Negative views on social norm messages. The findings highlight the diverse opinions and attitudes towards road safety campaigns among this age group. For example, some felt that fear-based messages are very effective, while others found them pointless. Further, most young drivers indicated that they are rarely exposed to phone use while driving campaigns. Regarding the social norm messages, young drivers favoured the combined norm message as opposed to the norms in isolation. Specifially, young drivers felt the combined message would be most effective and influential in reducing hand-held phone use while driving.

Conclusions

The current study provides preliminary evidence that the social norm approach may be effective in reducing hand-held phone use among young drivers. Further, this study highlights the need for goverment agencies to maximise exposure to phone use while driving camapigns in this high-risk cohort.

Acknowledgements

This project was supported by the Motor Accident Insurance Commission (MAIC).

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Online education for drink drivers

Sussan Osmond and Belinda Hughes

Department of Transport and Main Roads

Abstract

Drink driving is a significant cause of serious road causalities in Queensland, contributing to one in every five lives lost on the state's roads. To combat this problem, the Department of Transport and Main Roads (TMR) introduced the *Plan.Drive.Survive.Foundations* program in September 2021. All first-time drink driving offenders are required to complete the program prior to being relicensed. The program is an evidence-based intervention designed to influence behaviour change and encourage separation of drinking from driving. The program aims to educate participants on the dangers of drink driving, challenge any beliefs they may have that support drink driving, and help them create a plan to avoid drink driving in the future. This research aims to provide insights into program participants, the experiences of drink drivers who have completed the program, as well as the strategies and plans they have developed to avoid drink driving in the future.

Background

Drink driving is one of the highest contributing factors of fatalities and serious injuries in Queensland. To reduce drink driving, there is a need to utilise innovative strategies that are focused on changing behaviour, bridging knowledge gaps, or recognizing broader alcohol dependence or misuse. To combat this problem, TMR introduced the *Plan.Drive.Survive.Foundations* (PDSF) program in September 2021. All first-time drink driving offenders are required to complete the program prior to being relicensed.

Participation in the program aims to assist drink drivers to bridge knowledge gaps about the risks associated with drink driving and provide them with the motivation, knowledge and skills to separate drinking from driving. As such, the program includes four modules that cover a range of topics related to drink driving, including what is drink driving, how does drink driving affect you, the consequences of drink driving and the development of a plan to separate drinking from driving.

Findings

More than 10,000 drink drivers have successfully completed the online program since its introduction in 2021. The program collects data during and after completion, allowing TMR to assess its effectiveness and make any necessary changes to improve its impact. At the time of preparing this abstract, data had not been extracted or analysed but it is anticipated the findings will be shared as part of the presentation. This will allow for a comprehensive analysis of program participation and outcomes. The findings will provide us with a deeper understanding of drink driving offenders in Queensland (offence and offender information), their drinking behaviours, their thoughts on PDSF and the plan they develop to separate their drinking from driving.

Program participants

The research will provide valuable insights into program participants, including information on their demographic characteristics and offence details, assisting us to gain a better understanding of the characteristics of drink drivers.

Strategies to separate drinking from driving

An element of the program is for participants to develop a plan to separate their drinking from driving. The research will provide data on the strategies people will use to avoid drink driving, such as arranging for a designated driver, using public transportation, or staying overnight at a friend's house.

Experiences and satisfaction of program participants

Following program completion, participants are requested to provide feedback on the program, which is analysed to understand participant perspectives. Current participant feedback suggests that the program has been successful, with many participants reporting they have a better understanding of the risks associated with drink driving and feel more confident to plan ahead and avoid this behaviour in the future.

Next steps

Overall, the initial evaluation of the *Plan.Drive.Survive.Foundations* program appears to be an effective tool supporting first time drink driving offenders to separate drinking from driving. The next step will be to undertake an evaluation of the program to further assess its impact.


SEPARATING DRINKING FROM DRIVING
PLAN. DRIVE. SURVIVE.
FOUNDATIONS
THE ISSUE:
Drink driving continues to be a significant cause of serious road casualties in Queensland, contributing to one in every five lives lost on the state's roads. On the 10th September 2021, Queensland introduced a world-first online education program targeting the ongoing problem of drink driving.
LIVES LOST AS A RESULT OF CRASHES INVOLVING DRINK DRIVERS/RIDERS, QUEENSLAND
LIVES LOST
70
60
50
40
30
20
10
0
PERCENTAGE OF TOTAL
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
2017
2018
2019
2020
2021
2022
YEAR
PERCENTAGE OF TOTAL LIVES LOST
LIVES LOST INVOLVING DRINK DRIVERS/RIDERS
THE PROGRAM:
DRINK DRIVING REFORMS:
A package of drink driving reforms came into effect on 10 September 2021.
The drink driving reforms incorporated enhancements to the existing alcohol ignition interlock program and the introduction of education programs designed to change driver behaviour and separate drinking and driving. The education programs are:
1. Plan.Drive.Survive. Foundations (PDSF) applies to all drivers who commit and are convicted of a drink driving offence.
2. Plan.Drive.Survive. Comprehensive (PDSC) applies to any drivers who commit and are convicted of two or more drink driving offences from 10 September 2021. These repeat offenders must undertake this multi-session course to complete the Alcohol Ignition Interlock Program.
THE PROGRAM:
The Plan.Drive.Survive.Foundations program was introduced in September 2021.
• All first-time drink driving offenders are required to complete the program before being relicensed and getting back onto the road.
• It is an evidence-based intervention designed to influence behaviour change, bridge knowledge gaps, recognise broader alcohol dependence or misuse, and encourage the separation of drinking from driving.
• It aims to educate participants on the dangers of drink driving, challenge any beliefs they may have that support drink driving, and help them create a plan to avoid drink driving in the future.
Four modules:
• What is drink driving?
• How does drink driving affect you?
• It started with one decision
• Plan to survive
COMPLETIONS TO DATE:
WHAT WAS YOUR BAC WHEN YOU WERE CAUGHT DRINK DRIVING?
0.01 – 0.049 (581) [10%]
0.05 – 0.099 (3115) [55%]
0.10 – 0.149 (1295) [23%]
0.15 OR HIGHER (560) [10%]
I DIDN'T PROVIDE A SAMPLE (92) [2%]
DO YOU THINK YOU'RE LIKELY TO DRINK AND DRIVE AGAIN?
NO (5614) [99%]
YES (29) [1%]
THE RESULTS:
Top consequences of drink driving participants believed would interrupt their lives:
• Losing licence
• Killing or injuring themselves or other people
• Losing the ability to travel
Top choices of drink driving participants of how to separate their drinking from driving:
• Leave the car at home
• Pick a designated driver
• Stay somewhere overnight
More than 12,000 drink drivers have successfully completed the online program since its introduction in 2021. The program collects data during and after completion, allowing the Department of Transport and Main Roads (TMR) to assess its effectiveness and make any necessary changes to improve its impact. The data provides TMR with a deeper understanding of drink driving offenders in Queensland (offence and offender information), their drinking behaviours, their thoughts on PDSF and the plan they develop to separate their drinking from driving.
Results as of 20th July 2023:
Program specific:
• 85% of people found the course material accessible and convenient.
• 79% felt the course material made the course interesting
Behaviour specific:
• 99% think they are unlikely to drink and drive again
• 87% felt that they developed a better understanding of drink driving
• 88% felt the course helped them develop a plan to separate drinking from driving
StreetSmartsQLD
Queensland Government

On the variability of crash modification factors for safety treatments

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[a]Department of Civil Engineering, Toronto Metropolitan University, [b]Transoft Solutions

Abstract

Guidance documents around the world provide procedures for evaluating the safety effects of a design decision for a road being designed or a treatment that is being considered for an existing road due to a safety concern. For estimating these safety effects, crash modification factors (CMFs) are provided. Desirably these CMFs should vary by application circumstance. Yet, most available CMFs are single-valued. Research efforts that investigate the variability in CMFs are presented to demonstrate the logic of CMF variability. The focus is on two recent case studies that apply non-linear modeling to capture the logical reality that the effect of a change in a variable depends not only on the change but also on the original value. These pertain to freeway median width and passing lane installation and length. For both, the results are logical, and, in the passing lane case, are reasonably consistent with those from credible before-after studies.

Background

The Highway Safety Manual (HSM) (AASHTO, 2010) and other such guidance documents around the world provide procedures for evaluating the safety effects of a design decision for a road being designed or a treatment that is being considered for an existing road due to a safety concern. For estimating these safety effects, crash modification factors (CMFs) are required. Desirably these CMFs should vary by application circumstance. Yet, the vast majority of available CMFs are single-valued. For example, for installing a passing lane, the HSM recommends a constant CMF of 0.75 for total crashes, regardless of the length of the lane. However, it seems reasonable to expect that the CMF for installing a passing lane should not be single valued and should at least depend on the length of that lane.

Methods

Research efforts that investigate the variability in CMFs are presented. Both before-after and cross-sectional designs are presented, along with results that demonstrate the logic of CMF variability. Although before-after designs are preferred, cross-sectional designs using regression modeling are useful for estimating CMFs when there are insufficient instances where a feature is actually implemented. The generalized linear modeling (GLM) functional form has typically been used to represent the safety effects of influential variables that affect the CMF. However, CMFs derived from GLMs do not capture the logical reality that the effect of a change in a variable depends not only on the change but also on the original value. This issue is resolved in recent research with non-linear modeling using the WinBUGS software to apply full Bayes-Markov Chain Monte Carlo (MCMC) estimation techniques (Qin et al., 2005), one of the tools that can be used for model forms that cannot be linearized.

Results

Results from before-after designs are presented for several safety treatments that demonstrate the variability of CMFs. These include raised pavement markers, curve delineation, high friction surface treatments and roundabout installation. Then the results of two recent case studies (Jafari Anarkooli at al., 2021; Persaud et al., 2020) are presented. These pertain to freeway median width and to passing lane installation and length. In both cases, the recommended results from the non-linear modeling are shown alongside those from GLMs. Table 1 shows the CMFs for specific changes in freeway median width, while Figure 1 is a plot from which CMFs for installing a passing lane of a given length or extending an existing one can be derived.

Table 1. CMFs (and standard errors) for median-related crashes for increasing median width by 5 m. and 10 m.

Original median width (m)	5-metre increase		10-metre increase	
	CMF from MCMC	CMF from GLM	CMF from MCMC	CMF from GLM
10	0.869(0.021)		0.803(0.049)	
15	0.923(0.033)		0.882(0.061)	
20	0.955(0.031)		0.931(0.054)	
25	0.974(0.025)	0.934(0.020)	0.960(0.042)	0.872(0.041)
30	0.985(0.018)		0.977(0.031)	
35	0.992(0.013)		0.987(0.021)	
40	0.995(0.008)		0.992(0.014)	

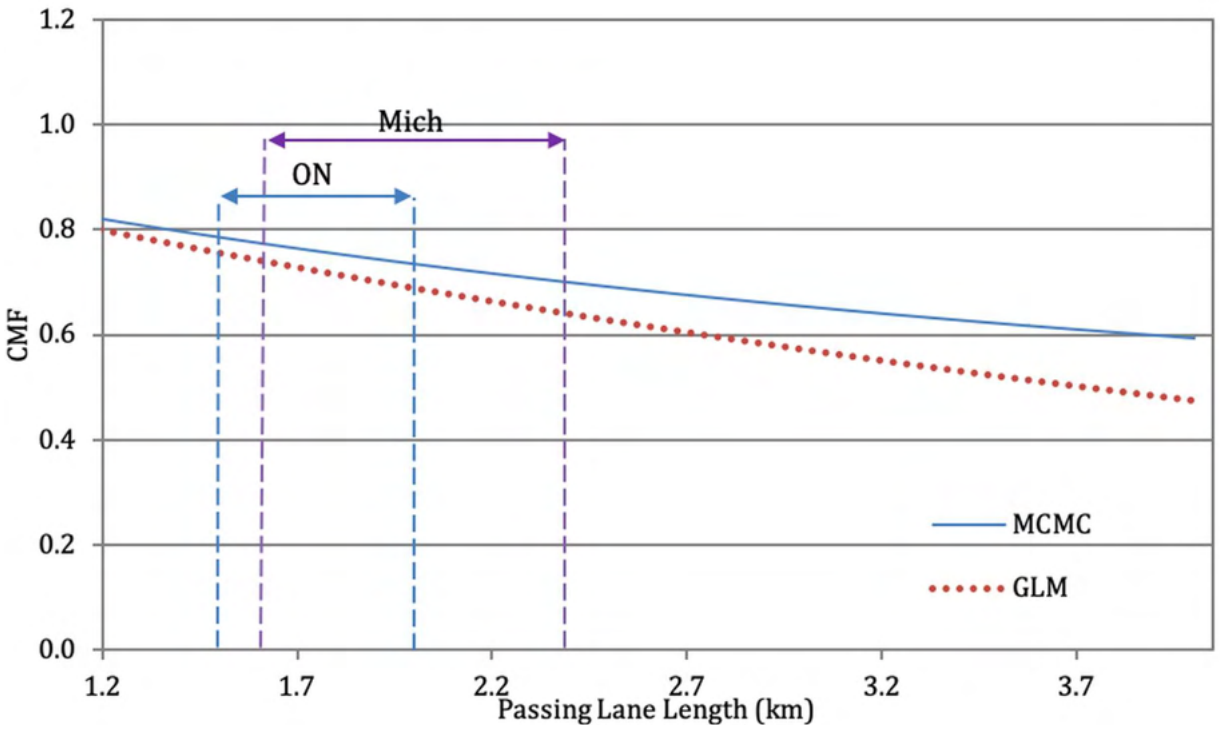

Figure 1. Total crash CMFs for instating a passing lane

Conclusions

In both cases, the results are logical, and, in the passing lane case, reasonably consistent with those from credible before-after studies, so are recommended for implementation in practice around the world for evaluating the safety effects of a design decision or for a treatment that is being considered for an existing road.

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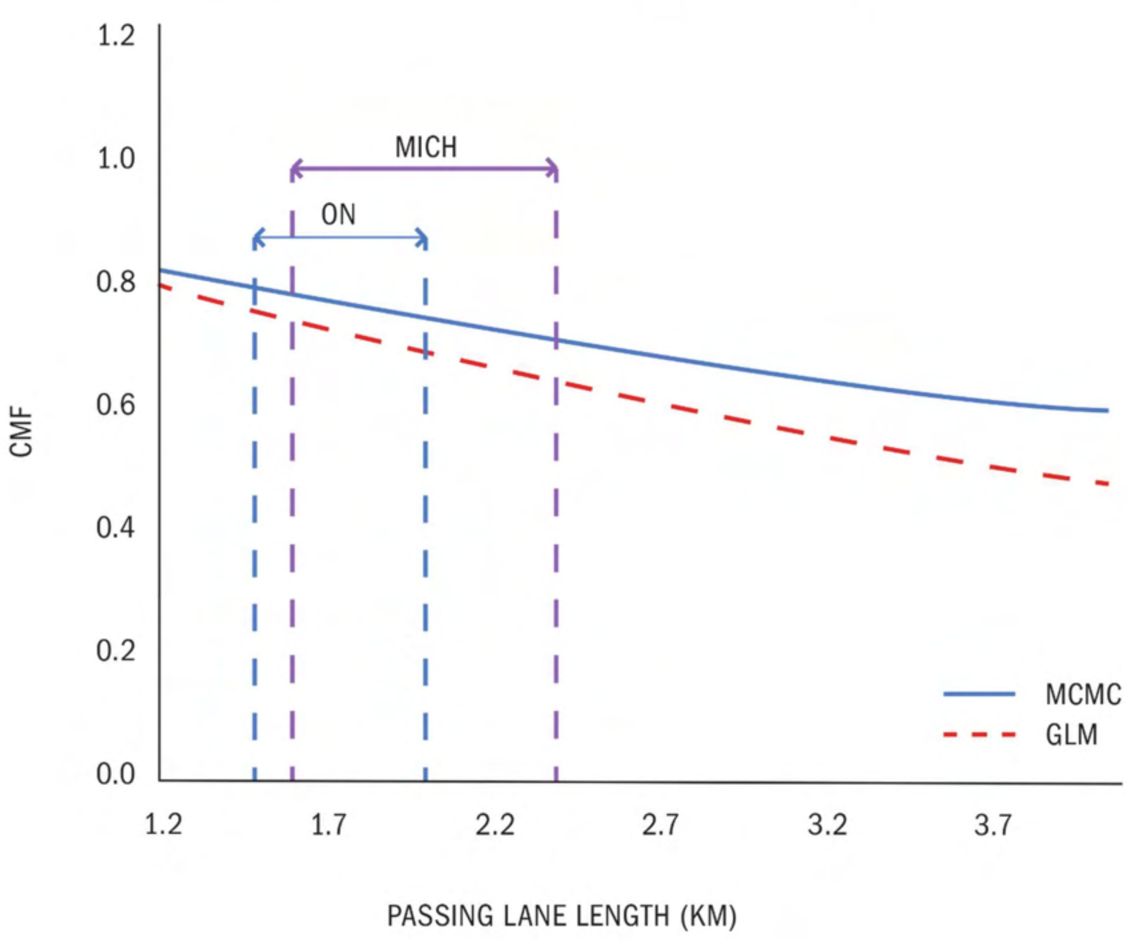
FIGURE 1. TOTAL CRASH CMFs FOR INSTALLING A PASSING LANE



Modelling the impact of Random Breath Tests (RBT) and Roadside Drug Tests (RDT) on road crash fatalities and hospitalised casualties

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Abstract

This study used time series models to examine the impact of the number of Random Breath Tests (RBT) and Roadside Drug Tests (RDT) conducted by the Queensland Police Service (QPS) on road crash fatalities and hospitalised casualties in all of Queensland and for each QPS region. The modelling and forecasting of road crash is a complex process involving multiple assessable and non-assessable factors. However, focusing on the factors that are countable and controllable may help with more accurate prediction and further data driven decision making and planning. The findings suggest consistent road policing enforcement activity, especially for RBTs, may have a positive impact on decreasing the number of road crash fatalities and hospitalised casualties.

Background

In alignment with the Queensland Government's commitment to reduce the burden of road trauma in Queensland, the Road Safety Data Bureau aimed to show the impact of increasing or decreasing the number of RBTs and RDTs on the number of road crash fatalities and hospitalised casualties.

The purpose of this study was to conduct road crash modelling with RBT and RDT numbers included as extraneous factors. Various scenarios for the number of RBTs and RDTs that could be conducted in 2022 to 2026 were considered in the models. These models are based on the number of road crash fatalities and hospitalised casualties (taken to hospital) that were as a result of alcohol/drug driving. The RBT scenarios were considered based on the ratio per number of licences. The assumed ratio of RBTs for 2022 is 0.6, for 2023 is 0.7, for 2024 is 0.8, for 2025 is 0.9 and for 2026 is 1:1 per licences. The RDT scenarios are a continuous increase compared with the number of conducted RDTs in 2021. The RDT increase for 2022 is 20 percent, for 2023 is 40 percent, for 2024 is 60 percent, for 2025 is 80 percent and for 2026 is 100 percent compared to 2021.

Method

Data for the conducted RBTs and RDTs were provided by Statistical Services, QPS for the period 1 January 2016 to 31 December 2021. The road crash fatalities and hospitalised casualties were extracted from the Department of Transport and Main Roads (TMR) RoadCrash database for the same period.

These datasets are then categorised into QPS regions. The statistical method used was an ARIMA model (Autoregressive Integrated Moving Average). ARIMA is a model used in statistics and econometrics to measure events that happen over a period of time. ARIMA makes use of lagged moving averages to smooth time series data and produces coefficients that represent the relationship between the enforcement activity and road crash fatalities and hospitalised casualties.

Results

The findings indicate that increasing the number of RBTs to achieve a 1:1 ratio per licence has the effect of decreasing the number of road crash fatalities and hospitalised casualties. In addition, the annual increase in the number of RDTs resulted in a decrease in the number of road crash fatalities.

Conclusion

The findings suggest consistent road policing enforcement activity, especially for RBTs, may have a positive impact on decreasing the number of road crash fatalities and hospitalised casualties. However, the findings do not imply that an ongoing increase in the number of RBTs conducted would result in an overall decrease in the number of road crash fatalities and hospitalised casualties. There is an optimum point for the conducted number of RBTs that should be considered in all studies and planning.

While increasing the number of RDTs resulted in a decrease in the number of road crash fatalities, there appeared to be insufficient evidence to suggest a similar impact on the number of hospitalised casualties.

The results of this study have continued to inform the planning and delivery of road policing enforcement activities in Queensland.

Spatial mapping of injury claims data to safety barrier locations

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Abstract

This paper reports on the methodology used to establish a valid dataset for analyzing the safety outcomes of the Transport Accident Commission (TAC) funded Safe System Road Infrastructure Program (SSRIP) on Victoria's highest-risk rural roads. The program installing road safety infrastructure, such as flexible barriers, wide centerlines and rumble strips to these roads was called the Top 20 Program. The TAC commissioned Abley to match injury claims data with the locations of road safety infrastructure, to monitor the impacts of the program on TAC claims. The paper describes the process involved in spatially matching injury claims and barriers using distance tolerances, attribute text matching, and exclusion factors to achieve a high level of accuracy in future matching runs. The resulting dataset can be used for ongoing analysis and monitoring of the program's performance, providing a valuable tool for road safety authorities embarking on design and implementation of safety infrastructure.

Background

Under the Towards Zero Strategy, the Transport Accident Commission (TAC)[10] funded VicRoads – now part of the Department of Transport and Planning (DTP) – to deliver the Safe System Road Infrastructure Program (SSRIP). These projects, collectively referred to as the Top 20 Program, involved installing road safety infrastructure, such as flexible barriers, wide centrelines and rumble strips, on 20 of Victoria's highest-risk rural roads. The final cost of the Top 20 Program is estimated at $550 million.

Purpose

To determine if this unprecedented investment in Safe System aligned infrastructure is delivering its intended safety outcomes, the TAC undertook a project to monitor the impacts of SSRIP on TAC claims. This paper reports on the methodology involved in establishing a valid dataset for this and future analysis.

Process

To assess the changes to the road network and injury outcomes, the datasets showed in Table 1 were merged.

Table 1. Data Requirements

	Data Variable Examples	Data Source
Crash data	Crash type, vehicle, date, location and narrative description	Police
Claims data	Injury severity, injury type, number of bed days	TAC
Asset data	Barrier location, type, length	DTP, TAC
Program Information	Project extents, construction dates, costs	DTP, TAC

The TAC commissioned Abley to match injury claims data with the locations of installed safety barriers.

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[10] https://www.tac.vic.gov.au/about-the-tac/our-organisation/what-we-do

Initially, a simple spatial process was developed to join injury claims information to barrier and program information using distance tolerances to define relationships between items from the different datasets in FME[11]. This first iteration outputted claims matched to barriers within the project extents with an 85% capture rate. This data was originally issued as a standalone Excel workbook with all claims matched to the corresponding barrier, and project details.

Following review by the TAC, Abley analysts opted to also provide a web map to allow the TAC team to review the data spatially alongside the Excel workbook. The uncaptured 15% claims were observed on the web map to be mostly claims located at major overpasses, outside the road environment and/or located inaccurately on adjoining local roads.

As this process will be repeated with new claims data (annually) it was decided to modify the FME process to preserve accuracy in future matching runs. Two collaborative workshops were held with the authors.

The spatial process went through several iterations to address the identified reasons for some claims not matching a new barrier. A stepped process in FME utilizing different distance buffers, attribute text matching and exclusions factors ensured a high level of accuracy was achieved when matching the TAC claims against the installed barriers within the SSRIP Top 20 project extents.

The FME process reads, spatially matches and outputs the matched injury claim and barrier data to both an Excel workbook and the TAC project web map.

The Claims are separated into three groups: those which are on a Project Road, those which are on a Non-Project Road, those which are Off Road.

Figure 1 demonstrates examples of this grouping where:

- Green Buffer: Project roads.
- Green Points: Project Road claims related to a project
- Red Buffer: Non-Project roads.
- Red Points: Non-Project Road claims not related to a project
- Blue Points: Off Road claims.

[11] Feature Manipulation Engine. This enables the integration of more than 400 data formats. It streamlines complex spatial processes and reduce manual input or enhance data processes to improve accuracy and timeliness.

Figure 1. Claims on project and non-project roads, with buffer widths

Conclusions

This work enabled analysis and monitoring of trauma changes on the TAC funded Top 20 Program routes. Other road safety authorities embarking on design and implementation of safety infrastructure can use this method to measure benefit realization. Future work will utilize this underlying dataset to present the ongoing performance of the Top 20 Program.

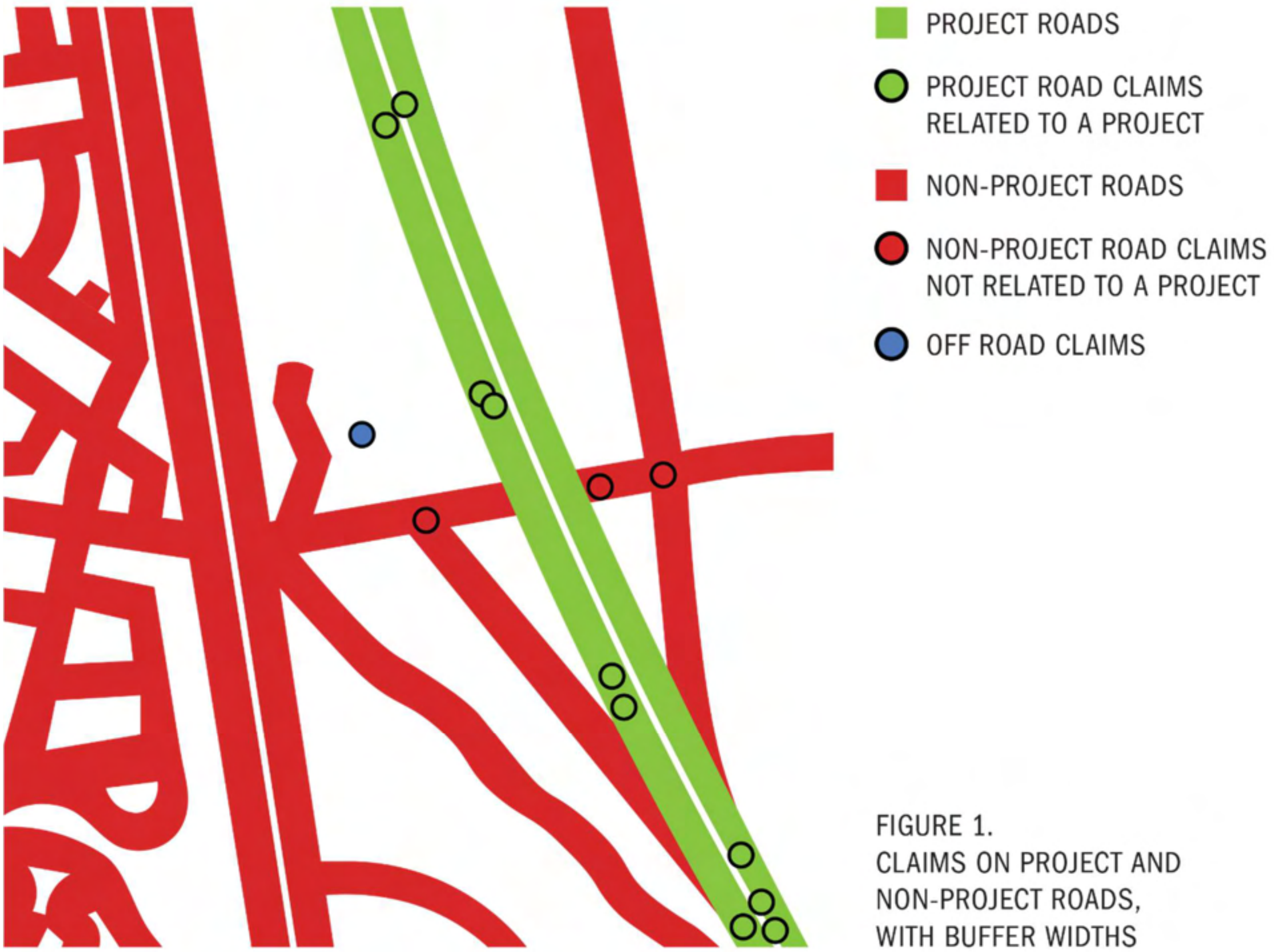

FIGURE 1.
CLAIMS ON PROJECT AND NON-PROJECT ROADS, WITH BUFFER WIDTHS

Investigating BAC legal limit reform in Victoria

Christopher Poulter and Elvira Lazar

Road SafetyVictoria, Victoria Department of Transport and Planning

Abstract

Road Safety Victoria within the Department of Transport and Planning (DTP) is investigating the merits of lowering the legal Blood Alcohol Concentration (BAC) limit in Victoria with the aim of reducing fatal and serious injuries involving alcohol. This activity is being undertaken as part of he Victorian Road Safety Strategy and aims to develop options for the government to consider in relation to reform. A road safety outcomes assessment of European jurisidictions who have successfully lowered BAC limits, and driver cohorts surveys in Victoria has been completed. Further research and policy activity will be undertaken to inform the evidence base and potential pathway for regulatory BAC limit reform.

Introduction

After decades of successful enforcement and educational initatives, the message to manage drinking and driving has made a significant impact on road trauma. Approximately 50% of the drivers killed in Victoria had a BAC above the legal limit of 0.05 in the late 1970's. While significant gains have been realised, alcohol-related impairment still contributes to approximately 18 per cent of all driver fatalities in Victoria each year. To address this, the first action plan under the Victorian Road Safety Strategy 2021-2030 commits to investigating the merits of BAC legal limit reform for fully licensed drivers/riders and other driver/rider cohorts identified as higher risk.

Method

The approach to investigating reform follows an agreed research and policy development framework that will culminate in provding government with a hypothetical roadmap to achieve reform. The following research activities have been completed to date:

- *International evidence* – An international scan of jurisdictions that have implemented a lower BAC legal limit to better understand factors needed for successful implementation.
- *Modelling* – Preliminary research was undertaken in 2018 to investigate the road safety and economic benefits of lowering the BAC legal limit in Victoria. As part of current work, this research is being expanded to also measure broader public health and social benefits of reducing BAC legal limits.
- *Attitudinal and behaviour surveys* – A quantitative survey was conducted to better understand community attitudes and behaviours of four identified cohorts - young drivers, repeat drink drivers, fully licensed drivers and motorcyclists. This research will be used as key data inputs into the BAC modelling.
- *Safe System* – A systems review identifying all the actors in the drink driving ecosystem and key points influencing potential reform.
- *Qualitative research* – Focus groups will be used to better understand the impacts, benefits and perspectives of lowering BAC legal limits for each of the identified cohorts.

Results

There were a number of success factors identified that would increase the likelyhoood of a lower BAC limit to be well received by the community and to have a significant positive impact on road safety outcomes. Some key results and insights include:

- Reductions in fatalities of approximately 20% and 10-15% where BAC limit have been lowered to zero and 0.02, respectively.
- Mixed results were identified in relation to the reduction of injuries. Results ranged from injuries remaining stable to reductions of approximately one third.
- Countries requiring the same BAC limit for all drivers saw more significant improvements.
- Success was able to be achieved where there was strong public and political support.
- Clear communication and high public awareness of the importance of reform helped enhance positive social norms and acceptance.

The results of surveys with the community and modelling work are pending.

Conclusion

Victoria has had a long a successful history in managing driving in relation to alcohol. However, crashes involving drivers impaired by alcohol still remains an issue. In terms of reform, lowering the legal BAC limit in Victoria is one of the last remaining regulatory levers that can be actioned in order to further reduce fatal and serious injuries involving alcohol.

Barriers faced by mothers and fathers to booster seat transition

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Abstract

Moving a child from booster seat to adult belt before a good fit is achieved is common in Australia and worldwide. This can increase the risk of injury in the event of a motor vehicle crash. Using focus groups, this research examined similarities and differences between mothers and fathers regarding the barriers to making accurate decisions about when to transition a child out of a booster seat to an adult seat with lap and sash belt. Results of the qualitative analysis show that the primary barriers faced by fathers are the use of child's height and legal requirements. Mothers' barriers include using the child's age and younger child needing booster seat. Shared barriers of both parents include the use of instinct over knowledge of a good seat belt fit, child's comfort in booster and child's complaints of using booster.

Background

Children will not be optimally protected in an adult seat belt if it does not fit properly (Brown & Bilston, 2009; Brown et al., 2006). Transitioning a child from a booster seat to an adult lap and sash belt too soon is common in Australia and worldwide (Brown et al., 2013; Brown et al., 2010; Macy et al., 2014) and increases the risk of injury (Anderson et al., 2017; Brown et al., 2006). In other areas of child injury there has been attention given to differences in attitude to injury risk between mothers and fathers (Morrongiello et al., 2010). To date there has been no study examining the difference between mothers and fathers in making transition to seat belt decisions. The aim of this study was to understand the barriers faced by parents making accurate transition decisions and examine the differences and similarities between mothers and fathers.

Method

The focus group method (Kitzinger, 1995) was chosen for the study as it was used previously in research on use of booster seats (Huseth-Zosel, 2018; Piotrowski et al., 2020). Two groups of mothers (with children aged 0–9) and two groups of fathers were attended by two researchers. One facilitated the discussion using a semi-structured discussion guide and the other researcher took notes and asked clarification questions. Questions about transitioning from a booster seat were presented with follow up questions to explore the barriers and facilitators to making a correct transition from a booster decision. All four video/audio-recordings were transcribed. A deductive approach was used for data analysis with two researchers using QSR International NVivo 12 Software.

Results

Of the 14 participants in the four focus groups six were fathers and eight were mothers, none of the participants were related or known to one another. Figure 1 presents the frequency with which different barriers considered by the participants were mentioned. Across the sample the most frequently mentioned barriers were child's complaints, child's comfort, and parent's intuition. However, this varied between mothers and fathers. Key barriers faced by mothers were using child's age and the needs of younger child to use booster seat. Primary barriers faced by fathers were using a child's standing height and relying on minimal legal requirements. Both mothers and fathers indicated reliance on their intuition to determine a good fit of the seat belt on the child in the adult seat as well as the child's comfort and protestations to sitting in the booster, yet mothers were more likely to be influenced by these barriers (see Figure 1).

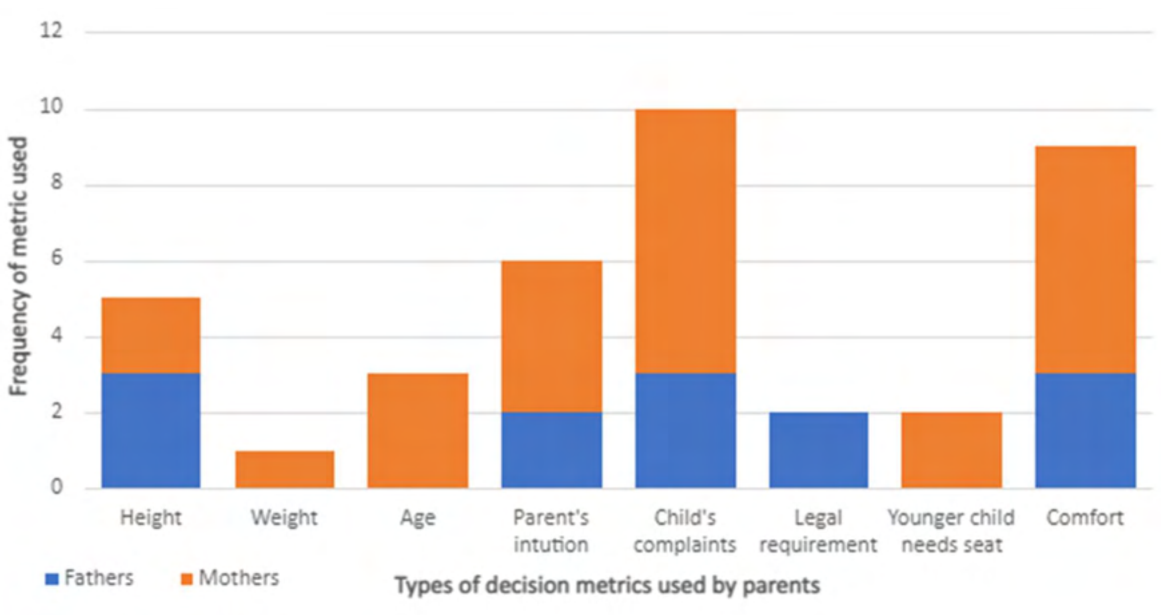

Figure 1. Barriers faced by mothers and fathers to correct transition from booster seat

Conclusions

Mothers and fathers rely too heavily on instinct, child's comfort, and complaints of sitting in the booster seat when determining a good seat belt fit. Fathers look at the child's height and legal requirements and mothers base their decision on child's age and needs of younger siblings. To address these barriers, resources to support correct transition decision could include knowledge of how to achieve a good fit for a child in an adult seat belt and self-efficacy of addressing the child's comfort. Consumer input is critical and guidance from both mothers and fathers is necessary to drive the design and content of resources to support the transition from booster decision.

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NSW Pedestrian Protection Program: improving pedestrian safety at signalised intersections

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[a]Transport for NSW, [b]Monash University Accident Research Centre

Abstract

The NSW pedestrian protection program (PPP) was a mass action program which aimed to upgrade all two-phase signalised intersections with timed pedestrian protection (TPP). TPP 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, while the green pedestrian signal is displayed allowing pedestrian movements to occur first. A comprehensive evaluation was conducted of the PPP to identify whether the program resulted in reduced pedestrian crash rates, fewer opportunities for pedestrian-vehicle conflicts, and increased visibility of pedestrians whilst crossing. It also explored whether the program had been delivered as intended. The study reveals that implementation of the PPP has significant benefits for producing *safe travel for all* pedestrians in NSW.

Background

Whilst research exists demonstrating the effectiveness of TPP (Fayish & Gross, 2010; King, 2000; Pecheux et al., 2009; Saneinejad & Lo, 2015; Van Houten et al., 2000), to date, no jurisdiction has delivered a mass action program of this kind or published evaluations assessing the effectiveness at a state-wide level.

An evaluation was conducted by the Research & Evaluation team at Transport for NSW in 2022, in conjunction with Monash University Accident Research Centre (MUARC), to assess the effectiveness of PPP at improving pedestrian safety. The evaluation focused on four key evaluation questions (KEQ):

KEQ1: Did the implementation of the PPP result in reduced pedestrian crashes, at treated intersections?
KEQ2: Did the implementation of the PPP result in fewer opportunities for pedestrian-vehicle conflicts, at treated intersections?
KEQ3: Did the implementation of the PPP result in increased visibility of pedestrians whilst crossing, at treated intersections?
KEQ4: Was the PPP implemented as intended?

Method

For brevity, details of the methodology and data used for each stage, including controls and crash history, have been deferred to be presented at the conference.

KEQ1: Results

A before-after crash analysis revealed that PPP resulted in a significant reduction in FSI pedestrian-involved crashes (between 43% to 47%), as well as a reduction of between 20 percent (not statistically significant) to 38 percent (statistically significant) in overall pedestrian-involved crashes. The effectiveness of the intervention was also mediated by the protection type provided (red arrow and/or delayed start treatment).

KEQ2: Results
The number of pedestrian crossing paths protected, and the amount of time protection was provided was explored. Results revealed that 98 percent of the sample of intersections assessed had the same, or an increased, number of crossing paths protected. Results also revealed that 93 percent of intersections assessed had the same or greater amount of time protection post-treatment (on average, an increase of 22 seconds per intersection). The increased protection led to fewer opportunities for pedestrian-vehicle conflicts.

KEQ3: Results
The study examined whether pedestrians ended up in a 'poor visibility' zone (first and last quarter of the crossing) or in the 'improved visibility' zone (middle half of the crossing) when pedestrian protection was lifted. Results revealed that 97 percent of intersection crossing paths reviewed had adequate protection for the average speed pedestrian to enter the 'increased visibility' zone. Further, the study revealed that 94 percent of these intersections provided adequate protection for slower, more vulnerable pedestrians - supporting road users of *all ages and abilities*.

KEQ4: Results
A series of stakeholder interviews were conducted to determine whether the program was implemented as intended and how the program could be improved for future rollouts of PPP. All stakeholders identified that there was a significant culture change as a direct result of the program - to implement TPP as a standard practice in all intersection upgrades. Stakeholders also identified that despite initial reservations by some that the implementation of PPP may lead to greater vehicular congestion, there was no evidence to suggest this occurred.

Conclusion

The evaluation of the NSW PPP revealed that the program significantly reduced pedestrian crash rates, resulted in fewer opportunities for pedestrian-vehicle conflicts, and protected pedestrians until they were in an increased visibility zone whilst crossing. It also revealed that the program had been delivered as intended and resulted in a greater promotion of pedestrian safety across NSW. The implications of these findings, some of the study limitations, and how they fed into the delivery of the future PPP rollout will be discussed at the conference.

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A BEFORE-AFTER CRASH ANALYSIS REVEALED THAT PPP RESULTED IN A SIGNIFICANT REDUCTION IN FSI PEDESTRIAN-INVOLVED CRASHES, **(between 43% to 47%)**,

AS WELL AS A REDUCTION OF BETWEEN 20% (NOT STATISTICALLY SIGNIFICANT) TO 38% (STATISTICALLY SIGNIFICANT) IN OVERALL PEDESTRIAN-INVOLVED CRASHES.

THE EFFECTIVENESS OF THE INTERVENTION WAS ALSO MEDIATED BY THE PROTECTION TYPE PROVIDED (RED ARROW AND/OR DELAYED START TREATMENT).

Predicting hazard perception expertise through machine learning

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Abstract

Young novice drivers continue to be overrepresented in crash statistics around the world (OECD, 2019). Hazard perception tests are a key tool used to distinguish between novice and experienced drivers and assessing whether drivers have the necessary competencies to drive safely. The present research aimed to develop a proof of concept to determine the utility of machine learning algorithms in distinguishing between novice and experienced drivers based on eye movement data. Groups of older, experienced drivers as well as younger, novice drivers were asked to watch a 10-minute video clip and their eye movement behaviours were recorded. Results revealed that machine learning algorithms could successfully distinguish between novice and experienced drivers with an accuracy of 71%, with further analysis suggesting that significantly greater accuracies can be achieved. The results hold promise as a potential new Hazard Perception Test (HPT) methodology to objectively assess whether drivers have the necessary visual scanning skills of experienced, more safe drivers, to detect emerging hazards.

Background

Globally, young novice drivers (YNDs) are overrepresented in crash statistics (OECD, 2019). One factor which contributes to this increased crash risk is poorer hazard perception abilities, typically measured through a hazard perception test (HPT; Moran et al., 2019). Eye movement behaviour has been shown to be significantly different in novice and experienced drivers (Moran et al., 2019; Mourant & Rockwell, 1974; Underwood et al., 2003; Liu 1998). Analysing eye movement behaviour has shown promise in providing insight into hazard perception skill beyond that of traditional button press HPT methodologies.

Advanced analytical methods through the use of artificial intelligence have led to an explosion of research exploring how these technologies can support better human decision making. Research has demonstrated that machine learning can use eye movement behaviour to successfully differentiate between different populations, including children, adults and even distinguish between drivers of varying impairment levels (de Naurois et al., 2019; Yang et al., 2015). However, despite success in the use of machine learning methods to distinguish between participant groups using eye movement data, no research has been conducted in using such methods in the context of hazard perception (Moran et al., 2019).

As such, the aim of the present research was to develop a proof of concept to assess the utility of machine learning algorithms in distinguishing between novice and experienced drivers based on eye movement data. This research assessed a new HPT methodology that overcomes the accuracy, sensitivity, and scalability issues of current HPT methodologies.

Method

70 participants; 40 novice drivers (under 25 years old and < 5 years of driving experience) and 30 experienced drivers (between 30-50 years old and >10 years of driving experience) were recruited. All participants watched the same 10-minute driving hazard perception clip in a Virtual Reality environment with eye movement data collected at 30Hz. Variables used to assess eye movements included number of fixations, total fixation duration, number of saccades, average saccade distance and standard deviation of saccade distance. This data was modelled across three custom built

machine learning algorithms - Support Vector Machine (SVM), Nearest Neighbour and Random Forest.

Results

The results revealed that Nearest Neighbour was the most accurate machine learning algorithm with a mean accuracy of 71%, followed by Random Forest (67%) and SVM (60%). Critically, no accuracy values fell below 50% suggesting performance was always better than chance.

However, further optimisation of the algorithms (currently underway) has preliminarily suggested that accuracies of upwards of 80% are achievable.

Conclusion

The results of the present proof of concept suggest that classification of drivers' eye movement data through machine learning models may be a valid tool in assessing hazard perception skills. This research may assist licensing agencies in developing a more sensitive and accurate HPT to help reduce crash risk in YNDs.

Research is currently underway to collect more data and optimise these algorithms to further improve the accuracy of the models.

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Improving speed compliance amongst young novice drivers

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Abstract

Speeding is a serious issue, that is the leading cause of road-related deaths and hospitalisations each year. Previous studies have indicated that training can be used as a speeding deterrent; even a single session of training can reduce the number of speeding violations, and the magnitude of speeding. The aim of this study was to examine the effect of training on young novice drivers' speed management behaviour. Approximately forty provisional licensed drivers between eighteen to twenty-five years of age were selected to participate in this study. The participants were divided into a control group, and a training group, and all participants were required to conduct three drives in a computer-based driving simulator; a familiarization drive, a baseline drive, and a test drive. For the training group, self-explanatory and graphical based feedback was provided after the baseline drive, before conducting the test drive. Upon completing the drives, participants completed a post-drive survey, which provided self-reported data relating to speeding occurrences, and their reasons for speeding. Based on this information, each driver was classed under one of the four key driver typologies derived by Blincoe et al. (2006). Namely, these typologies include: conformers, who report they never exceed speed limits; deterred drivers, who are put off speeding by the presence of cameras; manipulators, who slow only at camera locations; and defiers, who exceed limits regardless of cameras. The results of this study are important in addressing the issue of providing effective and tailored driver training to various types of young drivers, in order to improve their speed compliance. Ultimately, reducing the number of speed violations, and the magnitude of these speed violations should contribute to reduce road fatalities and hospitalisations on Australian roads.

Background

Speeding is the most common cause for road fatalities and injuries each year. Speeding just 5km/h over the speed limit on average results in a 10% increase in fatal crashes. In 2021, there were a total of 1,127 road fatalities in Australia. Approximately 19% of these road fatalities in 2021, consisted of young novice drivers aged from 17 to 25 years old. Thus, more effort is needed to address the speed management problem for young drivers. Various previous studies have indicated that driver training is an effective tool in improving speed management behaviour in subsequent drives evident for as long as six months post-training. In particular these studies implied that both self-explanation and feedback were both effective training methods in reducing the number of occurrences, and the magnitude of speeding for young novice drivers (Molloy et al., 2018a; Molloy et al., 2018b).

Self-explanation is a form of cognitive training method which involves the participant explaining their own actions to themselves (Rittle-Johnson, 2006). This process can improve speed compliance behaviour by providing an opportunity to better understand their actions, reasons for their actions, and the consequences of their actions (Molloy et al., 2018b). It is a training method that has proven to be effective in a variety of fields, including the educational environment (Rittle-Johnson, 2006), risk management (Molesworth et al., 2011), as well as in previous studies relating to speed management (Molloy et al., 2018b). Feedback is another such training method which involves providing specific, non-biased information about one's actions, in order to facilitate a more accurate assessment of a given situation, ultimately providing more complete and representative knowledge (Molloy et al., 2018b). Study conducted by Hill and Salzman (2012) has indicated that in a road environment, feedback can effectively improve important skills such as speed perception, and speed estimation.

This study is significant as it analyses objective data regarding the effect of training in improving speed management behaviour for different typologies of young drivers. This research will thus provide valuable background to understand the effectiveness of current speeding-related training and provide recommendations regarding its effective utilisation.

Method

Research conducted by Blincoe et al. (2006) identified four key group driver typology: Conformers, who report they never exceed speed limits; deterred drivers, who are put off speeding by the presence of cameras; manipulators, who slow only at camera locations; and defiers, who exceed limits regardless of cameras. This research will then examine the effect of driver training on these various typologies, and, provide recommendations on how training can be tailored to enhance its effect on each driver type. This study will require a pool of approximately 30-40 participants, who will partake in a range of surveys (demographic surveys, and post-drive surveys) to provide basic details of participants, and self-reported data. Additionally, a driving simulator experiment will be conducted through the facilities of the University of New South Wales (UNSW) Canberra Campus. This will be achieved using the UC-win/Road drive simulator software version 15.02 (Forum8, 2021). This process will involve a baseline drive, followed by a feedback training program, before another assessed drive in the simulator.

All participants recruited for this study were volunteers who held a valid Australian provisional drivers' license, between the age of 18 to 25 years. These were mostly students of the University of New South Wales (UNSW) Canberra campus. The research required approval prior to commencing from the University of New South Wales Human Research Ethics Committee. The actual experiment itself involved utilising a fixed-based, driving simulator; the UC-win/Road Drive Simulator version 15.02. This software was connected to a 49-inch curved Samsung S9 monitor, a Logitech G920 Driving force racing wheel, and a three-pedal set (accelerator, brake and clutch). As previously mentioned, each participant conducted a practice drive, baseline drive, and a test drive, with the sole between-groups variable being the training that occurred between the baseline and test drive for the training group.

Results

The results of the study are being currently collected and analysed and will be presented at the Australasian Road Safety Conference in Cairns, Australia.

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Innovative Pacemaker Lighting: enhancing safety and efficiency for Burnley Tunnel

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Abstract

The Burnley Tunnel Enhancement (BTE) project was developed by Transurban to address the persistent efficiency and improve safety issues presented by drivers slowing as they traverse the tunnel nadir and ascend to the egress. The landmark feature of the BTE project has been the development, installation and switch-on of an innovative dynamic Pacemaker Lighting (PML) system, that uses waves of light to encourage motorists to maintain pace and travel more safety and efficiently through the tunnel. SMEC developed a bespoke layered approach to assessing the road safety and human factors risks of the project, as well as providing detailed road safety engineering advisory for the safe operating parameters for the PML system. Vehicle speeds are measured at six locations throughout the tunnel, with data going back several years. Afternoon peak periods (from 16:00 to 19:00) have seen an increase of 16 percent for average speeds through the tunnel with an increase of 3 percent of vehicle throughput. The percentage of vehicles travelling above 50km/h during weekdays has increased by 18.7 percent, resulting in a smoother flow. There have been no injury collisions reported while the PML has been functioning. Currently collisions inside the tunnel are trending below average, though more data will be required for statistically significant evidence.

The Burnley Tunnel Enhancement Project

Background

Victoria's first major road tunnels, the Burnley Tunnel provides a key Melbourne CBD bypass option for 22 million vehicles per year. The Burnley Tunnel Enhancement (BTE) project was developed by Transurban to address the persistent efficiency and improve safety issues presented by drivers slowing as they traverse the tunnel nadir and fail to accelerate effectively while ascending to the egress. The BTE project aimed to address this key issue, whilst also upgrading the aging asset aesthetically, some 20+ years since it opened.

SMEC assisted Transurban in identifying and developing BTE project options, including functional lighting options. Following SMEC's Virtual Reality trials, Transurban confirmed an innovative 'Pacemaker Lighting' (PML) solution. PML sends waves of light through the tunnel at speeds that vary with current traffic conditions, encouraging them to increase or maintain their speed to minimize losses as they ascend.

SMEC was engaged to provide the detailed civil, electrical and lighting design for the project, as well as road safety assurance and advisory services.

A Bespoke Approach to Efficiency and Road Safety

SMEC developed a bespoke layered approach to assessing the potential road safety and human factors risks. This included Safe System Assessments comparing project options to existing conditions; engaging a specialist Human Factors consultant to enrich the assessment of how drivers would be impacted by the proposed functional lighting applications; contributing to project-wide Risk Assessments and Safety In Design (SID) workshops; commissioning, reviewing and responding to independent Road Safety Audits at various stages; and pulling all of these assessments together to continually feed into the Detailed Design for the overall BTE scheme.

SMEC's investigations showed that implementation of a PML system could provide safety benefits as well as achieving the key objective of uplifting traffic throughput. Existing crash trends through the tunnel include rear end, lane change and merge type crashes, all of which could be reduced by more consistent traffic speeds through the tunnel that the PML was designed to encourage and induce as a perceptual countermeasure.

SMEC's road safety analysis identified critical recommendations for the PML operating parameters, including rules governing the speed of the waves, and the recommended width, spacing and colour of waves. These parameters were developed using a broad range of road safety engineering, human factors expertise and drew on current best practice across a range of disciplines. Through system design and operational parameter calibration, SMEC worked with Transurban to ensure that the PML system has road safety and human factors considerations at the forefront.

The functional lighting was turned on through the tunnel's driven section in the tunnel in March 2023, including the PML function. The outcome is a Burnley Tunnel PML system that is safely boosting efficient connectivity for motorists and creating a better overall driving experience in the Burnley Tunnel (Figure 1).

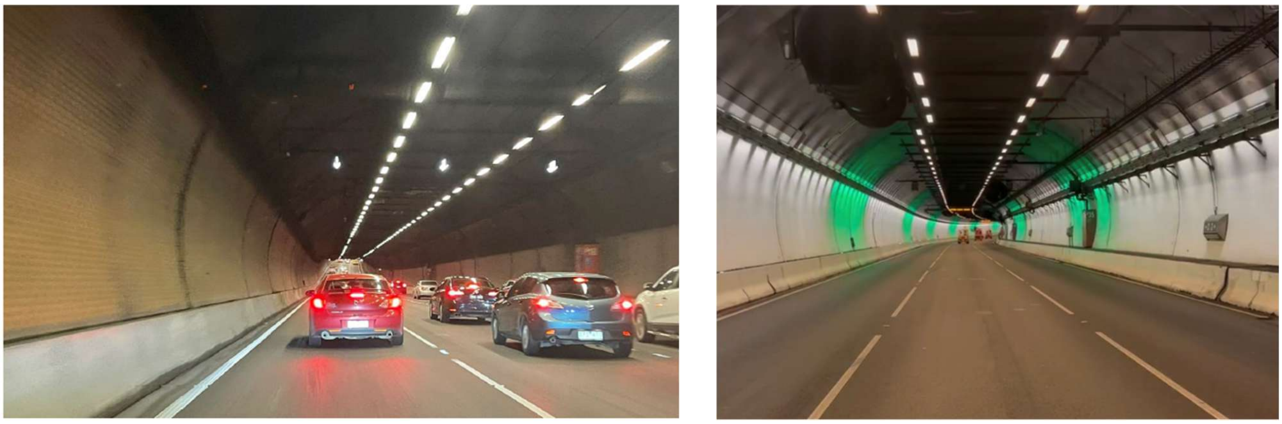

Figure 1. Before and After Comparison

Real-time detection, tracking and analysis of road user behaviour at railway level crossings

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Abstract

The railway network in Australia plays a vital role in the transportation of passengers and freight. However, incidents at level crossings pose a significant safety challenge, with over 23,000 crossings spread across the country. The lack of accurate data on these incidents makes it difficult to identify high-risk areas and make informed decisions regarding investment in this area. This paper proposes an AI-based system that utilizes deep learning and surrogate safety metrics (SSM) to monitor and report the safety performance of level crossings. The system uses the You Look Only Once (YOLO) Object Detection Algorithm, coupled with the DeepSORT Tracking System model and SSM extraction model, to detect, monitor, and report safety-critical events at level crossings, such as near-misses and collisions. The paper also provides a discussion around the deployment of this technology. The proposed system offers a cost-effective solution for system-level reporting of level crossings, which enables data-driven decisions to make transportation safer.

Background

Australia's vast railway network poses significant risks, with incidents at level crossings being a major concern (Turner et al., 2021). Unfortunately, record-keeping and data collection surrounding such incidents, especially near-misses, are often insufficient. Thus, there is an urgent need to deploy an intelligent system that can be integrated with traffic cameras to detect, monitor, and report potential accidents at level crossings.

Method

Our study aimed to develop a data-driven approach to identify high-risk areas and enhance road safety regulations in Australia. We created a visual map of historical incidents and used it to identify areas that required increased enforcement. To optimize our results, we developed a data labelling process that works together with Computer Vision Annotation Tool (CVAT) designed to facilitate the annotation and labelling of data for computer vision tasks (CVAT.Ai Corporation, 2023), thus saving time and improving model performance. We also conducted a thorough analysis of state-of-the-art detection and tracking systems, resulting in the development of a system that combines the YOLOv5 object detection algorithm (Jocher et al., 2022) with the DeepSORT detection and tracking algorithms (Broström, 2023). This system was customized to suit Australia's unique road conditions, utilizing dedicated datasets to optimize performance. Furthermore, we integrated surrogate safety metrics (SSM) with deep learning technology to create a dashboard that can evaluate and detect potential crashes in real-time. To deliver cost-effective solutions, we researched existing edge computing techniques that allowed us to process real-time data streams on-site, thus reducing network bandwidth pressure and transmission latency. Overall, our study demonstrates the effectiveness of combining advanced technology with data-driven methodologies to enhance road safety regulations in Australia.

Results

Through mapping of past incidents, we obtained valuable insights into high-risk areas that require attention. Our developed system accurately identifies various road users, including cars, trucks, trains, and pedestrians, even from long distances and despite occlusion. The integration of the DeepSORT tracking system allows for stable tracking of moving objects and accurate identification of their respective identities. Our system extracts post-encroachment time (PET) values from historical crash data to measure the time difference between main road user departure and train entry into the area of encroachment. This approach facilitates efficient monitoring and analysis through SSM. In addition, traffic sign detection is utilized to better understand the road conditions. By aggregating this data on a dashboard, precise identification of danger zones on the road and detection of potential anomalies are possible. The system has significant potential to enhance road safety by detecting, monitoring, and reporting safety-critical events at level crossings, such as near-misses and collisions. An example output of the system is provided in Figure 1.

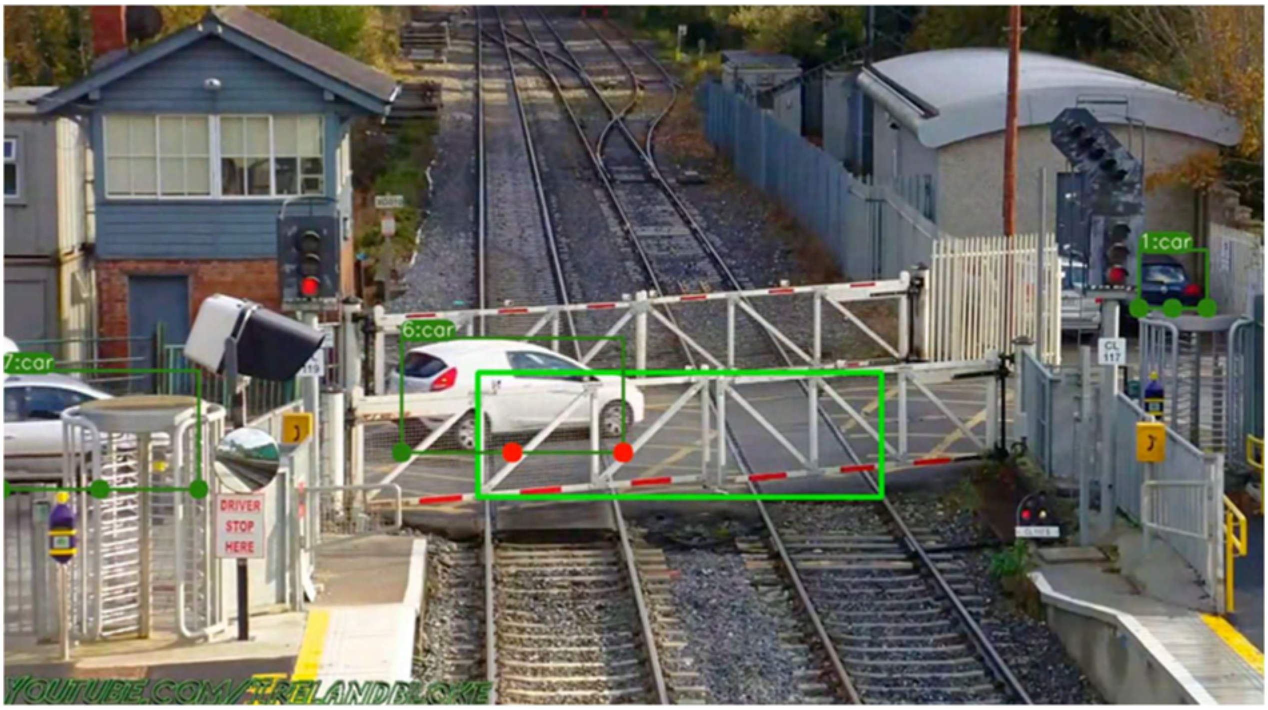

Figure 1. An Example Output of Road User Detection and Tracking System with Bounding Boxes

Conclusions

This study describes an AI-based system that uses deep learning techniques and SSM to monitor and report safety performance at level crossings in Australia. The system has demonstrated high accuracy in identifying vulnerable road users, even in challenging conditions. Integration of SSM allows for real-time monitoring and analysis of potential accidents. The system utilizes existing edge computing techniques, offering a cost-effective solution for system-level reporting of level crossings. This study showcases the potential of integrating advanced technology with data-driven methodologies to enhance road safety regulations in Australia. The developed system provides a solution to the urgent need for intelligent systems that can detect, monitor, and report potential accidents at level crossings.

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Investigating connected vehicle vector data at active transport priority crossings

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Abstract

Queensland Department of Transport and Main Road (TMR) has proactively worked to improve safety for pedestrians, cyclists and drivers by installing and monitoring the performance of priority crossings over the past few years. Despite these efforts, some practitioners are still concerned about the potential risks and implications of implementing priority crossings on projects. TMR is investigating the validity of such concerns by using data collected from connected vehicles, to examine vehicle speeds and deceleration profiles on approach to Priority Crossings. Preliminary analysis presented here indicates that vehicle speeds decreased after the Priority Crossing was installed, with only minimal increases in braking rates and no substantial changes in swerving or G-force before and after installation.

Background

Cyclists are disproportionally represented in police-reported crash data at intersections marked with “GIVE WAY” or “STOP” (Wahi et al., 2018). Vehicles travelling on pathways may be given priority at crossings through the use of “GIVE WAY” or “STOP” sign and line markings, which is known as a Priority Crossing (see Figure 1). TMR has worked to improve safety by Priority Crossings, and various studies initiated by TMR have demonstrated that priority crossings are safe when used correctly and in the right circumstances (CDM Research 2015, 2016a, 2016b, 2018).

Despite this, practitioners require more clarity on the use of these treatments. This project aims to investigate the validity of such concerns by using data collected from connected vehicles, to examine vehicle speeds and deceleration profiles on approach to Priority Crossings.

Figure 1. Fairview Close and School Road Priority Crossing, Bli Bli (Left) and McIntyre Street and Dickson Street, Wooloowin (Right)

Method

This study utilises connected vehicle data from multiple vehicle manufacturers from a growing sample of traffic, which is imported and processed by a proprietary company called CompassIoT. CompassIoT started collecting vehicle data in Queensland 2020, which includes speed and acceleration. Speed and braking data were sourced from CompassIoT to analyze driver behaviour before and after Priority Crossings were installed.

The two sites were chosen for preliminary analysis. These are (a) the Bli Bli site and (b) the Wooloowin site. The Priority Crossing at the intersection of Fairview Close and School Road in Bli Bli opened in February 2022. The available "after opening" data is from February 2022 to December 2022, and the available "before opening" data is from March 2020 to January 2022. The Priority Crossing at the intersection of Mclntyre Street and Dickson Street in Wooloowin was upgraded in March 2021, with post-opening data collected from April 2021 to December 2022, and pre-opening data covering March 2020 to March 2021.

Results

A descriptive method was used to provide insights of the main features of the dataset. This helped in identifying patterns, trends, and notable characteristics of the dataset in terms of speed reductions at each individual site before-and-after-installation.

The preliminary analysis indicates that the CompassIoT data may be suitable to assess whether there was an overall reduction in vehicle speeds after opening the Priority Crossing. For Fairview Close, the analysis showed that the Median Speed, Average Speed, and 85th Percentile Speed all decreased after the opening, with reductions of 65%, 46%, and 39%, respectively, as shown in Table 1. For Mclntyre Street and Dickson Street, the median speed, average speed, and the 85th percentile speed showed a speed reduction after the opening of the Priority Crossing, ranging from 8%, 6%, and 2% respectively.The results also show a minimal increase in braking rates before and after opening, which is expected, and the values remained well below the conventional "harsh braking" threshold of -0.6 (m/s²). The data proved invaluable to evaluate the swerving and G-force of the installation, with hardly any variance before and after the installation.

Table 1. Before and After Speeds, Acceleration, Swerving and G-Forces at Fairview Close Priority Crossing and Mclntyre Street / Dickson Street

Fairview Close Priority Crossing	**Before opening (N= 13)**	**After opening (N= 13)**	**Change**	**% Change**
Median Speed (km/h)	7.2	2.5	-4.6	-65%
Average Speed (km/h)	11.9	6.4	-5.5	-46%
85th percentile Speed (km/h)	24.7	14.8	-9.8	-39%
X- Acc (braking, mpss)	-0.0174	-0.0224	-0.004	29%
Y- Acc (Swerving, mpss)	-0.004	0.0026	0.006	12%
G- Force (mpss)	0.043	0.058	0.014	34%
Mclntyre Street Priority Crossing	**Before opening (N= 10)**	**After opening (N= 16)**	**Change**	**% Change**
Median Speed (km/h)	18.19	16.69	-1.50	-8.24%
Average Speed (km/h)	19.06	17.84	-1.22	-6.40%
85th percentile Speed (km/h)	22.28	21.67	-0.61	-2.74%
X- Acc (braking, mpss)	-0.0674	-0.0191	0.05	-71.66%
Y- Acc (Swerving, mpss)	0.0849	0.0483	-0.04	-43.11%
G- Force (mpss)	0.122	0.052	-0.07	-57.26%

Note. N= Number of valid records

Conclusion

The conclusions are twofold: indications from this preliminary analysis are that Priority Crossings do not appear to result in extreme braking events, do appear to result in lower vehicle speeds at the crossings, and, thus, seem likely to have a positive effect on road safety. A second outcome is that data collected from connected vehicles has shown promise as a practical, non-invasive way of understanding how road users operate in the system, and further use of this type of data is encouraged.

However, the limited sample size of the data could potentially affect the results. Therefore, further data collection is needed to understand the behavior of vehicles and vulnerable road users at Priority Crossings. This can be done effectively and efficiently via the analysis of video footage, using advanced video analytic techniques.

Acknowledgement

The authors would like to express their gratitude to CompassIoT for providing the connected vehicle data used in this study, and to TMR for granting permission to access it.

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The characteristics of crashes involving medical conditions in South Australia

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Abstract

With the population of Australians aged 85 or older expected to double by 2042 and the association of increased age with the greater likelihood of experiencing a medical condition, the potential increase in crashes caused by medical conditions is of concern. This study aims to understand the prevalence of medical conditions and the characteristics of the crashes involving medical conditions in order to guide development of strategies to mitigate the associated risks and harms. The sample consisted of 1,934 road users injured in crashes on South Australian roads who were admitted to the Royal Adelaide Hospital over the period 2014 to 2017. The findings indicate that 9.2% of hospital admission cases are caused by a medical condition, with loss of consciousness, attempted suicide, and seizures the most commonly observed. Crashes attributed to a medical condition were more likely to involve older drivers, and were also more likely to involve road users with at least one pre-existing medical condition and a greater number of pre-existing medical conditions than the comparison group.

Introduction

The association between medical conditions and road crashes is of concern in Australia as the number of people aged 85 or older is projected to double by 2042, increasing to more than one million people (Australian Bureau of Statistics, 2018). Increasing age is associated with an increase in the likelihood of experiencing a medical condition and the number of medical conditions experienced by an individual has also been found to increase with age, so it is likely that the number of crashes due to medical conditions will also increase (Alvarez & Fierro, 2008). Careful management of road users with medical conditions, particularly considering the aging population, will be necessary to improve road safety for older drivers and, ultimately, all road users. In order to develop appropriate strategies this paper updates existing knowledge through the analysis of recent data.

Method

The data for this study were drawn from a unique database linking data from several official sources including medical records, police reported crashes, and the results of drug and alcohol testing. Hospital medical records were manually matched with the other sources using a number of variables, including crash details (date, time, location), participant characteristics (age, sex, residential post code of patient), and the hospital to which participants attended post-crash. A medical condition was deemed to have been the cause of the crash when the medical records included documentation provided by the attending medical personnel stating that a medical condition or event contributed to the crash.

Sample

All people involved in a crash on a public road (as defined by ICD-10-AM) in South Australia who were admitted (i.e., received treatment for four hours or more) to the Royal Adelaide Hospital (RAH) over the period 2014 to 2017, were included in the study. Sample characteristics are described in Table 1. Only cases where it was certain that the crash was or was not due to a medical condition (columns *Yes* and *No* in Table 1) were included for analysis in this study, yielding a final sample of N=1,934.

Table 1. Sample characteristics

		Contributory medical condition			
	All cases (N=2,072)	Yes (n=177)	No (n=1,757)	Possible (n=127)	Unsure (n=11)
Age					
Range	16-95	18-95	16-95	19-95	30-89
M(SD)	45.26(19.27)	53.14(21.78)	43.47(18.14)	58.03(22.49)	57.64(22.47)
Sex					
Male	1,451	129	1,218	90	8
Female	621	48	530	37	1
Road user type					
Driver	983	151	740	85	7
Motorcycle rider	468	6	452	10	-
Cyclist	419	12	397	9	1
Pedestrian	202	8	168	23	3

Results

Medical conditions were identified as a contributing factor in 9.2% of cases. The most commonly identified medical conditions attributed as the cause of a crash included loss of consciousness (31.6%), attempted suicide (23.2%), seizures (16.4%), and cardiac events (9.0%). Road users involved in a crash due to a medical condition were found to be significantly older than those with no medical condition (p<.001). Medical condition crashes were also more likely to involve drivers and involve single vehicles crashing into stationary objects. Road users who crashed due to a medical condition were also more likely to have more pre-existing medical conditions than road users whose crash was not due to a medical condition (p<.001).

Discussion

The findings demonstrate that 9.2% of serious injury crashes are caused by a medical condition, with loss of consciousness, attempted suicide, and seizures the most commonly observed. Crashes attributed to a medical condition were more likely to involve older road users, most likely to be drivers, who were also more likely to have a pre-existing medical condition and a greater number of pre-existing medical conditions than the comparison group. Common crash types – single vehicle, hit object – indicated that vehicle technologies such as lane keep assist and autonomous emergency braking may go some way to preventing crashes when a driver experiences a medical event. Policy interventions to address this issue are discussed.

Acknowledgments

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 author would like to acknowledge SA Health and the Royal Adelaide Hospital (RAH) for allowing access to hospital records. Thanks to Tori Lindsay (formerly of the Centre for Automotive Safety Research) for the collection and matching of serious injury data from the RAH.

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Pedestrian safety perception at grade crossings in Dhaka City

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Abstract

Rail-pedestrian collisions are a very common phenomenon, especially in the developing countries' context, with fatalities very prevalent in such crashes. However, very few studies have addressed pedestrians' safety perceptions at road-rail crossings. This paper aims to investigate the influence of different socioeconomic and demographic features, crash history, and road safety knowledge on safety perception of pedestrians at a level crossing. A questionnaire survey was used to collect 284 first-hand responses from pedestrians of different backgrounds who use level-crossings during their daily commute at eight grade crossings in Dhaka, Bangladesh. Ordered Probit (both fixed and random coefficients) models and Bayesian Belief Networks (BBN) were used to assess the safety perception of pedestrians at level crossings and identify the characteristics which made them more susceptible to occurrences of pedestrian-train crashes. Our findings will help policymakers strengthen the monitoring system and increase safety consciousness among pedestrians.

Background

By way of comparison, 185 pedestrians died in 211 fatal railway incidents in Finland from 2006-2008 (Silla & Luoma, 2011). In Canada, rail-pedestrian crashes decreased from 16% to 13% in 2020 over the previous ten years (Government of Canada, Transportation Safety Board of Canada, 2021). From 2011-2020, out of 2090 train-pedestrian collisions in China, 1173 were fatal and 963 got injured. (Guo et al., 2022). Bangladesh, a developing nation, experiences more pedestrian-train crashes compared with other developed nations, with around 250 injuries and 300 deaths in pedestrian-railroad collisions (Jugantor, 2020). From 2005-2011, 68 collisions were reported in 44 manned level crossing gates; 75 collisions in 62 unmanned authorized level crossing gates and 20 collisions in crossings that were unidentifiable as manned or unmanned (Azzacy, 2012). Vendors (Dhruba, 2014), suicidal tendencies (Ferdous & Alam, 2021), use of headphones (Ogwu, 2019), and risk-taking behavior (Chowdhury, 2018) are some of the prime causes of train-pedestrian crashes. No study was done in Bangladesh about variables influencing pedestrians' decision making process or subjective perception about safe crossing distance before an approaching train. Hence this paper will investigate pedestrians' safety perception while crossing the railway track and how travel characteristics, road safety knowledge, crash history, and other factors affect their decision-making process.

Method

A questionnaire, divided into eight categories, was structured with 54 questions by analyzing previous literatures, local context and after conducting a pilot study. These included various socioeconomic and demographic features, situational context, crash history, knowledge and perceptions regarding safety, personal crossing characteristics, surroundings, and awareness factors.

Modelling Methodology

Independent variables are developed from survey responses while pedestrians' perceived safe crossing distance before an oncoming train is our ordinal response variable. Ordered Probit Models (Fixed & Random Coefficient) and Bayesian Belief Network (BBN) is used to identify the significant factors influencing pedestrians' safety perception while crossing. The Ordered Probit

Model will outline the relationship between dependent and independent variables whereas BBN not only finds the relationship between various independent and dependent variables but also interrelates the independent variables.

Result

The survey was conducted at eight grade crossings in different areas of Dhaka city, collecting 284 responses including 158 males and 126 females with overall average age of 34.4 years. Respondents included people immediately before or after using the grade crossings, and locals who frequently used the route. The obtained results will aid in identifying (a) similarities or differences between the independent variables, and their influence on evaluating pedestrians' safety perceptions; (b) the most and least risk-taking cohort of pedestrians and; (c) variables with significant impacts on their perceptions near grade crossings. Analysis reveals the high risk-taking cohort which included pedestrians aged under 25 years, those in support of slum-dwellers and vendors, lack in safety knowledge, discourage punitive measures among others.

Conclusion

This paper will assist the policymakers to undertake necessary initiatives for making the pedestrians more aware of safety issues, e.g., by introducing awareness programs, safety education, and so on. Besides, safety authorities can use the findings of this paper for introducing a robust monitoring system around grade crossings.

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Can greyscale reduce phone use on the road?

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Abstract

This study aimed to explore the impact of applying greyscale intervention to reduce mobile phone use on the road. The study design was as follows, participants were invited to switch their phone interface from colour to greyscale (black and white) for two weeks and completed two activities across one month (six stages: 4-time filling out a questionnaire and two interviews) as part of the study. After two weeks of greyscale intervention, participants could remain in greyscale or switch to colour for the following two weeks. The questionnaires to assess maladaptive mobile phone use (MMPU), included Mobile Phone Problem Use Scale (MPPUS), Mobile Phone Involvement Questionnaire (MPIQ), and Fear of Missing Out (FOMO). The interviews were conducted to examine positive and negative experiences of using greyscale. The findings included phone use trends across the study and self-reported behaviour. It was anticipated that insights from the results would indicate whether greyscale feature shows promise as an intervention for reducing MMPU, and phone use in general, and on the road.

Background

Excessive mobile phone use, also known as maladaptive mobile phone use (MMPU), is harmful to work and social interactions. MMPU is a term used to describe a high level of mobile phone usage that negatively impacts individuals (Oviedo-Trespalacios et al., 2019; Rahmillah et al., 2023a).

Examples of MMPU include problematic mobile phone use and compulsive mobile phone checking (Rahmillah et al., 2023a). Such usage can lead to adverse outcomes such as risky driving behaviours. Mobile applications have become a popular strategy for reducing phone use and preventing MMPU. A recent study comprehensively examined the features of 13 apps that aimed to reduce phone use and prevent MMPU and found evidence of effectiveness and data on user perceptions (Rahmillah et al., 2023b). The study categorised these features into seven types: self-tracking, social tracking, goal setting, blocking, gamification, simplification, and assessment (Rahmillah et al., 2023b). It was concluded that the greyscale feature of the iOS Screen Time app has been shown to be successful in reducing phone use by up to 38 minutes per day (Holte & Ferraro, 2020). Greyscale is not only free to use but also easy to implement widely since it is a built-in feature on all iOS and Android phones. This study's empirical contribution is testing the effectiveness of greyscale in reducing phone use and MMPU among road users.

Method

Sixty people aged 18-45 years old were invited to complete a self-report questionnaire at four time points and to participate in two interviews across one month. Eligibility criteria included using iPhone as their primary device, having held a provisional driver license/international driver license for at least two years, and driving a car at least one hour per week. They were not eligible for this study if they have been diagnosed with colour blindness or if they already applied greyscale regularly on their phone in the past 7 days. First, participants were asked to complete an online questionnaire which included information about their demographics (i.e., gender, age, hours driving, purpose of driving, education, etc.) and MMPU (Bianchi & Phillips, 2005; Przybylski et al., 2013; Walsh et al., 2010). The study design was as follows, participants were invited to switch their phone interface from colour to greyscale (black and white) for two weeks and completed two activities across one month (six stages: 4-time filling out a questionnaire and two interviews) as part of the study. After two weeks of greyscale intervention, participants could remain in greyscale or switch to colour for the following two weeks. At the end of weeks 1, 2, and 4 participants were asked to fill out questionnaires. They undertook the first interview after two weeks of greyscale use and the second (exit) interview at the end of week 4. Participants were asked questions about their positive and negative experiences of using greyscale.

Results

Findings showed that greyscale reduce total screen time, social media use, and number of pick up. Moreover, greyscale also reduce maladaptive mobile phone use (MMPU) based on score of Mobile Phone Involvement Questionnaire (MPIQ), but not significantly reduce score of Fear of Missing Out (FOMO) and Mobile Phone Problem Use Scale (MPPUS) after two weeks intervention. The data analysis is still in progress, and findings particularly regarding phone use behaviour on the road were presented as part of the presentation.

Conclusions

This project will make an empirical contribution to human factors, as today, the impact of greyscale on risky on-road behaviours is unknown. In addition, identifying barriers to technological acceptance may assist manufacturers and designers of technologies to develop ways to reduce phone use on the road.

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Can greyscale reduce phone use on the road?

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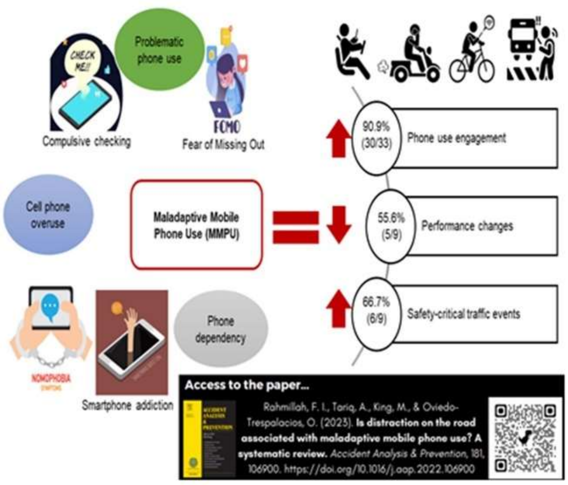
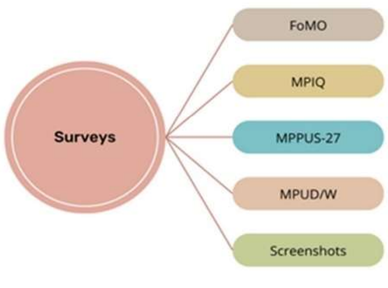
Background



Research Question

What is the effectiveness of greyscale to reduce phone use on the day and on the road?

Mixed Methods



- Fear of Missing Out (Przybylski et al., 2013)
- Mobile Phone Involvement (MPI) (Walsh et al., 2010)
- Mobile Phone Problem Use Questionnaire (MPPUS) (Bianchi and Phillips, 2005)
- Mobile Phone Use while Driving and Walking
- Screen time, Pickups, Social Media, Entertainment, and Productivity

App-based management approach

Rahmillah, F. I., Tariq, A., King, M., & Oviedo-Trespalacios, O. (2023). Evaluating the Effectiveness of Apps Designed to Reduce Mobile Phone Use and Prevent Maladaptive Mobile Phone Use: Multimethod Study. *Journal of Medical Internet Research, 25*, e42541. https//doi.org/10.2196/42541

Results (Short term-2 weeks)

Qualitative-Thematic analysis

POSITIVES

- "I think greyscale has been very helpful to **control** the use of my phone. When I see it [phone], I just feel like oh **I shouldn't use it.**" **(M,23)**
- " As the phone is not appealing in greyscale, I think it **prevents** myself from getting in **trouble or accidents** because of my phone usage while driving."**(M,34)**
- "I feel like the phone is not appealing, so no need using it and just **focus** on driving." **(M,33)**

NEUTRAL

- "I use GPS from my car device, I connect it on. **I don't have any problem** of using greyscale while driving." **(M,33)**
- "I mostly use my phone to listen to music a lot when walking. I don't think greyscale really give effect on my driving on walking." **(M,34)**
- "I **don't see any benefit** for me, but I can see how it **can help addicted people** to reduce their phone use." **(F,33)**

NEGATIVES

- "It is **confusing**. I use GPS a lot and I couldn't indicate what is the traffic because everything is grey." **(F,44)**
- "I think it would make it harder to use while driving because you **wouldn't be able to see it clearly and distinguish colours**, particularly if you were using it for Google Maps." **(F,34)**
- "But I will say that I don't get distracted by my phone. I am actually **distracted by the greyscale**. So, it's counter intuitive." **(F,31)**

Demography of participants

Participant characteristics	Number of participants (N=56, %)
Sex	
Male	24 (43)
Female	32 (57)
Age	
Age ≤25	7 (13)
Age 26-45	49 (87)
Driver license	
Valid foreign driver's license	15 (27)
Open/full	31 (55)
Provisional/probationary	10 (18)
Crash history due to phone use	
Yes	25 (45)
No	31 (55)

Quantitative-ANOVA repeated measure

	Baseline		Week 1			Week 2		
	Mean	SD	Mean	SD		Mean	SD	
FoMO	27.64	9.37	27.23	8.93	-	27.02	9.11	-
MPIQ	34.70	9.94	32.77	10.89	-	31.79	9.64	↓
MPPUS-27	143.43	50.81	139.82	44.99	-	138.63	49.74	-
Screen time	438.19	251.45	400.62	243.56	↓	402.18	257.39	↓
Pickups	118.48	56.16	111.01	56.62	-	109.56	61.21	-
Social media	210.90	146.75	166.62	135.36	↓	168.52	124.82	↓
Entertainment	81.41	132.46	76.51	123.90	-	66.22	91.20	-
Productivity	80.88	138.26	68.71	116.92	-	69.72	94.17	-

RECOMMENDATIONS

- "It will be better if there is a way to switch on the greyscale between **apps** instead of having to set up the whole phone through settings." **(M,28)**
- "If greyscale came out [with feature that can be **easily)** **switched on to the social media** apps, [not the GPS] that will be adding more useful." **(M,37)**
- I think it would be good if it is in the first page [of the phone] or where you can just **swipe up** to activate bluetooth." **(F,42)**

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CRICOS 00213J

Equity of Cooperative-ITS deployment: research challenges

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Abstract

Ensuring social equity is crucial for providing equitable access to resources, services, and infrastructure, encompassing the fulfillment of basic needs and opportunities for active social participation. Transportation plays a pivotal role in social inclusion by enabling individuals to access economic opportunities. However, the integration of new technologies in transportation has significant implications for social equity. Disproportionately, vulnerable road users (VRUs), as well as regions and rural/remote areas, bear an unfair burden of road crashes resulting in fatalities and injuries (NRSS, 2023). Assessing the fairness and appropriateness of deploying Cooperative Intelligent Transport Systems (C-ITS) infrastructure in these areas presents considerable challenges, necessitating the consideration of diverse equity factors, impact metrics, and demographic groupings. This paper aims to identify research challenges that road safety stakeholders must tackle when designing and implementing sustainable and equitable C-ITS programs. It proposes the adoption of a framework to guide the fair distribution of transportation safety and mobility benefits to all road users, regardless of their geographic location and demographic characteristics.

Background

Transportation serves as a means of connecting people with opportunities and resources. The implementation of Intelligent Transport Systems (ITS) is anticipated to have positive effects on road capacity, fuel efficiency, emissions, and safety. These benefits are expected to grow as the level of automation and market penetration increases. Much of the current focus in C-ITS revolves around technological aspects, including standards, interoperability, security, congestion, and sustainability (Degrande et al., 2023).

Our research has delved into the capabilities of Connected and Autonomous Vehicles (CAVs) and their potential unintended consequences, employing a transport justice lens as an evaluative framework (Martinez-Buelvas et al., 2022). It is crucial for governments to play a vital role in ensuring the equitable allocation of new transportation resources. Industries, governments, and researchers share the responsibility of assessing the justice implications stemming from the public deployment of novel transportation technologies like C-ITS (Martinez-Buelvas et al., 2022). Therefore, adopting a national approach that prioritizes equity in C-ITS investments within Australia becomes imperative.

Method and results

This abstract addresses the research challenges that have arisen from our extensive engagement in Connected and Autonomous Vehicle (CAV) projects over the past decade, including our involvement in CAVI (2023). These challenges are highlighted in our submission to the Department of Infrastructure, Transport, Regional Development, Communications and the Arts for the Industry Consultation on Draft Principles for a National Approach to C-ITS in Australia (DITRDCA, 2023).

There is significant technical limitations preventing the deployment of C-ITS and Automated Vehicles (AV) in the regions and rural and remote Australia. Lack of wireless coverage (4G/5G), maintenance facilities and slow market penetration will prevent such a population from benefiting from C-ITS advanced functions. Furthermore, the interaction pattern between C-ITS equipped vehicles and AV with VRUs is not well understood (Joshi et al, 2023; Zhao et al. 2022). More importantly, the Quality of Service offered to different road users at different geographic locations in terms of safety, security, mobility, and accessibility will never be uniform across Australia. Therefore, it is essential to specify the minimal quality of service requirement for a given context.

Insufficient consideration has been given to whether C-ITS effectively benefit vulnerable road users (VRUs), as well as regional, rural, and remote populations. The introduction of new transport technologies may exacerbate existing inequities and safety disparities in the transportation sector, particularly regarding the interaction between VRUs and motorized transport, as well as C-ITS deployment in rural and remote areas (Martinez-Buelvas et al., 2022).

A comprehensive understanding of the societal requirements and consequences of C-ITS is lacking, including ethical considerations, employment implications, and socio-economic impacts at both individual and community levels. Such understanding is essential to ensure a customized, robust, and sustainable deployment of C-ITS solutions. Assessing the fairness and appropriateness of C-ITS infrastructure distribution necessitates the consideration of various equity types, impact factors, metrics, and demographic groupings. For instance, low-density populations and long distances render this technological development inaccessible to certain communities, thus further widening regional disparities.

Numerous frameworks exist to articulate equity in C-ITS deployment. ICLEI (2022) presents a framework that encompasses the dimensions of access, participation, and opportunities, mapping social risks and opportunities associated with programs, and identifying key equity aspects for integrating social equity into sustainability programs. However, such a framework should be tailored to the Australian context and align with the safe system approach, utilizing suitable indicators to monitor social impacts holistically over time (Rakotonirainy et al., 2022). A comprehensive equity analysis requires detailed examination of travel demands, accessibility, multimodal service quality, user and external costs, user acceptance, and obstacles, with disaggregated data to measure disparities between advantaged and disadvantaged groups and locations (Litman, 2022)

Conclusion

The transportation sector is undergoing significant transformations due to new technologies. However, the mere introduction of new technology will not automatically bring about societal improvements unless accompanied by modifications to our existing transport systems and policies within a novel equity framework. Recognizing this need, we have identified a framework that provides a basis for conceptualizing an equitable transport system.

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Fatalities at railway level crossings in Australia and New Zealand

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Abstract

While safety at rail level crossings (RLXs) is a continuing concern, limited data is available regarding fatal incidents. This analysis provides an in-depth review of fatal RLX incidents, focusing on the demographics and circumstances of fatal RLX incidents within Australia and New Zealand. A search of the National Coronial Information System for cases over a 20-year period identified 154 fatal RLX incidents resulting in 184 fatalities. Data were extracted regarding the circumstances of the incidents and demographics of road users involved. Key findings included: similar proportions of incidents occurred at active and passive RLXs; most incidents occurred on weekdays; the largest number of incidents occurred during daytime in non-peak times; the most represented type of road users whose behaviour directly preceded the fatal incident were drivers; and that road users involved were mostly male, and mostly adults. The findings are being used to inform education and awareness campaigns.

Background

Rail level crossing (RLX) safety is a concern in Australia and internationally (e.g. ONRSR, 2021; Kamphuis, 2021). Many crashes between road users and trains result in fatal incidents due to the high forces involved. Significant investment is being made to address risk and reduce the negative social and economic outcomes of RLX incidents. However, limited data is available regarding the circumstances of fatal RLX incidents and demographics of those involved, impacting the ability to design effective interventions. The aim of this analysis was to review fatal incidents in Australia and New Zealand.

Method

Ethics approval was gained from the University of the Sunshine Coast Human Ethics Committee (A201490) and the Victorian Justice Human Research Ethics Committee (CF/21/5107). The dataset was created via a search of records from the National Coronial Information System into fatal RLX incidents over 20 years (1/07/2001 to 30/06/2021). Cases identified as involving self-harm were excluded. Where publicly available, investigation reports by transport investigation agencies were used for supplementary information.

For each case, information was extracted: year of death; jurisdiction of death; location type; level crossing type; time of day; road user type; road user age group; and road user sex. An inter-rater check was conducted on data extraction for 10 percent of the sample yielding 95.5 percent agreement. Disagreements were agreed between analysts for the final dataset.

Results

A total of 154 RLX incidents were identified, involving 155 road users[12], resulting in 184 fatalities. See Figure 1 for number of incidents over time. Figure 1 shows an initial increase in fatalities, followed by a downward trend in recent years. However, some events may still be under investigation and thus these figures may be an under-representation of actual fatalities. Other key

[12] Road users are defined as the person most directly related to the incident (i.e., the driver of a vehicle struck by a train). Additional fatalities generally represent those who were passengers in a vehicle involved (in a road vehicle or on the train).

findings included that: similar proportions of incidents occurred at active (51%) and passive RLXs (45%); most incidents occurred on weekdays (80%); the largest number of incidents occurred during daytime in non-peak times (50%); the most represented type of road users whose behaviour directly preceded the fatal incident were drivers (including heavy vehicle drivers; 45%); and that road users involved were mostly male (75%), and mostly adults (96%).

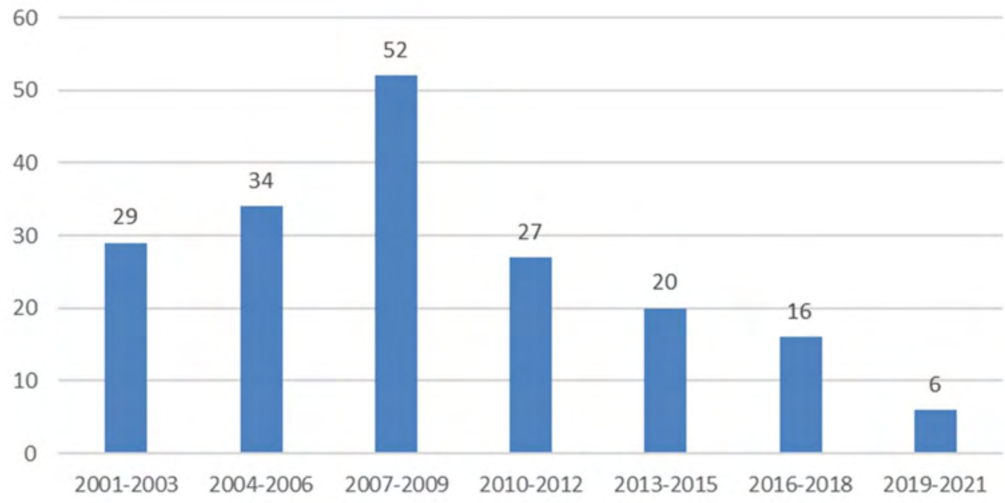

Figure 1. Fatalities by time period (n = 184)[13]

Conclusions

The findings from this preliminary analysis, including that drivers, and males in particular are key road users involved in fatal RLX collisions, are currently informing the targeting of education and awareness campaigns. The next stage of the research will identify the contributory factors to fatal RLX incidents. Findings from the overall project will assist to identify recommendations to address the systemic factors contributing to fatalities at RLXs. The work demonstrates the benefits of in-depth reviews of coronial records for informing road safety interventions.

Acknowledgements

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[13] Note that a single incident in 2007-2009 resulted in a large number of deaths, contributing to the high fatality numbers within this period.

Trust towards Autonomous Vehicles and human drivers under different scenarios

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Abstract

Autonomous vehicles (AVs) are proposed to improve road safety. Trust is a major barrier to AV acceptance. The introduction of AVs will impact other road user's behaviour, so it is essential to understand their perceptions towards AVs. We aimed to investigate third-party driver's trust in AVs compared to human-driven vehicles (HDVs) across different road events. Forty drivers participated in a simulated study with two conditions. In each condition, participants encountered a vehicle (AV or HDV) at two road events (right hand turn and pedestrian crossing). After each event, participants situational trust towards the vehicle was measured. We found that trust was significantly higher for AVs compared to HDVs, and that trust was significantly higher for the right-hand turn compared to the pedestrian crossing. These findings are promising for the incoming mixed traffic environment, however, education on the limits of AVs will be vital to ensure trust is appropriately calibrated.

Background

Autonomous vehicles (AVs) are proposed to greatly improve road safety. Trust is one of the largest barriers to acceptance of AVs; both in use of autonomous features and general acceptance towards AVs on the road (Zhang et al., 2019). Majority of trust in AVs research has focused on the user's trust in the AV (Dikmen & Burns, 2017). While understanding this relationship is important, it also essential to understand how third-party road users (pedestrians, cyclists and other drivers) trust AVs. Introducing AVs on the road will not only influence the AV user's behaviour, but also will impact other road user's behaviour, so it is essential to understand their perceptions towards AVs. A research report on Australian AV trials from the National Transport Commission (2020) reported that third-party road users (pedestrians and drivers) engaged in frequent risky behaviours around AVs. Similar findings have been reported in a simulated setting (Trende et al., 2019) where drivers were more likely to merge in front of AVs compared to human driven vehicles (HDVs); suggesting trust is a key factor in that behaviour. Cyclists and pedestrians have been found to have greater trust in AVs compared to HDVs (Hulse et al., 2018; Pammer et al., 2021). No study to date has investigated third-party driver's trust in AVs compared to HDVs; giving the aim of the present study.

Method

Forty drivers participated in a simulated driving study. The study had two conditions (AV and HDV which corresponds to the other vehicle present; see Figure 1), and this order was randomized. In each condition, participants encountered the vehicle at two types of city events (right hand turn and pedestrian crossing). After completing each event, participants responded to an adapted version of the Situational Trust Scale for Automated Driving (Holthausen et al., 2020) to measure situational trust towards the other vehicle.

Figure 1. Examples of the driving scene in the simulated experiment. In the AV condition, the vehicle that participants saw at the road event was an AV. In the HDV condition, the vehicle that participants saw at the road event was an HDV.

Results

A two-way repeated-measures ANOVA was conducted to examine the effect of vehicle (AV or HDV) and event (right-hand turn or pedestrian crossing) on trust scores. It found a significant main effect of vehicle, where trust scores were significantly higher for AVs compared to HDVs, $F(1, 39) = 6.05$, $p = .018$. A significant main effect of event was also found, where trust scores were significantly higher for the right hand turn compared to the pedestrian crossing, $F(1, 39) = 89.00$, $p < .001$.

Conclusions

The finding that third-party drivers have greater trust towards AVs than HDVs, suggests that drivers respond positively to encountering AVs on the road. Additionally, the finding that trust differed across the different road events suggests that trust is dependent on context. Taken together, these findings provide promise for the introduction of AVs on Australian roads. However, future research is needed to ensure that AV presence is not associated with overtrust, and a subsequent increase in risky driving behaviour of third-party drivers. Public education on the limits of AVs will be vital to ensure trust is appropriately calibrated for the incoming mixed traffic environment.

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A comparison of eRideable and cyclist behaviour in Perth

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Abstract

Little is known about how new eRideable laws in Western Australia (WA) are being complied with, and there is almost no empirical research in WA on eRider behaviour. The behaviour of eRiders and cyclists was observed at sites around metropolitan Perth, 7 days a week, from 8am-11am and from 3pm-6pm, for a two-week period. The information recorded included, the type of device being ridden, helmet use, rider gender, location (road, footpath, bike path), speed, and inappropriate maneuvers. Approximately 80 percent of the observations involved bicycles (or e-bikes), 19 percent e-scooters, and 1 percent e-skateboards. The most common location for riders was a bike path (57%), followed by a footpath (25%) and the road (17%). Approximately 80 percent of all riders were male. E-riders demonstrated more risky behaviour than cyclists, with helmet non-use, travelling too fast and inappropriate maneuvers being significantly greater than cyclists.

Background

Reflecting global trends, small electric rideable devices ('eRideables') continue to grow in popularity in WA. On 4 December 2021, new eRideables regulations, that introduced size/weight restrictions, speed limits for eRideable devices, and minimum age and helmet requirements for riders, came into effect. As the popularity and usage of eRideables has increased, paramedics have reported attending more e-Rideable incidents. Currently, little is known about how the new laws are being complied with, and, although there is good data from other states (e.g. Haworth, Schramm & Twisk, 2021) there has been little empirical research in WA on eRider safety behaviour.

To address this knowledge vacuum the current study was designed to document safety-relevant behaviours of eRiders in Perth.

Method

For the first two weeks in December 2022, ten research assistants observed and recorded aspects of eRider and cyclist behaviour at 10 sites around metropolitan Perth. The sites and times were chosen to ensure that they captured both commuter and recreational riders. Observations were made 7 days a week, from 8am-11am and from 3pm-6pm. The information recorded included the type of device being ridden, helmet use, rider gender, location (road, footpath, bike path), hire versus private, judged as travelling too fast and/or inappropriate manoeuvres for the conditions.

Results

Over the two-week observation period, information relating to 24,960 eRideables and bicycles was recorded. Approximately 80 percent were bicycles (or e-bikes), 19 percent e-scooters, and 1 percent e-skateboards. There were also small numbers of e-unicycles (37) and e-wheels (25). The most common location for riders was a bike path (57%), followed by a footpath (25%) and the road (17%). Approximately 80 percent of all riders were male.

While, on average, 90 percent of all riders were helmeted, this varied across rider groups. Logistic regression identified that helmet non-use was significantly greater for e-scooters (OR = 1.326, $p < .001$), e-skateboards (OR = 3.406, $p < .001$) and e-wheels (OR = 8.657, $p < .001$) than bicycles. Across all user groups, approximately 10 percent of riders were judged to be traveling too fast, but again this varied across user groups. Logistic regression identified that travelling too fast was

significantly greater for e-scooters (OR = 1.379, $p < .001$) and e-skateboards (OR = 1.434, $p = .033$) than bicycles.
The rate of inappropriate manoeuvres overall was 2.5 percent. Logistic regression identified that the occurrence of inappropriate manoeuvres was significantly greater for eScooters (OR = 1.309, $p = .008$) and eSkateboards (OR = 2.401, $p < .001$) than bicycles.

Conclusions

While it is clear that infrastructure factors contribute to eRider crashes (see e.g. Shah, Aryal, & Cherry, 2021; Yang, Ma, Wang, Cai, Xie, & Yang (2020), there is also evidence of risky behaviour in eRiders. For example, Hennocq, Schouman & Khonsari (2020) administered a questionnaire to 125 patients who presented with injuries associated with e-scooter use and found that risky behaviours were present in 87 percent of cases.

The current observational study compared eRiders with cyclists in the same locations and time periods. Risky behaviours were over-represented in eRiders compared to cyclists.

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A new systems thinking approach to road safety: policy position statement workshop

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Abstract

The Australian road transport system continues to create unacceptable levels of trauma. Whilst there are many systemic and societal factors that contribute to road collisions, the current road safety approach remains focused on a narrow set of causes. It is our view that this approach is no longer fit for purpose. The aim of this workshop is to communicate, discuss, and debate our recent policy position statement which called for a new systems thinking approach to road safety. The workshop includes an overview of systems thinking and the position statement, followed by a series of vignette-based practical examples of how systems thinking can be implemented in road safety practice. Each vignette will be followed by an opportunity for discussion and debate with workshop attendees. The workshop will close with a group practical exercise where attendees are encouraged to 'think in systems' and identify solutions to a pressing road safety issue.

Overview of workshop

1. Icebreaker and overview of workshop (5 mins, Martin Small)
2. Introduction to systems thinking (10 mins, Paul Salmon)
3. Audience Q&A (5 mins)
4. The policy problem (5 mins, Ann Williamson)
5. Overview of policy position statement (10 mins including questions, Martin Small)
6. Audience Q&A (5 mins)
7. Vignette 1: Fatigue management (5 mins)
8. Audience Q&A (5 mins)
9. Vignette 2: Cyclist safety (5 mins)
10. Audience Q&A (5 mins)
11. Practical exercise: No-blame crash reporting and investigation (15 mins)
12. Group discussion around barriers and enablers and workshop wrap up (15 mins)

The workshop relates to the conference theme of 'Safe travel for all' as it presents an overview of our recent policy positon statement in which we argue that a new systems thinking approach is required to achieve ambitious road safety targets. **A key principle of the systems thinking approach is the consideration of all participants when attempting to understand and optimise safety.** The ultimate benefit of implementing a new systems thinking approach will therefore be safe travel for all, including all forms of road user.

Audience benefit

1. A practical understanding of the systems thinking philosophy;
2. An overview of the limitations associated with the current safe system approach;
3. An overview of the proposed systems thinking approach to road safety;
4. Practical knowledge of how systems thinking can be implemented in road safety; and
5. Practical experience of applying the systems thinking approach to crash reporting, investigation, and analysis.

Background and experience of workshop leaders

Martin Small

Martin Small is a leading road safety management consultant, and non-Executive Director of RAA. He has long advocated formal adoption of safety management systems in road traffic, following early exposure in the maritime sector. He played a leading role in preparing ISO 39001 Road Traffic Safety Management Systems, and prepared guidance on the adoption of SMS by Australasian road agencies, and on safe systems of work in road traffic for employers. He was ACRS President from 2019-2022.

Paul Salmon

Paul Salmon is a Professor of Human Factors and is co-director of the Centre for Human Factors and Sociotechnical Systems at the University of the Sunshine Coast. Paul has over 20 years experience in applying systems thinking methods to understand and respond to complex safety issues. Paul's work in the area of road safety specifically has involved the application of systems thinking methods in areas such as the fatal five, cycling safety, gig economy delivery rider safety, and road crash analysis.

Ann Williamson

Ann Williamson is Emeritus Professor at the University of New South Wales Sydney and currently President of the ACRS. Ann was Director of the Transport and Road Safety (TARS) Research Centre, and Professor of Aviation Safety at the University of New South Wales where her work on human factors and injury in the areas of transportation and workplace safety was based strongly on systems thinking approaches.

Gemma Read

Gemma Read will co-deliver the workshop. Gemma is an Associate Professor at the Centre for Human Factors and Sociotechnical Systems at the University of the Sunshine Coast.

Audience interaction

The workshop will include contributions from six members from the policy position statement co-author group. This includes six short presentations (see above) as well as a practical exercise including all attendees. Interactive discussion with the audience is included after each presentation and vignette, and the workshop will close with a practical group exercise and an interactive discussion around barriers and enablers to the systems thinking approach. In total there will be 45 minutes of presentations and 50 minutes of interactive discussion, including the practical exercise.

Interactive components

- Icebreaker activity
- Brainstorming
- Hosting an expert panel
- Audience participation via practical exercise
- Audience discussion

Road safety management system for rural roads in Low and Middle Income Countries (LMICs)

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Abstract

Rural roads form the major component on most road networks, in Sri Lanka this amounts to 70% of the approximate 115,000 km road network. It also accounts for a major proportion of the road crashes. The road designs are often compromised due to lack of funding and have an ad-hoc maintenance regime. As a result there are significant safety risks due to roadway characteristics that remain unchecked. The study proposes a simplified road safety management system that can be implemented to assess the safety risk in the road network and prioritize mitigation measures within the budget constraints. A road safety inspection guideline is also part of this system that facilitates rating of roads based on exposure, likelihood and severity of a road crash due to a roadway issue. This can be easily integrated into existing asset management systems to integrate both safety and pavement conditions in fund allocation.

Background

Rural roads are important for connecting residential and commercial areas to the national road network, particularly in rural regions. However, despite the low traffic volume, the rural roads experiences a significant number of accidents, mostly due to high speeds and design issues (Wegman 2019). Many rural roads lack certain design features and essential road infrastructures like markings, signposts, and barriers. Therefore, safety is a primary concern when evaluating the effectiveness of a rural road network. Although Pavement Management Systems (PMS) consider multiple decision-making criteria to account for all relevant objectives related to road performance, safety performance is often overlooked due to the lack of necessary information (Farhan, 2011). Thus, this study proposed an alternative approach to incorporate the safety performance of rural roads, given the limitations of data and resources available to local road agencies.

Method

Moreover, the methodology proposes using a Cumulative Safety Index (CSI) based on a safety audit carried out by trained officers to evaluate the severity, exposure, and probability of safety issues on road segments in (Montella 2005, Cafiso et al. 2007),. Using the International Road Assessment Program (iRAP) (iRAP 2020), United States Road Assessment Program (usRAP) (Harwood and Hanza 2018), European Road Assessment Program (EuroRAP) (EuroRAP 2020), and research evidence, attributes that impact safety issues were selected. Each attribute was assigned a value on a 1-5 scale based on its impact on exposure, probability, or severity at a location, taking into account iRAP fact sheets, usRAP, EuroRAP, available crash data, and other research evidence on pre-crash factors. There are ten safety issues were considered in CSI including lack of signage, road markings at intersections, poor visibility, limited roadside space availability, road alignment, sight distance issues and lack of warning signs at curves etc.

Further, the study uses a Multi-Objective Optimization (MOO) model to identify the optimal maintenance scheme for the road network that maximizes both pavement condition and safety performance. The proposed MOO framework aims to minimize the average network International Roughness Index (IRI) and average network CSI for a single-year analysis, while taking into account constraints such as the allocated budget for the financial year and decision-tree restrictions.

To solve the optimization problem, Genetic Algorithm is employed by including three pavement maintenance strategies; minimum maintenance, preservation and corrective maintenance, and reconstruction and rehabilitation.

Feasibility

To illustrate the feasibility of the MOO method that integrates safety performance, 25 roads was chosen from the rural road network in Sri Lanka. The MOO analysis was carried out by varying available budgets, and the results showed that higher budget allocations lead to better improvements in the objective functions. The percentage of improvement in the CSI was found to be higher under single objective optimization than MOO concerning safety performance. However, the multi-objective optimization approach was deemed more effective and realistic in determining maintenance strategies for pavement condition and safety performance under available budgets. Therefore, this methodology can be applied to rural road maintenance planning to ensure a safe and comfortable travel experience for road users.

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Investigating cannabis flower's influence on cognitive skills related to driving

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Abstract

As medicinal cannabis use grows rapidly within Australia, issues surrounding the ability to accurately assess the impairing effects of this substance have become apparent. Considering this, the present study aimed to further elucidate how vaporised cannabis flower affects key cognitive skills that are necessary for driving in a sample of medicinal cannabis users (data collection in progress). Fifteen minutes after vaporising a dose of their prescribed cannabis flower, participants were administered a cognitive testing battery assessing sustained and divided attention, inhibitory control, information processing speed and mental flexibility. It is anticipated that data collection will be completed by May 2023 and results will be subsequently analysed.

Background

Medicinal cannabis use was legalised in Australia in 2016, resulting in a rapid rise in prescription rates (MacPhail et al., 2022). Cannabis flower can be prescribed for the treatment of several conditions and is recommended to be consumed via inhalation with a vaporiser. The main psychoactive component of cannabis, Delta-9-tetrahydrocannabinol (THC), is dispersed rapidly within the bloodstream after consumption, resulting in peak neurocognitive effects within approximately 15 minutes (McCartney et al., 2021). However, careful consideration of the literature indicates that these effects can differ between users and depend on a range of moderating factors. For example, those who use cannabis regularly have been shown to develop tolerance to some of these impairing effects (Ramaekers et al., 2021). There is therefore a pressing need for further research aiming to understand how inhaled cannabis flower affects cognition, specifically when it comes to functions necessary for driving and among medicinal populations. This knowledge can aid in the development of tools to identify THC impairment.

Method

A total of 34 medicinal cannabis users recruited from the Sunshine Coast have participated in this study. Those over the age of 18 with a current prescription for cannabis flower were invited to attend two testing sessions (baseline and post-consumption), with a washout period of approximately seven days. During their post-consumption session, participants consumed a dose of their cannabis flower using the TGA approved Volcano Medic vaporiser device, a safe and efficient method for intrapulmonary administration of cannabis (Hazekamp et al., 2006). Participants then completed the neurocognitive test battery post 15-minutes after inhalation, encapsulating the acute effects timeframe (McCartney et al., 2021). During their baseline session, participants completed the test battery without having consumed any cannabis within the last 11.5 hours. The order of these sessions was counterbalanced to mitigate practice effects. This study received approval from the University of the Sunshine Coast Human Research Ethics Committee (approval A211677).

Results

Paired samples t-tests will be conducted to determine if there are significant changes in cognitive performance from baseline to post-consumption on each test. Due to the possibility of Type 1 error inherent with multiple t-tests, a Holm-Bonferroni correction will be applied.

Conclusions

The results from this study will provide further insight into how THC impacts cognitive skills that are necessary for driving, in a sample of regular medicinal cannabis users. In addition, the findings will guide future research aiming to develop potential measures of impairment.

Acknowledgements

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Self-reported e-scooter rider and non-rider near-misses and crashes

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Abstract

E-scooters have become popular, providing convenience and environmental benefits compared to other transport modes. Increased usage has seen a corresponding increase in injuries. Near miss experiences can provide a deeper understanding of risk factors when crash data is lacking. In 2020, an online survey of people who had interacted with e-scooters, as a rider or other road user, was conducted in Brisbane. Questions were asked about crash and near miss events, including road users involved and the contributing factors. Near misses were more commonly reported than crashes, while the self-reported crash factors were consistent with hospital studies. The findings highlight the prevalence of single-vehicle crashes, while near misses were more likely to involve two or more parties. Further research is required to examine the relationship between near-miss experiences and the perceived safety of using an e-scooter of e-scooters for riders and non-riders.

Background

Electric scooters (e-scooters) promise convenience (Christoforou et al., 2021) and environmental benefits (Vestri, 2021). Their use has exploded since shared e-scooter schemes were introduced in the United States in 2017 (Christoforou et al., 2021) but it has been accompanied by increased numbers of injured e-scooter riders (Toofany et al., 2021). Near miss experiences have been shown to negatively influence perceived safety (Poulos et al., 2017). Given the paucity of e-scooter crash data in official road crash statistics, exploring self-reported crash and near-miss data can provide a deeper understanding of the various factors that may increase the risk of trauma for e-scooter users. This paper explores traffic and environmental factors associated with e-scooter crashes and near-misses within the Australian context, to identify risks to e-scooter riders and other road users.

Method

An online survey of people who had ridden a private (n=96) or shared (n=150) e-scooter and those who had interacted with them (n=387) was undertaken in Brisbane during June to September 2020. Participants aged 18 years and older were recruited by paid Facebook advertising and were eligible for a prize draw. They were asked whether they had ever been involved in a near miss (described as an unplanned event that has the potential to cause, but does not actually result in, an accident) and, for their most recent near miss, who else was involved and to rate the importance of contributing factors. They were then asked these questions about their crashes (described as accidents which involved a collision or a fall) and their severity.

Results

Table 1 summarises the self-reported involvement in crashes and near misses. As expected, near misses were more common than crashes for each of the three groups, but the difference was less for private e-scooter riders. For the riders and non-riders who had been involved in crashes, about one-third had been involved in a crash where someone was required to attend a hospital emergency department.

Consistent with hospital-based studies, most e-scooter crashes involved only the rider. However, the near misses reported by riders were much more likely to have involved other road users, particularly pedestrians and drivers. About two-thirds of the near misses reported by non-riders occurred when they experienced being almost hit as a pedestrian or almost tripping over an e-scooter.

E-scooter riders rated uneven surface as the most important contributor to their most recent single-vehicle crash or near miss. There was a trend for “my riding behaviour” (crashes and near misses) and “traffic conditions” (near misses) to be rated more strongly by shared than private e-scooter riders (p<.06). Non-riders rated “e-scooter and its operation” (e.g., brake failure or speed of an e-scooter) as the most important contributing factors for near-misses with pedestrians.

Table 1. Involvement in crashes or near misses and road users involved in most recent crash.

	Crash			Near miss		
	Private (N=96)	**Shared (N=150)**	**Non-rider (N=387)**	**Private (N=96)**	**Shared (N=150)**	**Non-rider (N=387)**
Involved in crash/near miss	36	18	43	63	76	254
Most recent involved						
No one else	29	17	-	28	44	-
Bike rider	1	0	1	7	4	31
Pedestrian	1	0	15	14	12	172
Driver	1	1	1	11	11	9
Pedestrian (tripped)			7			22
Pedestrian accessing public transport			2			3
Other	3	0	13	2	3	12
Motorcycle						2
Another e-scooter	1	0		1	2	

Conclusions

Self-report crashes are largely consistent with the findings from hospital studies. Further research is required to examine how near-miss experiences influence the perceived safety of e-scooter for both riders and other road users.

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Validity of self-paced online education and assessment: a review

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Abstract

Several Australasian road authorities have introduced interactive on-line versions of their driver handbooks and knowledge tests required for learner licensure. These are completed at the candidates' preferred pace and time. The intention is to ensure candidates learn all of the education components, and potentially improve access. This project aims to review recent evaluations of self-paced online education and assessment programs focusing on 16-25-year-olds to determine their validity and outcomes in comparison to conventional approaches. Given limited literature specific to driver licensure, comparable approaches in the food, retail and mining sectors are also under review. To-date driver licensing evaluations are lacking but generally studies report positive outcomes. Gender and perceived effort may influence selection of test type. Evaluations of online Australasian programs will be important for informing safe foundational learning for all learner drivers.

Background

A longstanding convention for obtaining a learner driver licence (permit) in Australasia is to study a driver handbook and complete a driver knowledge test. These are intended to ensure important foundational learning of licensing requirements, road rules and safe driving behaviours. Commonly, handbooks, all test questions and/or practice tests are now available online to improve access and encourage learning. Consequently however, some candidates report only studying the test questions. Recently, interactive online versions of handbooks and tests have emerged. In New Zealand, Drive NZ Road Code incorporates a series of learning modules and practice tests (https://drive.govt.nz/learner-licence/interactive-road-code/). Australian examples adopt similar approaches but additionally incorporate the formal test. This includes Queensland (https://prepl.transport.qld.gov.au/), Victoria (https://www.vicroads.vic.gov.au/licences/your-ls/learner-permit-test-online), Tasmania (https://www.platesplus.tas.gov.au/home) and South Australia (https://www.mylicence.sa.gov.au/myls).

These new approaches aim to ensure candidates access all desired education content. While candidates complete the program at their own pace, they are encouraged to access the test in multiple sessions to help extend the learning phase. They typically take 3-4 hours to complete. Being available on-line at any time, could also improve access to the test, such as for rural residents where testing availability might be limited. However, most programs are available in English-only, whereas conventional tests are available in multiple languages, can be taken orally and in groups with the support of an interpreter.

This project seeks to review Australasian and international literature to explore the validity, access and safety outcomes of self-paced online education and testing programs, including driver licensing specific evaluations and those in other fields where these approaches have been in place for many years.

Method

Preliminary searches of recent (past 5 years) literature were conducted via Scopus, Web of Science, TRID, PubMed, Google Scholar and websites of major road safety research bodies in Australasia, the UK, EU and North America, with a focus on 16-25-year-old participants.

Search terms included: ‘online learning’ OR ‘e-learning’ OR ‘web-based learning’ OR ’online training’ OR ’e-training’ AND ‘driver education’ OR ’retail’ OR ’evaluation’, variously including ’adolescent*’ OR ’teen*’ or ’young adult’.

Results

This project is on-going. Limited evaluations specific to learner licensing were found in over 3,000 records. As a result, the search was expanded to other self-paced safety-related training, such as workplace health and safety induction programs, common in the food handling, retail and mining sectors. This resulted in over 20,000 records, for which screening continues. To-date, all relevant studies report positive findings for online programs, noting that none include comparisons to conventional methods. Factors contributing to choice of online over conventional options may include gender (female) and perceived effort (easier).

Conclusions

Continued review will seek to identify validity and reliability assessments, including comparison to conventional methods in terms of pass/fail rates, number of attempts to pass, knowledge retention, whether access is improved by geographical or culturally and linguistically diverse populations, and associations with critical incidents outcomes (e.g., road/workplace offences/errors/‘accidents’). Currently, the limited findings highlight the importance of evaluating Australasian learner licensing developments.

Acknowledgement

This research was funded by Transport for NSW.

Predicting temporal segment-level crash risk map using advanced decision trees

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Abstract

To effectively manage safety, it is crucial to identify the spatial and temporal patterns of crashes. Since crashes are rare events and are influenced by various factors, machine learning algorithms are becoming an increasingly popular and efficient approach for forecasting crash risk. This study utilized NSW crash data between 2017 and 2020 to calibrate two advanced decision trees, the Ordered Random Forest (ORF) and Extremely Randomized Tree (ERT). Both models were used to forecast crash risk in segments of the transport network of Sydney using month, day of week, time of day, speed limit and presence of vulnerable road users. The accuracy of the models on the test dataset, which consists of Sydney crash data in 2021, was approximately 52 percent for three levels of severities, including "no injury, minor injury, major injury or fatal". The interactive map is utilized to display both actual and predicted crash risks across Sydney's network.

Background

The visualization of crash risk maps provides a representation of the occurrence of serious and fatal injuries on the road network. Such maps can be an essential component of a strategic risk management and investment approach. While crash risk maps highlight the spatial distribution of crashes, it is important to also examine how the distribution changes over time through a temporal analysis. This is because certain actions, such as the placement of police patrols or the implementation of variable speed limits, rely on an understanding of the temporal distribution of crash severity. Therefore, a comprehensive analysis of crash risk should include a temporal dimension, in addition to the spatial component.

The emergence of new technologies, such as artificial intelligence, sensor fusion, and advanced algorithms, has led to the development of models that can identify hazardous traffic patterns (Hossain et al., 2019). In many recent studies, machine learning algorithms have been employed to predict the frequency of crashes (Iranmanesh et al., 2022; Barbosa Silva et al., 2020). The objective of this study is to employ a machine learning algorithm for the purpose of predicting a temporal segment-level crash risk map in Sydney.

Method, Results, Conclusions

In this study, data on crashes in NSW was gathered from an open data website (Open Data, NSW Crash Data). The actual risk values are derived from real-world data, while the predicted risk values are generated by the machine learning models. These models undergo calibration using the real data, taking into account the impact of time-related variables on crash risk. The risk of crashes for each road segment was computed by means of a weighted average equation. The weights were assigned based on the severity of crashes, with the major injury and fatal crashes assigned a weight of 3, minor injury crashes assigned a weight of 2, and no injury crashes assigned a weight of 1. These weights serve as inputs to the models' calibration process and can be adjusted to enhance the accuracy of the models. The data was then divided into two subsets, crash data from 2017 to 2020 used as the training dataset and crash data from 2021 used as the test dataset.

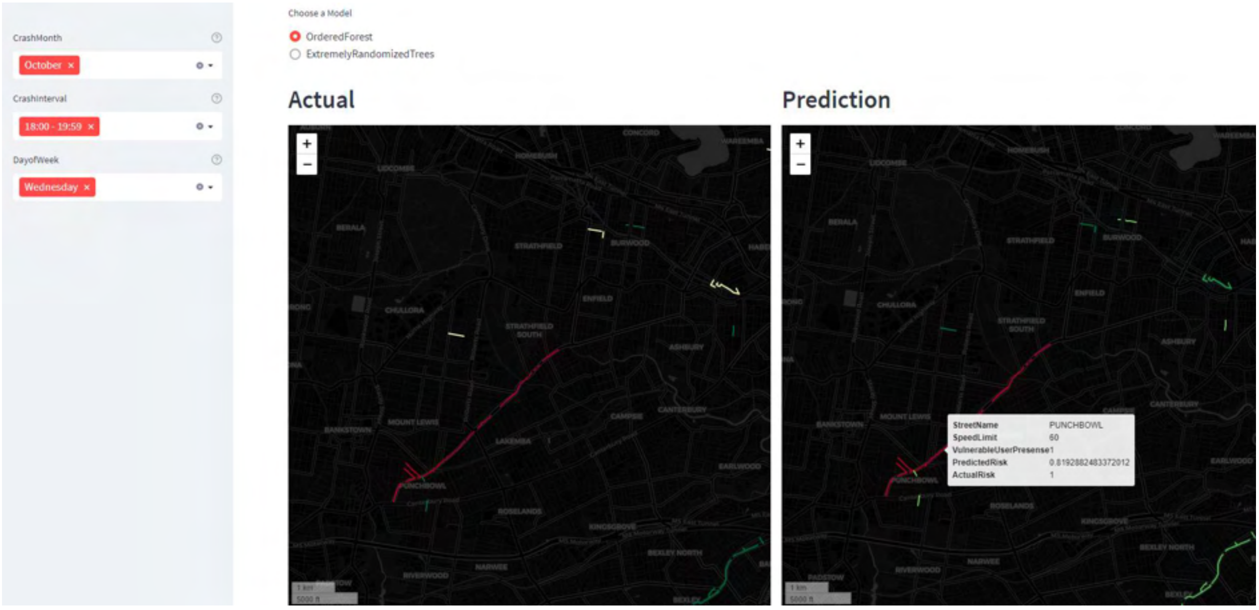
The Ordered Random Forest (ORF) tree was used to estimate the conditional probabilities of crash severity for road segments. The Extremely Randomized Tree (ERT) was employed to build multiple trees with bootstrap, enabling learning from imbalanced data. Both the ORF and ERT were calibrated using the training dataset and evaluated on the test dataset. Table 1 displays the performance of both models using a confusion matrix and four performance measures of ORF and ERT on the test dataset.

The elements on the main diagonal of the confusion matrix represent the number of correctly predicted crash severities. For instance, the ORF model accurately forecasted 3879 out of 4498 minor injury crashes. Accuracy is the ratio of the sum of correct forecasts to all forecasts, while precision is the ratio of correct forecasts to all forecasts for a specific class. The F1-score combines accuracy and precision scores into a single measure. High-quality models are characterized by accuracy and precision scores closer to one, and a higher F1-score is more desirable. While the performance measures may not be exceptionally high, they highlight the significant importance of taking into account the influence of time-related variables on crash risk mapping. This recognition emphasizes the need for comprehensive analysis and consideration of temporal factors when assessing and predicting crash risks on the map.

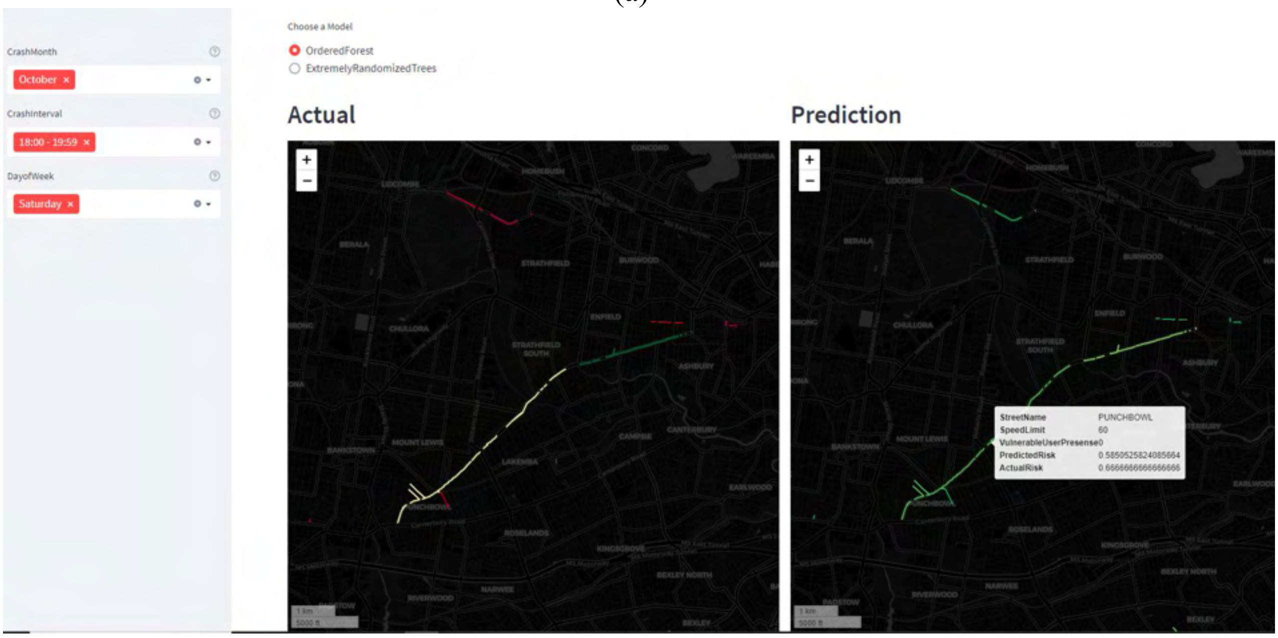
Table 1. Performance measures of ordered random forest (ORF) and extremely randomized tree (ERT) on test data set

Confusion Matrix of ORF			
Actual \ Prediction	No Injury	Minor Injury	Major Injury or Fatal
No Injury	789	2365	8
Minor Injury	471	3897	130
Major Injury or Fatal	142	1416	135
Accuracy	0.515	**Precision**	0.524
		F1	0.450
Confusion Matrix of ERT			
Actual \ Prediction	No Injury	Minor Injury	Major Injury or Fatal
No Injury	804	2355	3
Minor Injury	495	3975	28
Major Injury or Fatal	165	1495	33
Accuracy	0.514	**Precision**	0.527
		F1	0.433

Figure 1 presents the crash risk for PUNCHBOWL street in Sydney, revealing changes in both the actual crash risk and ORF prediction when the day is changed from Wednesday to Saturday while keeping October as the month and the time interval fixed at 18:00-19:59. The risk is color-coded to denote high, medium and low-risk segments in red, yellow, and green, respectively.



(a)



(b)

Figure 1. Visualisation of crash risk in PUNCHBOWL Street using Ordered Random Forest Decision tree in a day of October at 18:00-19:59 (a) Wednesday (b) Saturday

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Uptake of speed adviser app with mobile speed camera alerts

Kerry Shaz and John Wall

Transport for NSW

Abstract

The NSW Centre for Road Safety describes speeding as the "biggest killer on our roads", being a contributing factor to 41 percent of fatalities between 2017-2021. Intelligent Speed Assistance (ISA) is an advanced vehicle safety feature that reminds drivers of the posted speed limit. Australian research suggests that advisory ISA could reduce serious casualty crashes by almost 20 percent (Creef et al., 2011). The NSW government launched Speed Adviser, a free smartphone application, in 2014. Speed Adviser provides drivers with spoken and visual warnings when the speed limit is exceeded. In 2022, a new feature was added alerting drivers travelling through mobile speed camera (MSC) locations. Whilst the provision of MSC locations is unlikely to lead to network-wide improvements in road safety, the number of downloads substantially increased and now exceeds 105,000. The increased availability and usage of ISA in NSW is likely to help make travelling by roads safer for all.

Background

The NSW Centre for Road Safety describes speeding as the "biggest killer on our roads" reporting that speeding contributed to 41 percent of road fatalities and 24 percent of serious injuries between 2017-2021. Intelligent Speed Assistance (ISA) is an advanced vehicle safety feature that reminds drivers of the posted speed limit. Australian research suggests that advisory ISA could reduce serious casualty crashes by almost 20 percent (Creef et al., 2011). ISA is becoming more prevalent in recent years with Europe mandating ISA technology in new vehicle models from July 2022 (European Union, 2019) and the Australasian New Car Assessment Program (ANCAP) evaluating Speed Assist Systems in its overall safety rating of vehicles (ANCAP, 2022).

The NSW government launched a free smartphone application called Speed Adviser, a form of ISA, in 2014. Speed Adviser provides drivers with spoken and visual warnings when the speed limit is exceeded and when a school zone is active. In 2022, a new feature was added alerting drivers travelling through approved MSC locations (not of actual enforcement). There were challenges incorporating MSC data, due to its format.

Results

Prior to the release of MSC alerts, downloads of Speed Adviser were steady with fewer than 500 downloads in a typical month (Table 1). The MSC alert functionality of Speed Adviser was launched in the media on 9 October 2022 with a metropolitan television news story featuring a Transport for NSW Senior Manager and the NSW Minister for Metropolitan Roads (Channel 9 News, 2022). Print news stories, social media posts and blog updates followed in the subsequent days. This media attention likely contributed to the increased awareness of the app and subsequent increased downloads.

Table 1. Downloads in the months before and after the inclusion of MSC alerts

	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
Android	242	238	227	10,965	748	907	494
iOS	205	247	231	20,529	802	1,971	404
TOTAL	447	485	458	31,494	1,550	2,878	898

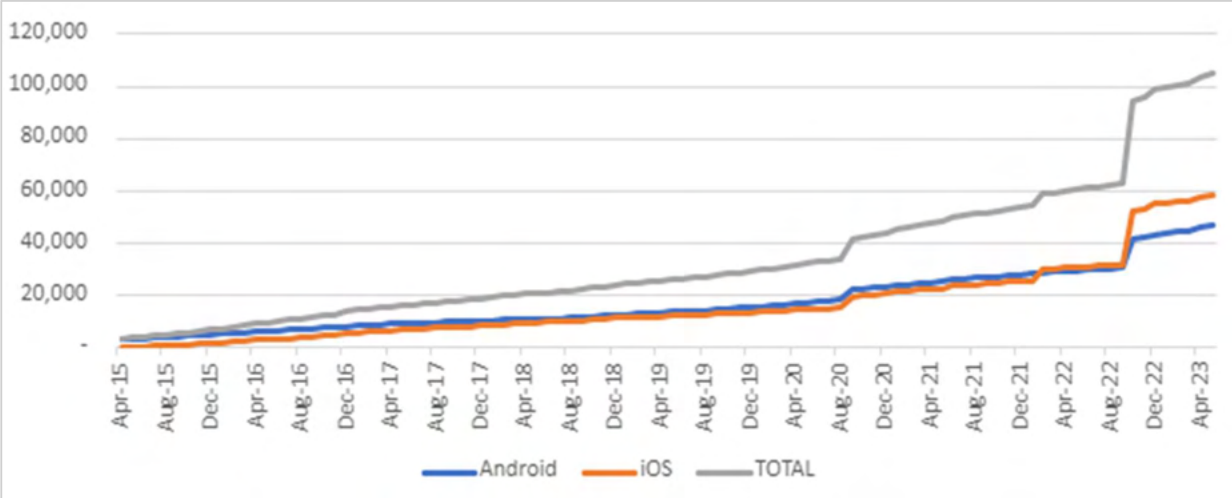

Figure 1. Speed Adviser, cumulative downloads 2015-2023

In addition to downloads increasing in October 2022, there was also more correspondence received and reviews posted about the app. Users contacted the team to report speed zone errors, technical difficulties, or to enquire if the application was available in other jurisdictions. This increase in user feedback demonstrates that the target audience were not just downloading the app but were also actively using it as intended.

Other measures to determine app usage were not collected due to privacy. The purpose of the application is not to collect or store data about individuals or monitor their actual speed compliance.

Discussion

The present work has demonstrated that the introduction of MSC locations to the Speed Adviser app as well as the associated publicity, has led to a significant increase in downloads and usage of the app. Previous ISA trials in NSW have shown that 89 percent of drivers using the technology reduced the amount of time they exceeded the speed limit (Creef et al., 2011). It is expected that wider usage of Speed Adviser may therefore increase speed compliance across the network. Furthermore, the mapping of speed zones used in this application can support broader technology, including connected and automated vehicles and speed limiting technologies, thus facilitating safer road travel for all.

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Star-rating using iRAP: demonstrator case study, BIL-Mandalika Road, West Nusa Tenggara

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Abstract

While being used worldwide and introduced for long time in Indonesia, the star-rating method is not commonly recognized among Indonesian road administrators. According to a presidential decree (No.1, 2022), the goal of Pillar 2 Safer Road is for all new roads to achieve a 3-star rating or above by 2030. This paper aims to provide an overview of the use of simple tools to carry out road safety star-rating based on the iRAP protocol. The Star Rating Demonstrator was used to showcase the star rating of the BIL-Mandalika road. The road segment data were sourced from Google Maps and Google Street View. Results show that the 17.5 km road section has an average score of 4 stars. This paper shows that star rating assessment for short road sections can be conducted using simple and inexpensive tools.

Background

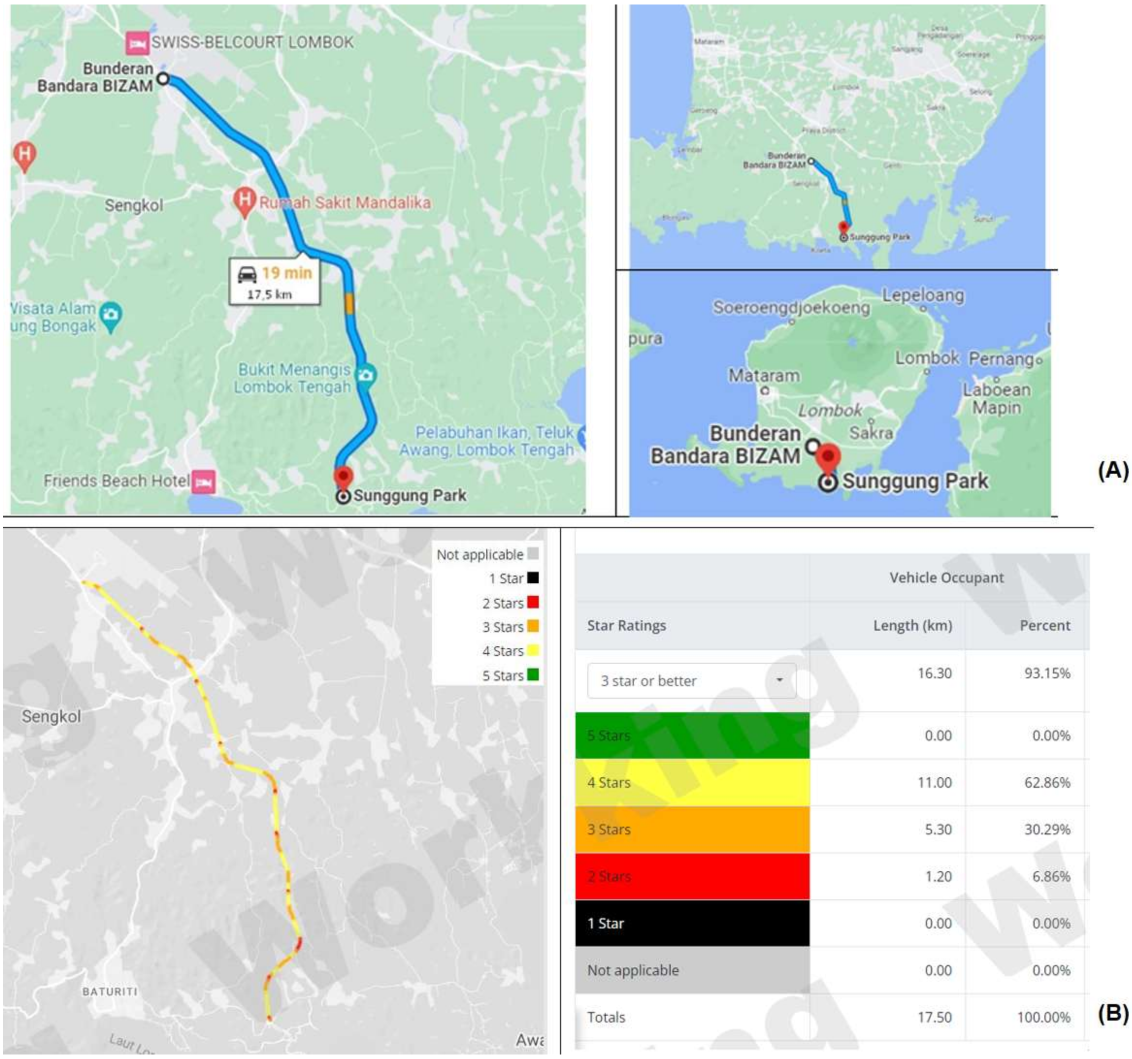
The implementation of road safety star-rating using the iRAP method has been carried out by the Ministry of Public Works of Indonesia since 2010 (at that time it was carried out by the Institute of Road Engineering/IRE). The implementation of the star rating is considered expensive and resource intensive task due to the data being sourced using specialised equipment such as the Hawkeye survey system, which is not available to some road administrators. This resulted in the implementation of the star rating being hindered and not progressing. The use of the Hawkeye survey tool can produce very accurate results, but the costs and effort acquired are quite high.

Purpose

This article aims to provide an overview of the use of alternative inexpensive and simple tools to carry out star ratings with reliable results.

Data and Methods

The road segment data is acquired from Google Maps and Google Street View. The star-rating tool used is the Star Rating Demonstrator available on iRAPp website. The case study focussed on the 17.5-km long BIL-Mandalika Road in West Nusa Tenggara - Indonesia (see Figure 1). Attributes are calculated through visual observation using images from Google Street. The 100 meter long segment is determined using the measurement feature on Google Maps.



	Vehicle Occupant	
Star Ratings	Length (km)	Percent
3 star or better	16.30	93.15%
5 Stars	0.00	0.00%
4 Stars	11.00	62.86%
3 Stars	5.30	30.29%
2 Stars	1.20	6.86%
1 Star	0.00	0.00%
Not applicable	0.00	0.00%
Totals	17.50	100.00%

Figure 1. (A) Location of BIL-Mandalika Road, Lombok Island West Nusa Tenggara, (B) Result of Star Rating from VIDA dashboard

Results

The final results show that the 17.5km long road section gets an average 4-star. Typical road segments are four lane separated with guardrail and proper shoulders. Segments with 3 stars include: STA 4.4 km since it has property access and horizontal curvature, while segments with 2 star is in a junction with a score of 20.01. For further result see Figure 1. This study was carried out with coding according to the iRAP protocol and carried out by trained officers, but further supervision still needs to be done by trained supervisors.

Conclusion

Based on the case study, it can be concluded that the star rating Demonstrator tool can be used to carry out star-rating by combining iRAP demonstrator tools with road data from Google Streetview or Mapillary imagery and google maps. Star-Rating provides a concise and objective road rating of safety level based on the geometric conditions and the properties of the road. Therefore, for road administrator with limited budget, this approach can be recommended to improve road safety.

Risk assessment for transportation of Dangerous Goods through tunnels

Binod Shrestha, Vivek Shrivastava, Diana L. Zagora and Christian Christodoulou

Transport for NSW

Abstract

Transportation of Dangerous Goods (DG) through tunnels must consider the safety of its users in all transport modes. A serious incident involving DG vehicle in a tunnel can be extremely costly in terms of loss of human life, environmental degradation, tunnel damage and transport disruption. The risks associated with DG vehicle transportation should be analysed and mitigated considering the balance of cost, risk and performance. Transport for NSW (TfNSW) has developed a multimodal risk assessment standard to set out a clear and consistent approach for assessing the risk of the passage of DG vehicles through tunnels. This extended abstract summarises the new standard outlining the key concepts of risk assessment and the requirements of risk assessment methodology. This standard provides an innovative and evidence-based approach to the risk assessment of transporting DG through tunnels and provides significant economic benefit by saving travel time costs and enhancing the safety measures to mitigate the risks to the surrounding community and its customers.

Background

Transportation of DG vehicles may pose significant risks to the community, environment, or infrastructure when loss of containment of the freight occurs. This risk should be analysed and mitigated so far as is reasonably practicable (SFAIRP). A few studies had been attempted in TfNSW tunnel projects as a part of the design and evaluation process to transport the DG. However, those studies were considered insufficient to drive a robust decision-making process within TfNSW. There is no current state or national standard for risk assessments associated with the transport of DG through tunnels. Therefore, TfNSW has developed a multi-modal standard for the risk assessment of DG through tunnels considering the best practice of Asset Management principles.

Standard Development Process

The DG risk assessment standard has been developed by defined work sprint packages and an innovative solution that achieved the desired outcome. A risk workshop was organised among the wider stakeholders within TfNSW to understand the purpose and value of developing a consistent risk assessment standard for the transport of DG through tunnels. The key activities comprised of:

- Conducting extensive literature review of the DG risk assessment
- Discussing the background and purpose of the risk assessment standard and value creation
- Collating feedback on the draft structure of the standard
- Discussing different types of risks that need to be considered
- Utilising the experience of risk assessment in the recent transport projects

DG Risk Assessment Concepts

The key concepts of risk assessment for the transportation of DG vehicle through tunnels include:

- Factors influencing decision making
- DG risk framework
- Safety in criteria
- Risk reduction
- SFAIRP - Under legislation TfNSW is responsible to manage risks SFAIRP.
- Risk assessment techniques

The DG risk framework has been developed considering an overall process for the development of fixed DG facilities integrating the hazard-related assessments. The assessment process is a generic framework that forms the basis for the development of a risk assessment methodology for the transportation of DG vehicles through tunnels, across the different stages of the asset life cycle.

Risk Assessment Methodology

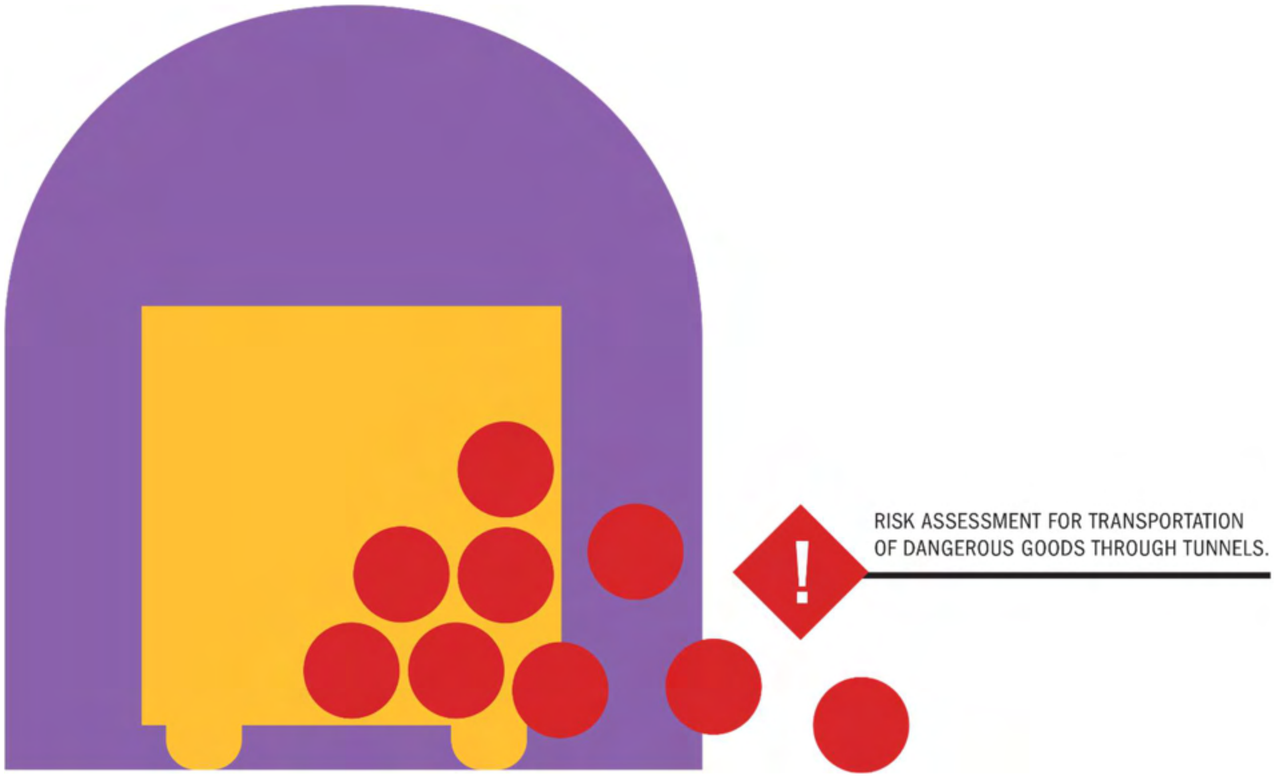
This standard describes the risk assessment methodology that spans the entirety of the lifecycle of road and rail tunnels. The risk assessment technical report should follow the quantitative risk assessment in all lifecycle activities:

- Demand/need stage - the type of DG freight transported along the route shall be identified and compared for each route as part of the risk assessment process.
- Planning stage: Comparative risk assessment, and absolute risk assessment
- Create/Acquire stage - the nominated route may have design changes that impact the societal risk. If this case, an absolute risk assessment shall be reconducted.
- Operational/Maintenance stage – the DG risk assessment should be carried out at least every five years of operation or when the operations and maintenance strategy change.
- Renew/Dispose stage - the same assessments as the operational/maintain stage may be carried to assess the changing conditions when renewing the asset. Outcomes of the quantitative risk assessment should indicate whether existing tunnel design is adequate to demonstrate SFAIRP or if there is need for the tunnel to undergo modifications to meet SFAIRP requirements.

A few specific requirements to consider in road or rail tunnels regarding the DG transportation are listed in the standard based on industry knowledge and experience as well as consideration of general risk reduction measures for tunnels.

Conclusion

This standard presents the key concepts of risk assessment including the DG risk framework, factors of influencing decision making, safety risk criteria and risk assessment methods. It provides an evidence-based approach for the risk assessment of DG vehicles through tunnels to help inform decision making by getting assurance through a systems and safety engineering approach for the tunnel design and operational procedures by managing the risk SFAIRP. It offers significant economic benefit by saving travel time costs and enhancing the safety measures to mitigate the risks to the surrounding community and its customers.


RISK ASSESSMENT FOR TRANSPORTATION
OF DANGEROUS GOODS THROUGH TUNNELS.

Child restraint legislation and injury rates in children aged 0-14 years

Chen-Chun Shu

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Abstract

In March 2010, new child restraint legislation was implemented in NSW which required child passengers up to the age of 7 travelling in a motor vehicle to be restrained in an age-appropriate restraint. With before and after design using generalized estimating equations Poisson model and changepoint analysis method, this linked data study analyzed injury rate in child passengers aged 0-14 admitted to hospital July 2001 - March 2019 in NSW. When comparing with age group 11-14, the injury rate for age-group 1-6 reduced by 20 percent in 2008 (IRR= 0.80, 95% CI= 0.66-0.96) and by 21 percent in 2007 (IRR= 0.79, 95% CI= 0.66-0.97). There was no significant change in injury rate before and after 1 March 2010. Our findings identify earlier declines in injury rates in children aged 1-6 years also indicating a need for a flexible approach to identify earlier or later change time-point for similar studies.

Background

In March 2010, new child restraint legislation was implemented in NSW which required child passengers up to the age of 7 travelling in a motor vehicle to be restrained in an age-appropriate restraint. Prior to this restraint type was only stipulated for children aged <1 years. Past research examining the policy impact has not found any significant reduction in child injury, possibly due to short period of follow-up, different datasets used, and methods assuming a specified change time-point. The objectives of this study were to (1) compare injury rates in child passengers before and after March 2010, and (2) identify the true change points.

Methods

Study design: This is a retrospective linked data study applying a quasi-experimental before and after design using data collected through various datasets in New South Wales, Australia, between 1 July 2001 and 31 March 2019.

Study sample: Four-wheel motor vehicle passengers aged 0 to 14 admitted to hospitals with injury diagnoses were identified using ICD-10-AM codes from a linked dataset comprising of the NSW Admitted Patient Data Collection, Registry of Death, and Cause of Death datasets.

Data Processing: Sequential and multiple records within 24 hours contributed by different hospitals were aggregated into a single record as the index admission. Monthly injury admission number and rate were then aggregated and adjusted to the population[1] by age 0, 1-6, 7-10, and 11-14 (years old).

Statistical approach: Injury rate over time were assessed using a quasi-experimental design using generalized estimating equations (GEE) Poisson model. Age-group 11-14 were used as a control as the travelling requirement for this age-group was not different before and after March 2010. The data distribution before and after various time-points including March 2010 were checked for overdispersion, autocorrelation, seasonality before testing in the GEE models. All data were analyzed with SAS Enterprise Guide 7.1 and RStudio 4.2.1.

Results

213 data-points/months and 2940 injury cases were analyzed. Over the 19 years, there was a decline in the injury rate for all age-groups (Figure 1). When comparing with the control group, significant change points were identified in March 2008 and March 2007 for age-group 1-6. Compared to the

control, the injury rate for age-group 1-6 reduced by 20 percent in 2008 (IRR= 0.80, 95% CI= 0.66-0.96, p= 0.019) and by 21 percent in 2007 (IRR= 0.79, 95% CI= 0.66-0.97, p= 0.0205) (Table 1).

Table 1. GEE Poisson Model estimations of reduction in admitted injury rates 2004-2016

Age group **Ref: 11<= age <15 y/o**	**Point estimates**	**95% CI**	**p-value**	**IRR (95% CI)**
March 2016				
0	0.21	(-0.31, 0.73)	0.4303	1.23 (0.73, 2.08)
1-6	-0.17	(-0.42, 0.08)	0.1735	0.84 (0.65, 1.08)
7-10	-0.12	(-0.38, 0.14)	0.3698	0.89 (0.68, 1.15)
March 2015				
0	0.14	(-0.35, 0.63)	0.573	1.15 (0.71, 1.88)
1-6	-0.11	(-0.33, 0.12)	0.3567	0.90 (0.72, 1.13)
7-10	0.03	(-0.20, 0.27)	0.7743	1.03 (0.82, 1.31)
March 2014				
0	0.19	(-0.26, 0.65)	0.4058	1.21 (0.77, 1.92)
1-6	-0.05	(-0.26, 0.16)	0.6081	0.95 (0.77, 1.17)
7-10	0.05	(-0.17, 0.27)	0.6798	1.05 (0.84, 1.31)
March 2013				
0	0.06	(-0.38, 0.51)	0.774	1.07 (0.69, 1.66)
1-6	-0.07	(-0.26, 0.13)	0.5159	0.94 (0.77, 1.14)
7-10	0.02	(-0.19, 0.23)	0.8458	1.02 (0.83, 1.26)
March 2012				
0	0.10	(-0.32, 0.53)	0.631	1.11 (0.73, 1.70)
1-6	-0.10	(-0.29, 0.09)	0.3193	0.91 (0.75, 1.10)
7-10	-0.03	(-0.23, 0.18)	0.7982	0.97 (0.80, 1.19)
March 2011				
0	-0.0009	(-0.42, 0.42)	0.9967	1.00 (0.66, 1.52)
1-6	-0.18	(-0.37, 0.004)	0.0557	0.83 (0.69, 1.004)
7-10	-0.11	(-0.31, 0.09)	0.274	0.90 (0.73, 1.09)
March 2010				
0	0.01	(-0.41, 0.43)	0.9493	1.01 (0.67, 1.54)
1-6	-0.15	(-0.33, 0.04)	0.1174	0.86 (0.72, 1.04)
7-10	-0.09	(-0.29, 0.11)	0.3622	0.91 (0.75, 1.11)
March 2009				
0	-0.02	(-0.45, 0.40)	0.9113	0.98 (0.64, 1.49)
1-6	-0.16	(-0.35, 0.02)	0.0846	0.85 (0.71, 1.02)
7-10	-0.05	(-0.25, 0.14)	0.5895	0.95 (0.78, 1.15)
March 2008				
0	-0.14	(-0.57, 0.29)	0.5162	0.87 (0.57, 1.33)
1-6	-0.22	(-0.41, -0.04)	0.019	0.80 (0.66, 0.96)
7-10	-0.05	(-0.25, 0.15)	0.6148	0.95 (0.78, 1.16)
March 2007				
0	-0.002	(-0.45, 0.44)	0.9942	1.00 (0.64, 1.56)
1-6	-0.23	(-0.42, -0.03)	0.0205	0.79 (0.66, 0.97)
7-10	-0.02	(-0.22, 0.19)	0.883	0.98 (0.80, 1.21)
March 2006				
0	0.09	(-0.38, 0.56)	0.7007	1.10 (0.68, 1.76)
1-6	-0.14	(-0.33, 0.06)	0.1808	0.87 (0.72, 1.07)
7-10	0.11	(-0.11, 0.33)	0.3328	1.11 (0.90, 1.39)
March 2005				
0	-0.02	(-0.52, 0.48)	0.9489	0.98 (0.60, 1.62)
1-6	-0.08	(-0.30, 0.13)	0.4557	0.92 (0.74, 1.14)
7-10	0.07	(-0.16, 0.31)	0.5413	1.08 (0.85, 1.36)
March 2004				
0	0.04	(-0.52, 0.60)	0.8936	1.04 (0.59, 1.82)
1-6	-0.11	(-0.34, 0.13)	0.3715	0.90 (0.71, 1.14)
7-10	0.09	(-0.17, 0.36)	0.4894	1.10 (0.84, 1.43)

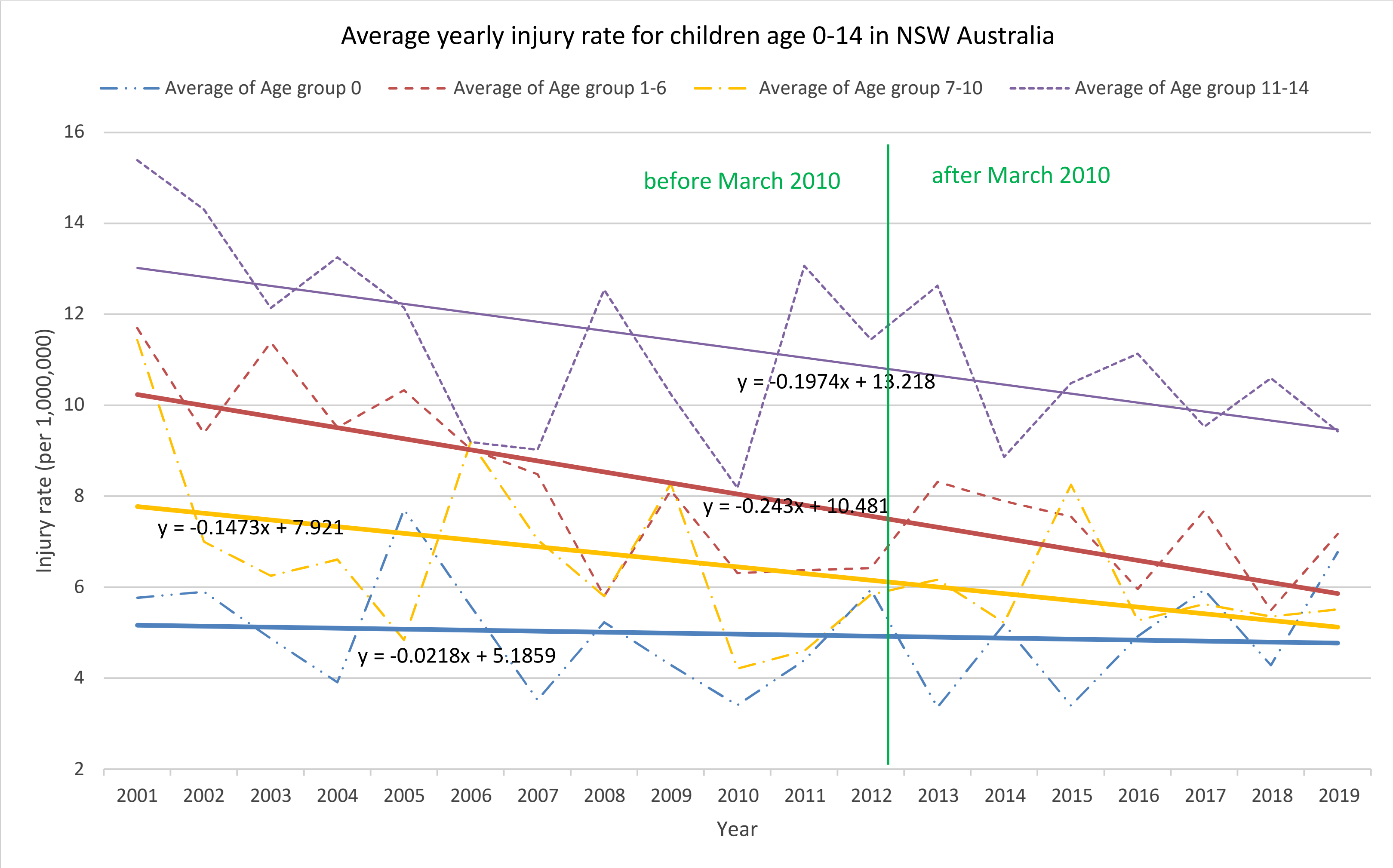

Figure 1. Average injury rate (per 1,000,000) for children age 0-14 in NSW, Australia

Conclusions

No significant change in injury rate for children of 1-6 years was found before and after the child restraint legislation implemented in NSW on 1 March 2010. However, changes in restraint practices might occur before or after the legislation due to activities in the lead up to, and following the legislation change. Our findings identify earlier declines in injury rates in children aged 1-6 years. Our findings have implications for the methodologies for similar studies examining the impact of implementation of legislative changes also indicating a need for a flexible approach to identify the true change point, such as changepoints analysis.

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Implementing the National Driver Distraction Roadmap

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Abstract

Implementation of the National Roadmap on Driver Distraction is a commitment of the Australian National Road Safety Strategy 2021-2030, and Austroads has begun work on a project to support this. The Roadmap reflects the growing recognition that a systems approach is required to address driver distraction. Driver distraction occurs as part of a complex interaction of many different components within the road traffic system, and solutions will need to come from a wide range of service and product suppliers. Progress is reported on the establishment of a governance framework, an implementation guide, and a forward work program to 2030. The paper discusses the value of a systems thinking approach to the distraction problem, and of establishing road safety governance systems which actively bring non-government actors together to provide direction and input on government supported projects.

Background

A National Roadmap on Driver Distraction was published by the Australian and Queensland Governments in 2019, following a program of work led by Queensland involving research into the systemic safety issues associated with driver distraction, and engagement with a wide range of stakeholders. Implementation of the Roadmap is a commitment of the Australian National Road Safety Strategy 2021-2030, and Austroads has begun work on a project to support this.

Issue

The Roadmap identified that driver distraction is the least understood and least enforceable behavioural issue in road safety. Research evidence (particularly regarding mobile phone use) shows that driver distraction is extremely dangerous, but unlike other key issues such as speeding, drink driving, and seatbelt wearing there is little if any evidence of effective behavioural countermeasures. The Roadmap reflects the growing recognition that a much wider, systems approach, is ultimately required to address driver distraction. A core problem is that driver distraction occurs as part of a complex interaction of many different components within the road traffic system (and other aspects of society), and that road safety practice often fails to address safety problem from a systems perspective. Solutions to the problem will need to come from a wide range of service and product suppliers.

The Roadmap acknowledged that engaging the distracted driving “ecosystem” is critical for the development of innovative solutions to reduce distraction related fatalities and serious injuries on Australian roads. It set out five strategies that provide the basis for addressing the problem and which are fully incorporated in the Austroads project:

- Designing for a safer interaction
- Mapping out the adoption of in-vehicle distraction mitigation technology
- Recognising the vehicle as a workplace
- Encouraging greater compliance through enforcement
- Changing driver behaviour.

Progress to Date

To continue the collaborative design process a governance framework is being developed with the intention of establishing a leadership group which encourages ownership by key stakeholders, and a forum which is open to all stakeholders. Initial attention will focus on a forward work program to prioritise initial investment and set out options for further investment through to 2030. An implementation guide is also being prepared. The paper will report on progress made on each of these three deliverables.

This project is adopting a systems perspective to an intractable problem which is likely to persist, and probably worsen, if it is not addressed. This paper will discuss the value of a systems thinking approach to a road safety issue, including the critical *interactions* between different *components* of the road transport system and other relevant societal systems, and the relevance of this approach to road safety more generally. It will highlight critical actions by various stakeholders to date, and discuss the value of establishing governance systems in road safety which actively bring non-government actors together to provide direction and input on government supported projects.

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Review of driver monitoring technologies

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Abstract

Victoria's Transport Accident Commission (TAC) sought a review of Driver Monitoring Technologies to better understanding whether they (yet) represent a fundamental safety technology for all future vehicles. The review considered the relevance, readiness and efficacy of the technology. Inattention is a significant contributor to road crashes in Victoria and driver monitoring technologies are a relevant countermeasure. The European regulatory environment is likely to support both uptake and further maturing of the technologies, particularly for interior (driver-facing) cameras. The review found evidence of both the role of inattention in crashes and some evidence for professional heavy vehicle drivers of behaviour change in response to driver monitoring alerts. Increased adoption of the technology such as in response to European regulation, offers opportunities to further quantify efficacy to assist assessment of value relative compared to other road safety interventions.

Background and Purpose

Victoria's Transport Accident Commission (TAC) works with road safety partners to achieve a vision of no deaths or serious injuries on Victorian roads. Victoria's Road Safety Strategy 2021-2030 includes both "initiatives that have an immediate impact while also preparing for future changes to road safety technology." This project examined one area of developing technology, using literature analysis and targeted interviews to explore a hypothesis that "driver monitoring technology is a fundamental safety technology for all future vehicles."

Method

Addressing the posed hypothesis required an exploratory discussion rather than a yes / no test. Achieving the purpose of the work required answering contributing elements to inform an overall assessment:

- Relevance: what is inattention and what is its contribution to the road safety challenge in Victoria both in aggregate and indicators of prevalence?
- Readiness and Efficacy: what range of technologies are available and what are their effectiveness and maturities?
- Adoption: what adoption of which technologies is likely, what are the drivers of adoption and what influence may be possible over adoption?

Only some parts of some questions benefited from the availability of high-quality literature. The purpose of the work required the best achievable answer (with any necessary qualifications) rather than an assessment of the state of literature. A modified Delphi method was used to undertake a multi-stage review in each area, with expert interviews providing a partial control on the preliminary results of each stage.

Relevance

Inattention is where a driver pays insufficient attention to activities required for safe driving. It includes both drowsiness as a type of insufficient attention and distraction as a type of misdirected attention.

The analysis of literature found that:

- *Inattention contributes to many crashes*: estimates varied from 25% to 71%, e.g. the Victorian Enhanced Crash Investigation Study found 49% of sampled serious crashes had inattention as a contributing factor, and 25% included drowsiness (Fitzharris et al, 2020);
- *Inattention is prevalent:* 52% of baseline epochs in the 3,500 vehicle United States SHRP2 Naturalistic Driving Study included at least one form of observable distraction (Dingus et al, 2016); and
- *Inattention is risky:* odds ratios vary between types of inattention and between studies, e.g. 8.82 for *reaching for moving object in vehicle* in Klauer, et al (2006) and 2.22 for texting on a mobile phone in Owens, et al (2018), but are mostly greater than one.

The project also found that for crashes that occurred in less hazardous environments, a greater proportion had inattention as a contributing factor than for crashes in more hazardous environments (e.g. crashes more likely to have inattention as a contributing factor for straight roads compared to curves, for lit roads compared to unlit, for lower rather than higher speed limits). There was also some evidence of imperfect self-moderation: in general driving, drivers were more likely to initiate secondary tasks when stationary than when moving and more likely to glance away when gap increasing to lead vehicle than when gap reducing.

Readiness and Adoption

Driver monitoring technologies include both:

- *Direct methods*: interior driver-facing camera, biometric sensors on body or in seat; and
- *Indirect methods:* vehicle dynamics monitoring (e.g. steering corrections), exterior camera (monitoring lane-keeping behaviour) and steering wheel (torque, touch).

Both methods have been in research, development and production for some years. There has been significantly greater uptake to date of the lower cost indirect methods, but changes to EU regulations (see below) are likely to increase adoption of direct methods.

The European Union General Safety Regulation (EU GSR) includes staged requirements for new vehicles to have both driver drowsiness and attention warning (DDAW) for which test methods assume indirect methods and advanced driver distraction warning (ADDW) likely to require an interior camera to achieve draft requirements for gaze direction and visual distraction. The EU GSR, along with EuroNCAP and ANCAP test protocols, can be expected to support increased availability of vehicles equipped with direct and indirect driver monitoring to the Australian market.

Evidence of Efficacy

The increased adoption of driver monitoring technologies creates possibilities to gather additional evidence about their efficacy in achieving reduced crash rates. At present, there is a wide literature base on role of inattention in crashes as well as much analysis of how distraction might be detected. There is more limited direct evidence that driver monitoring alerts lead to behaviour changes, and this has most commonly been assessed for professional heavy vehicle drivers. Some current claims that driver monitoring technologies reduce crash rates use logic arguments to make this claim rather than direct evidence of efficacy, particularly relying on the significance of inattention. The consideration of efficacy for driver monitoring technologies would also benefit from context with respect to other methods that are also available to addressing crashes for which inattention is a contributing factor (e.g. the analysis of Seidl et al, 2017 treated vehicle crash avoidance systems as an additional layer of relevance).

Next steps

The increasing fitment of driver monitoring technologies in the European vehicle fleet, and likely increases in Australian fitment, create an opportunity to monitor and learn more about driver monitoring technologies. It appears *likely* that increased adoption driver monitoring technologies would be beneficial (and unlikely to be harmful), but further quantification of efficacy would assist assessment of their relative value compared to other road safety interventions.

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Motorcycle Safety Project – preparing for ride to Zero

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Abstract

From 2019 to 2021, research was undertaken to understand motorcycle rider motivations and attitudes to identify opportunities to improve their safety. The project took a rider-centric approach over three stages that identified seven riding personas. Opportunities were identified to improve the safety of two of these personas: Social and Avid-Enthusiast Riders. These riders were prioritised due to their risk profile and willingness to improve their riding skills and safety through their social networks and online media. Building upon this research, the Ride to Zero program is a new community-led approach to develop initiatives to improve the safety of riders. The program will initially focus on developing a rider mentoring program, online content and support for riding organisations to promote safety within their communities. Ride to Zero is a key motorcycle safety initiative of the Queensland Government and will be delivered under the Queensland Road Safety Strategy 2022-2031.

Background

Motorcycle riders and their pillion passengers are one of Queensland's most vulnerable road user groups and are consistently overrepresented in the annual number of lives lost on Queensland roads. To help address this, the Motorcycle Safety Project (MSP) commenced in 2019 to better understand rider experiences and identify opportunities to take a rider-centric approach to improve their safety. This involved engagement with riders through interviews, journey mapping, voting exercises and co-design workshops.

The MSP was undertaken over three stages, the first identified seven rider personas, stage two focused on the Queensland composition of these rider personas and the third stage, concluded in 2021, focused on two of these rider personas.

Motorcycle Safety Project Findings

The MSP captured the differences in the attitudes and behaviours of the seven personas, these being:

- Commuters
  - Ride for work
  - Professionally trained riders
- Delivery Riders and those in the gig-economy
- Social Riders – Riders associated with riding groups, large or small, formal or informal
- Thrill and Risk Seeker
- Adventure Riders – Those who ride on varying road surfaces
- Avid-Enthusiast – Riders for whom bikes are a key part of their lives, and
- Solo Me-Time Riders – Riders who ride for relaxation and being absorbed in the moment.

The third stage of the research targeted Social Riders and Avid-Enthusiast Riders to identify opportunities to improve their safety. These riders were prioritised due to their risk profile and potential opportunities to improve their safety via their willingness to improve their riding skills through their social networks and online media.

The research also identified that riders felt government road safety messages blamed riders for crashes which made them less receptive to government messaging. Messages to riders that focused more on the positive riding skills that prevented crashes would resonate more with them.
The research recommended the development of the following three initiatives for Social Riders and Avid Enthusiast Riders, supported by creating ongoing dialogue and engagement between riders and government:

- Empower rider to rider mentoring
- Promote rider learning by connecting them to online content and trusted resources
- Support riding groups and community to influence safety.

The Ride to Zero Program

In line with the approach adopted in the MSP, the program has commenced development of these initiatives that puts riders at the centre of design. This will ensure the initiatives meet the needs and preferences of riders and are aligned to their behaviours and attitudes.

The program has also undertaken research to further understand Thrill and Risk Seeker, Adventure, and Solo Me-Time Riders, to identify initiatives to improve their safety for development in a future stage of the program.

Initial engagement for the program involved ride group leaders and influential riders to raise awareness of the program, build relationships and support. During these engagements, riders were highly supportive of the program and its initiatives.

Next Steps

Following the development of the three initiatives described, the program will provide further support to improve the safety of riders by seeking to identify and deliver initiatives targeted to the other rider persona groups.

Cognitive correlates of driving performance in older adults: a meta-analysis

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Abstract

With the increasing ageing population, there is a need to identify markers of safe driving capacity in older adults and to distinguish those who may not be cognitively safe to drive. In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, this review analysed current evidence concerning the relationship between standardized neuropsychological test measures and driving performance in healthy older adults. A total of 18 studies were eligible for inclusion, of which 12 studies were included in the meta-analysis. Reaction time, Trail Making Tests A and B, Useful Field of View (UFOV) 2 and 3 tests correlated significantly with driving performance. No effects were observed for the Mini-Mental State Examination and UFOV 1 tests. The findings from this research highlight the potential of neuropsychological test measures to identify older adults who may be at increased risk for driving impairment.

Background

This meta-analytic review examines the evidence for the relationship between cognitive function and driving performance in older adults. The primary aims of this review were: (a) to identify cognitive correlates of reduced driving performance in older adults and (b) to determine whether such measures reliably predict reductions in driving performance over time.

Methods

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Peer reviewed studies that examined the (cross-sectional or longitudinal) relationship between standardised neuropsychological test performance measures and driving performance (e.g., via an on-road test, in-vehicle monitoring system, hazard perception test or driving simulator) in healthy adults aged 60 years and older, were included.

Results/Discussion

Eighteen studies were eligible for inclusion, of which 12 met requirements for meta-analysis. The results indicated that reaction time and Trail Making Test (TMT) A scores exhibited small-to-moderate correlations with driving performance, with moderate effects identified for block design, TMT B, Useful Field of View (UFOV) 2 and 3 tests. Further, no significant relationships were observed between the Mini-Mental State Examination and UFOV 1 with driving performance. Due to a paucity of data, the longitudinal relationship between such measures and driving could not be identified. The findings highlight (a) the potential of cognitive assessments to identify older adults at risk of driving impairment (as part of a larger diagnostic assessment), and (b) the urgent need for prospective longitudinal studies in investigating the impact of age-related changes in cognition on driving performance over time.

Acknowledgements

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A full manuscript is currently under review with Accident Analysis & Prevention.

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 (FSIs) in Australia. Regional and remote intersections are particularly dangerous for road users, due to high speeds and a widespread lack of safety measures beyond minimum control and sight distance requirements. The high cost of additional safety treatments means that 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 to help fill this safety gap as an evidence-based option for lower-volume regional intersections. RJAWS Lite has been trialled at six intersections in South Australia, with the trial concluding in June 2023. The results of the trial have demonstrated a tangible reduction in speeds and associated risk of FSIs due to the RJAWS Lite treatment.

Background

Crashes at intersections contribute a substantial number of fatal and serious injuries (FSIs) in Australia. Regional and remote intersections are particularly dangerous, due to high speeds and a widespread lack of safety measures beyond minimum control and sight distance requirements. 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 limit through an intersection when the potential for a collision with side road traffic arises (Mongiardini et al., 2021). Despite the promising benefits of this and similar treatments, installation costs exceed $150,000 and can rise to $500,000. This largely limits its implementation to high-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 the Australian Government's Road Safety Innovation Fund (RSIF) program (ORS, n.d.) administered by the Office of Road Safety, with support by the South Australian Department for Infrastructure and Transport (DIT). The treatment uses radar detection, mobile-based communication, and off-grid solar power systems to substantially reduce costs when compared to RJAWS. It is estimated that for three and four leg intersections, RJAWS Lite will cost around $80,000 and $100,000 per intersection, respectively.

Method

A radar sensor detects the presence of minor road vehicles and activates flashing lights on a modified speed advisory sign used to warn drivers on the major road to slow down while traversing the intersection (Figure 1, bottom and top left). In addition to standard RJAWS, a flashing control sign in RJAWS Lite gives warning to minor road traffic when approaching the intersection too quickly (Figure 1, top right), as detected using the radar on the minor road. The purpose of this additional feature is to warn drivers that may be at risk of running through the intersection control at-speed.

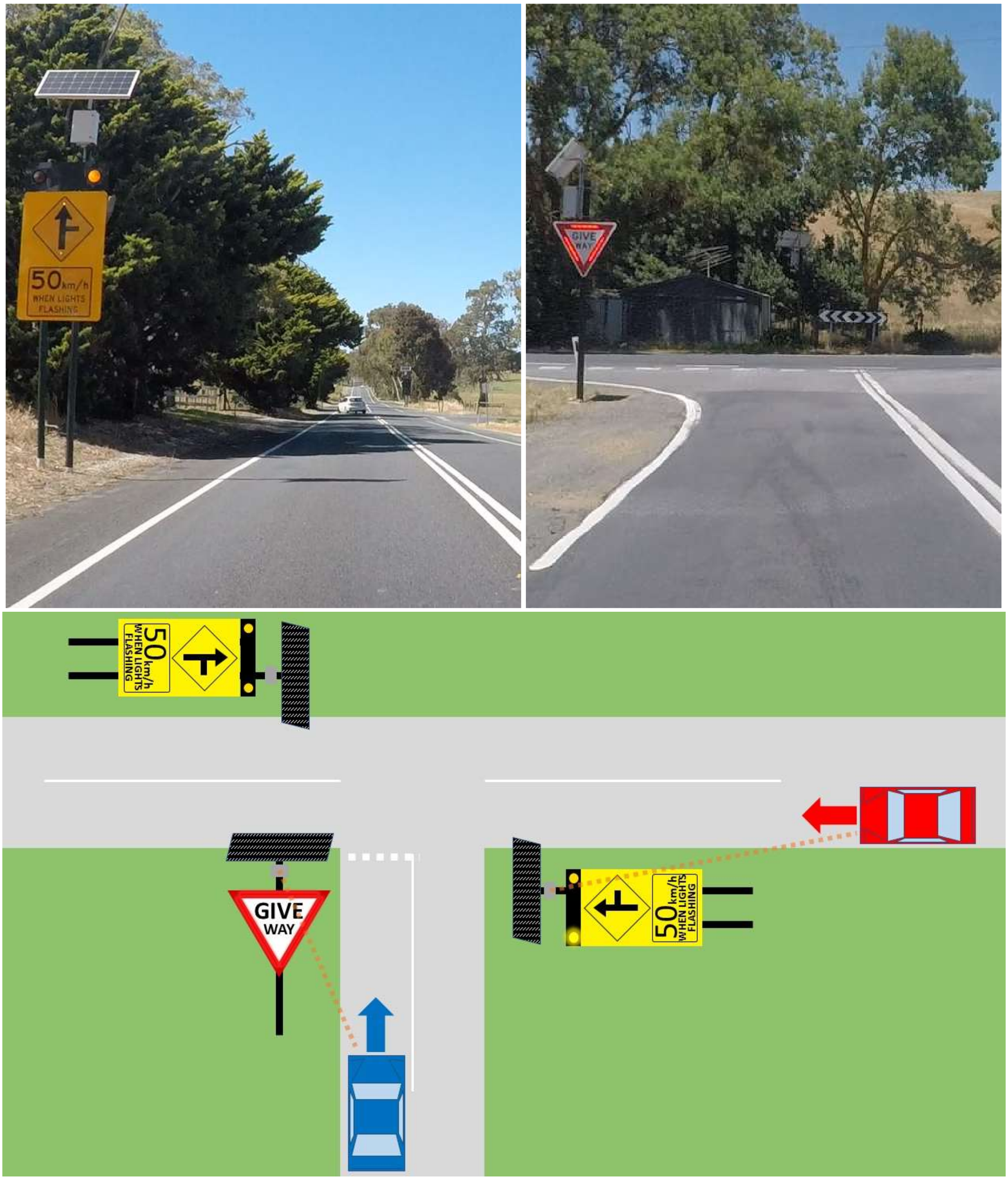

Figure 1. The major road warning sign (top left) and minor road flashing control sign (top right) during activation of the system. Diagram of RJAWS Lite (bottom): major road speed warning signs are activated when minor road traffic approaches the intersection (blue car) and major road traffic is present (red car); minor road flashing control sign is activated when minor road traffic approaches the intersection above a set speed threshold (blue car)

RJAWS Lite has been trialled at six intersections on regional roads in South Australia – equally distributed between speed zones of 80 km/ and 100 km/h. Six additional intersections are used as controls. A before-after evaluation method is used. Traffic surveys were undertaken for four weeks before and after installation of the treatment at both treatment and control sites. Speed, detected using pneumatic tubes (20m from the intersection on the major road) and the system's radars, is used as the evaluation metric. Radars were installed at the control sites to provide the same survey capability as at the treatment sites.

Results and Conclusions

A summary of the preliminary results is shown in Table 1 (final results will be available after June 2023). RJAWS Lite appears to elicit a reduction in average speed along the major road between 1.2 and 13.0 km/h (controlled variations), which corresponds to a reduction in risk of FSIs of between 7 percent and 42 percent (Kloeden et al., 2001). The poor performance at sites 3 and 6 were likely due to already slow traffic speeds (site 3) and a downhill grade on approaches (site 6). Finding appropriate sites for the trial was challenging, with treatment and control sites sometimes geographically distant, limiting the usefulness of the control. Also, using speed to evaluate the flashing give way sign does not provide the best indication of benefit – visual observations would be better but were not possible due to budget constraints.

While the speed reduction elicited along the major road is not always as large as for RJAWS (Mongiardini et al., 2021), the treatment represents good value considering the substantial cost saving. Considering the low cost of RJAWS Lite and its ability to reduce the risk of FSIs, it represents a potential Safe System-aligned treatment for low volume and Local Government roads.

Table 1. Average travel speed on major road and associated risk of fatal or serious injury (FSI) crash in proximity to the trial intersections. Note risk of FSI crash is calculated for individual vehicles and may not reflect the change in average travel speed.

AVERAGE TRAVEL SPEED								
Site Pair	**Speed Limit (km/h)**	**Speed at Treatment (km/h)**			**Speed at Control (km/h)**			**Controlled Variation (km/h)**
		Before	***After***	***Variation***	***Before***	***After***	***Variation***	
1	80	76.1	68.7	-7.4	75.5	75.2	-0.2	-7.2
2	100	87.9	78.9	-9.1	88.5	88.5	-0.1	-9.0
3	80	66.0	65.0	-1.0	60.2	60.4	0.2	-1.2
4	100	92.9	79.6	-13.3	93.1	92.8	-0.3	-13.0
5	80	76.8	68.0	-8.9	73.3	73.9	0.6	-9.4
6	100	94.7	89.3	-5.5	89.5	88.8	-0.7	-4.7
RISK OF FATAL OR SERIOUS INJURY CRASH								
Site Pair	**Speed Limit (km/h)**	**Relative Risk at Treatment**			**Relative Risk at Control**			**Controlled Variation**
		Before	***After***	***Variation***	***Before***	***After***	***Variation***	
1	80	92.4	65.3	0.71	81.5	91.7	1.13	-42%
2	100	58.8	42.9	0.73	76.0	77.9	1.03	-30%
3	80	55.3	52.1	0.94	38.8	39.3	1.01	-7%
4	100	78.1	51.9	0.66	78.7	79.1	1.01	-34%
5	80	91.5	63.8	0.70	85.4	83.7	0.98	-28%
6	100	81.4	68.7	0.84	70.4	69.4	0.99	-14%

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Investment planning to meet the 2030 targets in Victoria

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Abstract

The Transport Accident Commission has sought to identify key priorities and opportunities that could lead to a 50 percent reduction of fatalities and MAIS 3+ serious injuries in Victoria from 2020 to 2030. In this work, baseline trauma modelling was first undertaken to estimate the amount and characteristics of residual trauma in Victoria expected during the period 2020-2050, with a particular focus on the target period of 2020-2030, to understand how close to the 2030 targets Victoria would be in a business-as-usual scenario. Response scenarios were then developed with the purpose of closing the gap between the baseline trend and the 2030 injury and fatality targets. Modelling outcomes showed it is possible to achieve a 50 percent reduction of road traffic related MAIS 3+ injured and fatalities in Victoria. However, such reductions require a multidisciplinary response and substantial risk reduction on a network-wide level.

Background

The Transport Accident Commission's (TAC) key functions include the prevention of transport accidents and supporting those who have been injured on Victoria's roads. Severely injured clients (MAIS3+ injury score) account for 16 percent of the TAC's hospitalised claims but almost 60 percent of estimated Life Costs, 62 percent of bed days in hospital and 74 percent of Years Lived with a Disability for hospitalised claimants (Strandroth et al., 2022). For these reasons the TAC has sought to identify measures and system transformation that will prevent severe injuries given their high costs to the TAC scheme and high injury burden on road users.

Aim

This work aimed to identify trauma prevention options and measures designed to halve fatalities and MAIS 3+ injury claims in the medium term by 2030 and progress the TAC and Victoria towards elimination of these injuries by 2050.

Methods

Predictive dose-response modelling was undertaken to estimate the amount and characteristics of residual trauma in Victoria during the period 2020-2050, with a particular focus on the target period of 2020-2030, to understand how close to the 2030 targets Victoria would be in a business-as-usual scenario. This baseline trend includes already funded infrastructure programs, enforcement levels and vehicle fleet improvement through the natural exchange of old vehicles to new vehicles. Scenarios were then developed with the purpose of closing the gap between the baseline trend and the 2030 injury and fatality targets. The method used is described in Strandroth et al (2016) and was designed to estimate the combined future benefit of road safety interventions in different areas. Three different scenarios were developed, with similar scope but with Scenario 1 being a more deliverable alternative, Scenario 2 being more ambitious, and Scenario 3 could be seen as a 'what if' scenario to investigate the full potential of some safety measures.

Results and Conclusions

The baseline reduction to 2030 from an annual average in 2015-2019 was 16-31 percent for MAIS 3+ and 27-39 percent for fatalities, with the lower estimates accounting for 1.5 percent annual traffic growth. Scenario modelling resulted in an estimated 24-46 percent reduction of MAIS 3+

injuries, traffic growth included, and 38-54 percent reduction without traffic growth. Same estimates for fatalities were 35-51 percent with traffic growth and 46-57 percent without.
It was concluded that it is possible to achieve a 50 percent reduction of road traffic related MAIS 3+ injured and fatalities in Victoria. However, such reductions require a substantial risk reduction on a network level, something that calls for major infrastructure upgrades, speed limit reductions and vehicle fleet improvements while at the same time increasing enforcement levels.

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Eighty-eight ways to safer micromobility

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Abstract

The E-Scooter Road Safety Guideline (Guideline) is a Transport for New South Wales (Transport) initiative. It demonstrates that 'Safe Travel for All' can be applied to the rising travel mode of micromobility. Councils and stakeholders will be offered a Safe Systems based framework to introduce and manage the NSW E-Scooter Shared Schemes Trial offered by third party providers; the use of privately owned E-Scooters is currently prohibited. Micromobility has trended upwards in Australia and New Zealand over recent years, particularly with the expanding role of the private sector in the provision of shared E-Scooter schemes. In collaboration with the National Transport Research Organisation, Transport choose to integrate Safe System principles to develop eighty-eight prompts across the pillars of Safer People, Safer Speeds, Safer Roads and Safer Vehicles. The Guideline will be released by Transport in 2023 and contributes to learning how micromobility can be safely integrated into the communities of NSW.

Why an E-scooter Road Safety Guideline?

The Guideline was developed to simplify the approach of performing a safety assessment using Safe System and road and safety audit principles. This eases the task of applying safety assurance for the trials. The Guideline manages E-Scooter trials through a shared responsibility. Its core purpose is to minimise harm and reduce potential of fatal and serious injury E-scooter crashes (NTRO, 2023). Figure 1 illustrates the Guideline framework in terms of stakeholders, shared responsibility, and the Safe System pillars.

Figure 1. Guideline framework

Shared responsibility

The *NSW E-Scooter Shared Scheme Trial Guide* requires councils in consultation with Transport to form, lead, and coordinate an E-Scooter working group and implement the Guideline. Stakeholders include Council, Transport, the E-Scooter shared scheme provider, Local Police Area Command, Local Health District and emergency services. This checklist encourages collaborative discussion, sharing of information and data, reporting of trial progress and undertaking of specific roles and tasks (NSW Government, 2022a).

Safer roads

NSW E-Scooter trials will operate on roads (including bicycle lanes) with a speed limit up to 50 km/h, shared paths, and bicycle paths (NSW Government, 2022b). Transport and councils are responsible for the safety of their respective network infrastructure. The safe roads checklist is organised into the infrastructure types of shared paths, bicycle paths and bicycle lanes. Safer outcomes can be delivered by implementing maintenance plans for paths and road related areas. Careful consideration of signage and pavement markings can contribute to facilitating safe active travel for all users on the trial routes. Planning, implementation, and management of E-Scooter parking facilities in strategic locations will contribute to unimpeded paths of travel on the shared path or cycling infrastructure (NTRO, 2023).

Safer people

Communication plans prepared by councils and the use of E-Scooter technology can facilitate the education of micromobility safety to the community. The safer people checklists specify communicating amended road rules, expected user behaviours and risky E-Scooter behaviours to be avoided. Users and non-users will be informed on E-Scooter safety and their responsibilities when traveling on path infrastructure. Information regarding available customer contact channels to the council and E-Scooter provider is necessary. This facilitates reporting on trial issues, infrastructure condition, incidents and injuries resulting from E-Scooter crashes (NTRO, 2023).

Safer speed

Transport has set the maximum operating speeds of E-Scooters to 10 km/h for shared paths and 20 km/h for bicycle paths and bicycle lanes (NSW Government, 2022a). The safer speed checklists require E-Scooter providers to comply through application of geofencing measures (and sharing with NSW Police for enforcement activities) and E-Scooter technology to control vehicle speed. This helps to maintain a safe travel environment for all path users (NTRO, 2023).

Safer vehicles

The checklist ensures that E-Scooter providers are responsible for E-Scooter compliance with legislation. E-Scooter safety features (speed limiters, etc) must provide safer outcomes for their users and protect pedestrians and cyclists. E-Scooter technology facilitated by the provider should enable safe use of the E-Scooter, coupled with geofencing, among other technologies, to ensure a safe trial environment (NTRO, 2023).

Conclusion

This Guideline provides a 'Safe Travel for All' approach to micromobility. The Guideline will assist Transport in monitoring and evaluating future E-Scooter trials. To ensure safe movement for all road users and transport modes Guideline implementation will also progressively identify what systems and processes that Transport need to continue the promotion of active transport in New South Wales.

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Development of Child Restraint Evaluation Program 7 testing and scoring protocols

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Abstract

The Child Restraint Evaluation Program (CREP) commenced in 1992 and the testing and scoring protocols have been periodically updated since, with the aim to promote improving child restraint designs and occupant protection. This article describes the development of the current CREP protocols (CREP-7), which were implemented in 2021. The CREP-7 protocols represent a major progression of the program. The changes to the assessment and rating of child occupant protection in CREP-7 are intended to introduce elements from United Nation Economic Commission for Europe (UNECE) 129 into the evaluation of Child Restraint System (CRS) performance in Australia. The most important changes are the introduction of an intruding door side impact test based on UNECE 129; utilizing the biofidelity and measurement opportunities of the Q-Series dummies; the introduction of a test rig that is representative of a current popular vehicle; and increase alignment between CREP and other CRS initiatives worldwide. This article fits with the conference theme ‘safe travel for all’ with a focus on ‘all ages and abilities’.

Background and Methodologies

Previous CREP Crash Protection Protocols have used the P-Series crash test dummies. CREP testing has highlighted issues with the P-series dummies, including known inferior biofidelity compared to other dummies. It was decided to adopt Q-series dummies in CREP-7 on the basis of their better biofidelity and capability to be used reliably in test procedures that target specific priorities for injury reduction (Wismans et al, 2015).

The CREP test bench has also been criticised for not reflecting current vehicle rear seats (Brown et al, 2017). For CREP-7, a new test bench was designed to geometrically replicate the rear seat environment of the Mazda 3, a popular compact family vehicle. A simulated front seat is included with an incline of 22.5^{o}, as shown in Figure 1.

The third major change from CREP 6 is the side impact test. The motivation for changing this test was that the CREP 6 method did not simulate intrusion into the occupant space which is common in injurious side impact crashes to child occupants (Whyte et al., 2021). The UNECE 129 test method (test rig and intrusion speed/displacement) was used as the basis for development of the CREP 7 side impact test protocol.

CREP 7 frontal test validation

A full-frontal crash test was undertaken using a Mazda 3 four-door sedan at an impact speed of 56 km/h, as per CREP 4 to 6. The speed is slightly greater than the 50 km/h barrier speed specified in ANCAP 2020 full width test. In the rear seat were two Q3 dummies, one placed in a rearward facing restraint type A4 and the other in a forward-facing CRS type B.

As part of this work, the dummy responses in this Mazda 3 crash test were compared to the dummy responses in CREP 7 frontal tests using the same CRS type and make/model and found to be similar.

Figure 1. CREP 7 test cabin and bench CREP 7 scoring protocol development

Repeatability of the CREP 7 protocol frontal test was also assessed and found to be acceptable of which the findings will be presented as part of this work.

A new protocol for scoring CRS performance was developed by utilising injury assessment criteria measured from dummy instrumentation that were adopted from several sources including UNECE 129, ANCAP/EuroNCAP and European Enhanced Vehicle-Safety Committee. Additionally, visual assessments on dummy kinematics such as forward head excursion and the restraint's ability to minimize head contact with vehicle structures were included.

Conclusions

The new testing and scoring protocols for CREP 7 represent a significant progression of the program that were implemented following consultation with CREP stakeholders. The first series of CREP 7 results were released in May 2021.

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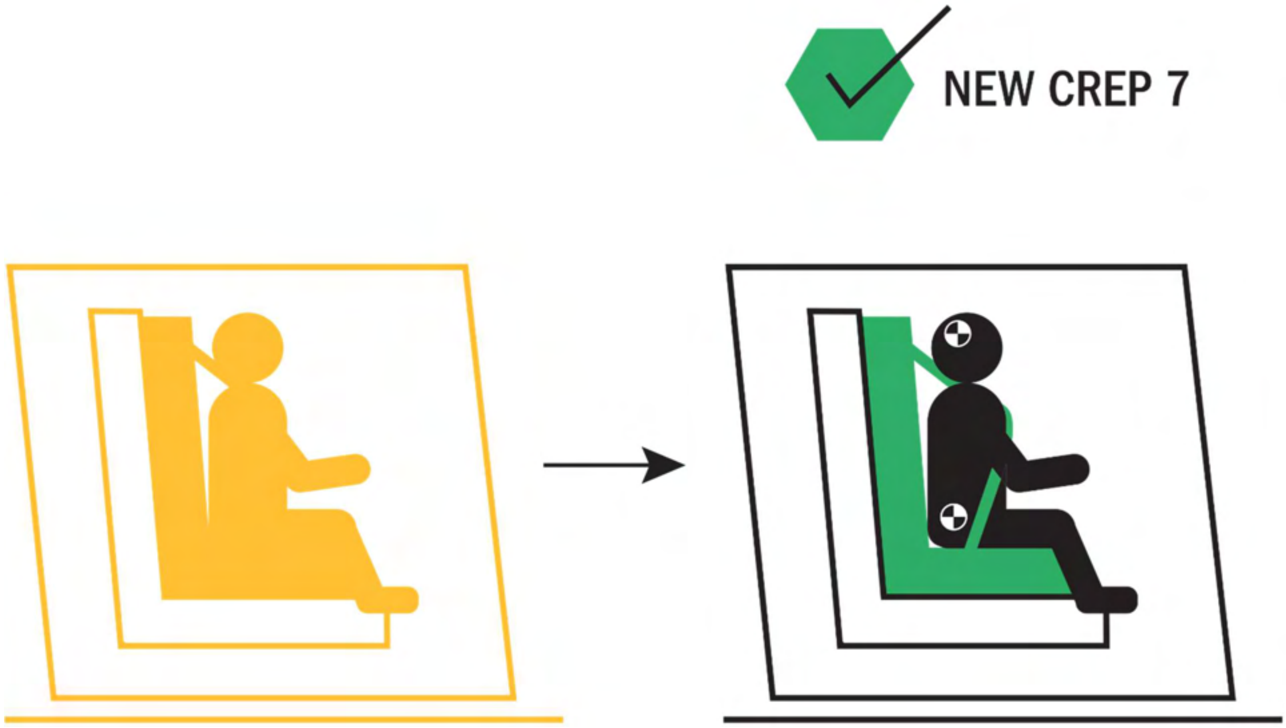
NEW CREP 7

Injury surveillance database: promoting road safety in Pakistan

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Abstract

Rescue 1122 attends over 1000 road traffic crashes (RTCs) daily across Punjab. To reduce this growing burden of RTCs and promote injury prevention research, Rescue 1122 has set-up an injury surveillance database (ISD) that captures various injury characteristics of casualties. This study presents the major findings of ISD. Data of 198,1207 casualties (Male: 80%, Female: 20%) presented at public hospitals across Punjab during 2013-2022 were collected and analyzed. Over half of casualties (52%) were young aged 11-30 years, 36 percent were illiterate and 66 percent were earning less than US$ 2 per day. Causes of injuries included: 72 percent RTCs, 12 percent falls, 5 percent violence and 1.4 percent occupational injuries. In RTCs, motorcyclists were over-represented 83 percent, while pedestrians were 6 percent. The ISD is first centralized database in country that provides reliable data on all kind of injuries. This data can be used in research to reduce the burden of unintentional and intentional injuries in Pakistan.

Background

Injuries pose a significant burden of morbidity, disability and mortality globally. Global Burden of Disease (GBD) study shows that 8 percent of all deaths were attributed to injuries in 2019 worldwide (Haagsma et al., 2022). In Pakistan, road traffic crashes (RTCs) cause about 27000-30,000 deaths every year (WHO, 2018), while data on other unintentional and intentional injuries is limited (Tahir, 2018). Rescue 1122 (a public emergency service) operates across Punjab i.e. largest province of Pakistan with population around 124 million. It offers pre-hospital care in nearly all types of intentional and unintentional injuries, where road traffic injuries (RTIs) constitutes the major proportion. Burden of RTCs can be estimated with the fact that only Rescue 1122 responds to over 1000 RTCs every day across 36 districts of Punjab (Rescue, 2023). To reduce this growing burden of RTCs and promote injury prevention and road safety research and efforts, Rescue 1122 has set up an injury surveillance database (ISD) in 2013 that captures various injury related characteristics of casualties' transported to the emergency departments of public hospitals across Punjab.

Method

A retrospective study was conducted and data were derived from ISD for the last nine years 2013-2022. Data included basic demographics and information about injuries sustained by all those casualties who were transported (by Rescue 1122 and private ambulances/vehicles) to emergency departments of 40 major public hospitals located across 36 districts of Punjab during the study period.

Results

Data analysis shows that over half of casualties (52%) were young aged 11-30 years, 36 percent were illiterate and 66 percent were earning less than US$2 per day. Among the casualties, 28 percent were labourers, 21 percent students and 12 percent housewives. Causes of injuries included: 72 percent RTCs, 12 percent falls, 5 percent violence and around 1 percent (each) occupational and sports injuries. In RTCs, motorcyclists were over-represented 83 percent, pedestrians 6 percent, rickshaw (4%) and car (3%) occupants and heavy vehicle drivers were around 1 percent. Major injuries sustained by casualties included: abrasions, lacerations and puncture wounds 69 percent, fractures 13 percent, head (10%), poly trauma (3%) and spinal (1%) injuries. Over half of casualties (51%) were transported to hospitals by Rescue 1122 ambulances, while remainders (49%) were transported by private ambulances and vehicles including motorcycles 19 percent. Most casualties (80%) were shifted to hospitals (from crash/injury scene) in half an hour, while about 15 percent were arrived in hospitals in about 30 to 60 minutes. Nearly a quarter of casualties (24.33% and 23.5%, respectively) were presented to hospitals during 8:00-11:59am and 16:00-19:59pm, respectively. Around 62 percent casualties were treated and discharged from the hospital on the same day, 37 percent were admitted for definitive care and about 0.50 percent would be died en route to hospital or at hospital.

Conclusions

The ISD is the first centralized database in country that provides reliable data on all kind of injuries including RTIs. This data can be used in research, evidence-based planning and policy formulation to reduce the burden of unintentional and intentional injuries in Punjab/ Pakistan. Findings reveal, particularly RTCs are growing in Punjab that pose a significant public health and development challenge that necessities urgent actions on the part of all stakeholders. The data of ISD needs to be used in research across all five pillars of road safety to bring down the burden of RTCs in the province/country.

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Review of the Learner Approved Motorcycle Scheme (LAMS)

Tana Tan, Duncan McRae and Kenn Beer

Safe System Solutions Pty Ltd

Abstract

A review of the current Australian and New Zealand Learner Approved Motorcycle Scheme (LAMS) was conducted by Safe System Solutions Pty Ltd on behalf of Austroads, which recommended updates to make LAMS more equitable for novice riders. The review focused on five areas, including adding electric motorcycles to the LAMS, allowing modifications to LAMS motorcycles for accessibility and safety, and more. The recommendations includes performing further research on motorcycle type and FSI crashes, considering replacing LAMS with the EU's novice motorcycle rider scheme, not adopting the ACT LAMS, researching electric motorcycle power and torque delivery, allowing all motor trikes to be added to the LAMS, continue to allow accessibility modifications, , and allowing LAMS motorcycles to be modified for safety and functionality, and not removing any type of motorcycle from the LAMS list without first perofming more research into ease/difficulty of riding various motorycle types.

Introduction

In 2002, the LAMS was implemented in New South Wales to replace the 250 cc engine capacity limit for novice riders due to the high occurrence of Fatal and Serious Injury (FSI) crashes involving race replica 250 cc motorcycles. The scheme was subsequently adopted by other Australian states and territories, as well as New Zealand, albeit with some variations in different jurisdictions. However, there has not been a formal review of LAMS since its introduction. This project conducted a comprehensive review of LAMS to incorporate the latest research and information relevant to novice riders and to enhance its fairness.

Method

The review completed the following tasks:

1. Reviewing Monash University Accident Research Centre's (MUARC) report titled *Current Trends in Motorcycle Related Crash and Injury Risk in Australia by Motorcycle Type and Attributes* and evaluating the soundness of the methodology and findings
2. Performing a literature review on current LAMS practices in Australia and New Zealand (ANZ) and equivalent schemes in the UK, The Netherlands, Sweden and Canada.
3. Assessing the feasibility of including ACT's allowance of novice riders to ride motorcycles with an engine capacity of greater than 660 cc provided that the Power-to-Weight Ratio (PWR) is 150 kW per tonne or less.
4. Assessing the feasibility of allowing electric motorcycles with a 25 kW motor or greater to be added to the LAMS list, noting that NSW, SA, and WA have already adopted a 25 kW kW motor limit for electric motorcycles
5. Assessing the feasibility of allowing motor trikes to be added to the LAMS list.
6. Assessing the feasibility of allowing modifications to LAMS motorcycles for the purpose of accessibility to those with physical disabilities.
7. Assessing the feasibility of allowing modifications to LAMS motorcycles to improve safety.
8. Assessing whether some motorcycle types are more difficult to ride.

Results

The following summarises key recommendations for the current LAMS:

1. Conducting further research in the area of motorcycle type and association with FSI crashes.
2. Consider adopting EU's novice motorcycle licensing systems.
3. Conducting research to understand how the adoption of the ACT LAMS by other States and Territories might affect FSI crashes.
4. Maintain the current electric motorcycle LAMS requirement of 25 kW motor or less.
5. Motor trikes should be added to LAMS list provided that they meet the current criteria and consider updating motorcycle rider training and licensing courses to include motor trikes.
6. Allow LAMS motorcycles to be adapted for physical accessibility through modifications, provided that the modifications do not increase the PWR, increase power, or decrease weight.
7. Allow LAMS motorcycles to be modified for safety and functionality provided that they satisfy the following criteria:
    - the modifications do not increase the PWR, increase power, or decrease weight.
    - the modifications comply with ADRs, relevant standards, jurisdictional standards or requirements, and legislation for vehicle modifications.
8. Conducting further research to understand if some motorcycle types are more difficult to ride than others.

Conclusion

This project reviewed LAMS with a focus on updating the scheme to reflect current research and make it more equitable for novice riders. The recommendations aim to enhance the safety and accessibility of LAMS for novice riders through incorporating the latest research and information and provides recommendations on future research areas.

Truck drawbar safety for vulnerable road users

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Abstract

Road Safety Victoria, within the Victorian Department of Transport and Planning (DTP), commissioned a project to investigate potential solutions to minimise the risk of pedestrians and bicyclists inadvertently entering the space between a static or moving truck and dog trailer. This research is part of the Construction Truck and Community Safety Project. The project involved reviewing literature and patents related to the safety issue, developing a model to determine the feasibility of having shorter drawbars, and conducting interviews with truck designers, manufacturers, and heavy vehicle road safety professionals. The findings were then used to develop potential solutions. The project identified existing and in-development safety solutions and contemporary safety measures that are in use. The paper presents the project methodology, findings, and potential solutions to the safety issue.

Introduction

The Victorian DTP has commissioned Safe System Solutions Pty Ltd and Advantia Transport Consulting to identify potential solutions to minimise the risk of pedestrians and bicyclists inadvertently entering the space between a truck and dog trailer. This is particularly relevant for construction trucks operating in populated areas where pedestrians and cyclists are more likely to interact with them.

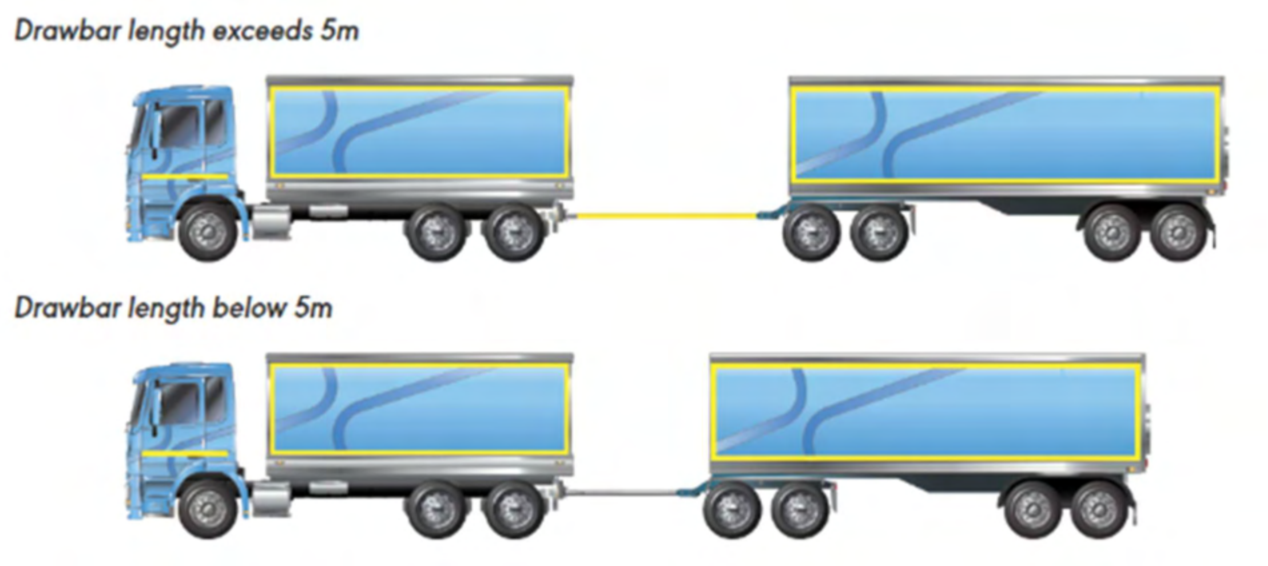

Figure 1. Drawbar Lengths (Source: NHVR)

Method

Three key steps were performed for this project. Firstly, a literature review, patent review, and interviews with key informants were conducted. Secondly, interviews with 10 stakeholders were conducted. Lastly, potential solutions were developed that considered findings from the literature review, patent review, and interviews with stakeholders. The potential solutions needed to consider the safety benefits to pedestrians and bicyclists as well as ease of installation, retrofitting, use, and maintenance.

Results

A total of 15 potential solutions were developed by the project team. They included visual and audible warning devices; flags, buntings, protrusions fitted to the draw bar; high conspicuity paint; pole type draw bar instead of A-frame type; and shorter draw bars. The advantages, disadvantages, and items for consideration were listed alongside each potential solution to enable RSV to make an informed decision as to which potential solution they may wish to develop in more detail in the next phase of the project.

Conclusion

This project aimed to identify potential solutions to minimise the risk of pedestrians or cyclists inadvertently entering the space between a truck and dog trailer. A literature review, patent review, and interviews with key informants resulted in 15 potential solutions being developed which included visual and audible warning devices; flags; buntings; protrusions fitted to the draw bar; high conspicuity paint; pole type draw bar instead of A-frame type; and shorter draw bars These solutions now require further exploration and development.

Motorcycle Safety Forum – ACRS Victorian Chapter

Wendy Taylor[a], Kenn Beer[b], Tana Tan[b] and Shaun Lennard[c]

[a]Wendy Taylor, [b] Safe System Solutions Pty Ltd, [c]Shaun Lennard Consulting

Abstract

In May 2022 the Australasian College of Road Safety Victorian Chapter organised and held a motorcycle safety forum. The purpose of the forum was to bring together in one room a mix of people committed to making motorcycling safe and to workshop issues and to discuss solutions and innovation, and to collate everyone's comments into a report, and to distribute the forum proceedings far and wide. The paper expands on the design of the forum, the outputs from the diverse group of attendees and the possible use of the outputs by public policy makers.

Background

Motorcycles and scooters, collectively known as powered two or three wheelers (PTW), are an important mode of transportation. However, PTW riders and pillions are overrepresented in road trauma across Australia and New Zealand. In Victoria, despite representing four per cent of registered vehicles, they account for 17 per cent of fatal and serious injuries (VicRoads 2022).

Method

As a community led initiative, a Motorcycle Safety Forum was held on May 19, 2022, during the 2022 National Road Safety Week. The forum aimed to bring together a mix of people committed to making motorcycling safe, gather ideas and information from different motorcycle safety perspectives, workshop issues, and discuss solutions and innovation. Additionally, the forum aimed to collate everyone's comments into a report to distribute to forum participants and other road safety stakeholders, and to remind road safety agencies about the need to engage and consult relevant community when developing and delivering strategy, policy, legislation, initiatives, action plans and works programs.

The 48 forum participants included motorcycle riders, scooter riders, engineers, academics and researchers, operational police including solo riders, rider trainers, post-graduate research students, community and not-for-profit organisation representatives, road safety auditors, road safety practitioners, transport and road safety agencies representatives and those interested and invested in rider safety. Four guests from interstate, who are well known for their motorcycle safety expertise and experience, were also invited to participate.

The world café methodology was used during the forum, with participants invited to move around the tables dedicated to the forum themes and to engage with others and comment about vehicles, roads, infrastructure and roadsides, people, gear, speed, and other relevant topics. Scribes at each table recorded participants' comments, and the world café event finished with a wrap-up of each theme by each scribe, with guests and participants invited to express any further comments. The scribes' writing was transcribed into the forum outputs report.

Figure 1. Motorcycle Safety Forum

Conclusion

The diversity of experience at each table meant a diverse range of opinions and views, and robust discussion resulting in recording 180 comments itemised in the abovementioned themes. The mix of participants' knowledge, experience and perspectives resulted in the identification of issues, risks, hazards, improvements, initiatives, and solutions to make motorcycling safe. The forum was successful in bringing together a mix of people committed to making motorcycling safe and providing a platform for discussions and recommendations to improve PTW rider safety.
The motorcycle safety forum outputs report serves as a reference for everyone involved in making motorcycling safe.

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Improving safety outcomes for Victorian children travelling in vehicles

Kathy Taylor, Jason Chambers and Melanie Courtney

Kidsafe Victoria

Abstract

Studies have consistently demonstrated high rates of incorrect installation and usage of child car restraints in Australia. When child car restraints are incorrectly installed or used, the risk of life-threatening injuries has been shown to be 4-6 times greater. The ‘Safe Seats, Safe Kids’ program – which is run by Kidsafe Victoria in partnership with Neighbourhood Houses Victoria and with support from the Victorian State Government – was introduced to combat the issue of incorrectly fitted child car restraints and improve safety outcomes for children travelling in vehicles. Of the over 18,200 child car restraints recently inspected as part of the program, 86 percent were found to be incorrectly installed or used, with 37 percent requiring a full refit.

Background

Studies have consistently shown high rates of incorrect installation and usage of child car restraints in Australia (Whyte et al., 2020). The risk of life-threatening injuries has been shown to be 4-6 times greater when child car restraints are incorrectly fitted or used (Neuroscience Research Australia et al., 2020).

Program

The ‘Safe Seats, Safe Kids’ program – which is run by Kidsafe Victoria in collaboration with Neighbourhood Houses Victoria and with support from the Victorian State Government - was introduced in November 2019 to help combat the issue of incorrectly fitted child car restraints and improve safety outcomes for children travelling in vehicles. The program provides all Victorian parents and carers with the opportunity to access a free fitting or safety check– together with education and advice to help them continue to keep their kids safe on every trip -from accredited child car restraint fitters who operate on dedicated days at Neighbourhood Houses and other local venues across the state.

Findings

Of the more than 18,200 child car restraints recently inspected by 30 professional fitters across Victoria as part of the program, 86 percent were found to be incorrectly installed or used, including:

- 47% which required an adjustment (e.g., harness heights and headrests adjusted, twists removed from tether straps)
- 37% which required a complete refit, and
- 2% which needed to be replaced due to issues including being more than 10 years old, having damaged/missing parts, or being an overseas model that did not meet Australian standards.

From the findings above, we discovered metropolitan Melbourne had a higher misuse rate than regional Victoria particularly with rear facing child car restraints and children from birth to 2 years of age. Typical incorrect installation and usage issues identified include issues with top tether straps, harness straps, seatbelts, recline levels, ISOFIX attachments and children in the wrong type of restraint for their size.

Table 1. Total fittings, installations and safety checks by location

	Fittings, installations and safety checks							
	Metro Melbourne				Regional Victoria			
Age range of child	Correctly installed	Adjustment	Re-install	Non standard	Correctly installed	Adjustment	Re-install	Non standard
0-6 months	9%	47%	39%	5%	11%	50%	37%	2%
6m-12 months	11%	52%	34%	3%	10%	61%	28%	2%
12-18 months	11%	43%	45%	2%	11%	44%	44%	1%
19m-2 years	12%	37%	50%	2%	15%	46%	36%	3%
2-4 years	13%	39%	45%	2%	15%	49%	36%	0%
5-7 years	18%	47%	32%	4%	28%	31%	36%	5%
8+ years	38%	38%	19%	5%	50%	33%	17%	0%

Conclusions and Implications

Findings from the recent checks undertaken through the ‘Safe Seats, Safe Kids’ program demonstrate continued high rates of incorrect installation and usage of child car restraints in Australia, and the importance of restraint fitting services in detecting and assisting parents and carers to address these issues. With increasing cost of living pressures being felt by families, having access to programs such as this assists in ensuring that all parents and carers – including the most vulnerable populations -– have access to professional assistance and advice. The program's findings will inform future educational activities and resources, helping parents and carers choose, install, and use child car restraints correctly. Stakeholder discussions will also be guided by these findings, particularly regarding design features and educational strategies. Over 30,000 new parents annually will benefit from this education and advice to improve child safety during vehicle travel. Furthermore, anecdotal evidence from discussions with parents indicates lower rates of incorrect installation and usage in rural areas. This can be attributed to longer driving distances and higher speeds, motivating parents to invest more time in researching and ensuring proper installation and usage practices.

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New guidance for the safety of school children and school crossing supervisors

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Abstract

School Crossing Supervisors have been assisting children to safely cross the road in Queensland since the introduction of the School Crossing Supervisors Scheme in 1984. As part of this scheme, a risk assessment was developed to assess the risks at school related pedestrian crossings to determine if the road environment poses sufficient risk such that a School Crossing Supervisor is warranted. The Department of Transport and Main Roads (TMR) has recently revised this risk assessment methodology to align with contemporary road safety knowledge and to consider behavioural and workplace health and safety measures. This revised methodology has been published in the Queensland Road Safety Technical Users Volumes (QRSTUV): Guide to Schools. The method introduces Workplace Health and Safety considerations to the risk assessment to identify situations deemed too high a risk even for a crossing with a School Crossing Supervisor and facilitates road infrastructure improvements.

Background

The Department of Transport and Main Roads (TMR) School Crossing Supervisor Scheme has been in operation for over 30 years and has been successful in keeping school children safe when crossing the road when traveling to and from school. As part of this scheme a risk assessment process was developed to assess the risks at school related pedestrian crossings to determine if the road environment poses sufficient risk such that a School Crossing Supervisor is warranted. The risk assessment did not take into account the Workplace Health and Safety risk to the School Crossing Supervisor (that is, there was no limit to risk score and the outcome being whether a School Crossing Supervisor was provided or not).

Project

TMR identified opportunities to improve the current risk assessment process. In addition, the increase in Workplace Health and Safety incidences and near misses triggered the need to incorporate the safety of School Crossing Supervisors into the risk assessment process. The project team developed a revised risk assessment methodology that aligns with contemporary road safety knowledge and considers behavioural and Workplace Health and Safety measures. The revised method introduces Workplace Health and Safety considerations to the risk assessment to identify situations deemed too high a risk even for a crossing with a School Crossing Supervisor and facilitates road infrastructure improvements.

Outcome

This revised methodology has been published in the Queensland Road Safety Technical Users Volumes (QRSTUV): Guide to Schools. A new risk assessment formula has been developed which considers the road features, type of pedestrian facility, type of school pedestrian, posted speed limit, and pedestrian and traffic volumes to assess the safety of the school crossing for both school pedestrians and the School Crossing Supervisor operating the crossing. The revised method has risk categories of "low", "medium" and "high" risk and "too high" risk. Low risk indicates that a School Crossing Supervisor is not required, medium risk indicates a School Crossing Supervisor is required, and high risk indicates an engineering assessment is required to confirm the risk level and to consider infrastructure upgrades. The "too high" risk category is triggered if the available sight distance for the crossing (relative to the posted speed limit and gradient of the road) is less than required.

The revised risk assessment method will assist TMR in identify lower risk or more suitable locations for the installation of new school crossings. It will also provide a mechanism and/or process for TMR to demonstrate the safety concerns with School Crossing Supervisors operating crossings at high-risk locations and to facilitate the upgrading of crossings and school related infrastructure. The application of the revised method has potential to reduce the risk of safety incidences occurring that may involve children crossing the road and School Crossing Supervisor operating crossings.

Regulating for the new generation of e-mobility

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Department of Transport and Main Roads

Abstract

Personal Mobility Devices (PMDs) are an emerging form of transportation. A PMD is a small electric vehicle, for use by one person and includes e-scooters, e-skateboards and similar devices. Given the rapid advancements with PMDs, the regulatory approach should be future focused by design to capture different device types, including those we are yet to imagine. Queensland has taken a proactive approach to regulating PMD safety, with rules first introduced in 2018 and significant reforms in 2022 to address emerging safety issues. The current Queensland regulatory framework for PMDs is designed to balance the utility of an emerging transport mode with the safety and comfort of all path and road users, in particular people with a disability. Lessons learned from the Queensland experience include the benefit of broad and regular stakeholder consultation, the importance of being proactive in regulating emerging transport technologies and the need for measured and resilient decision-making.

Background

Queensland has been an Australian leader in the regulation of PMDs. Rules for 'Segway-like' devices introduced in 2013 were expanded in 2018 to allow a broader range of PMDs to be legally used. Since 2018, a variety of safety issues emerged, as the number of devices in use increased exponentially. This prompted a comprehensive review of the regulatory framework, which was a key action within Queensland's *PMD Safety Action Plan*.

2022 Reforms

As a result of significant stakeholder consultation, a package of road rule reforms for PMDs came into effect on 1 November 2022. These changes aim to improve the safety of riders and the broader community and clarify how and where PMDs can be used. The reforms covered:

- **Access**: PMDs are permitted to use some on-road bike lanes, in addition to existing access such as footpaths, shared paths, bike paths and local streets.
- **Speed**: PMDs are limited to 12km/h on footpaths and shared paths, in addition to a general 25km/h limit elsewhere. Specific signed speed limits (below 25km/h) also apply, for example, in shared zones. Riders that exceed relevant limits are subject to tougher and escalating penalties.
- **Classification**: PMDs are classified as vehicles and their users as riders, ensuring general road rules (such as traffic lights and give way requirements) apply. Changes were also made to the definition of a PMD to support more efficient enforcement. This includes making speed, braking and sharp protrusions specific offences, as opposed to elements of the definition.
- **Safety equipment**: PMD riders are required to wear a helmet (either a bicycle or motorcycle helment is permitted) and devices with a handlebar must have a bell fitted.

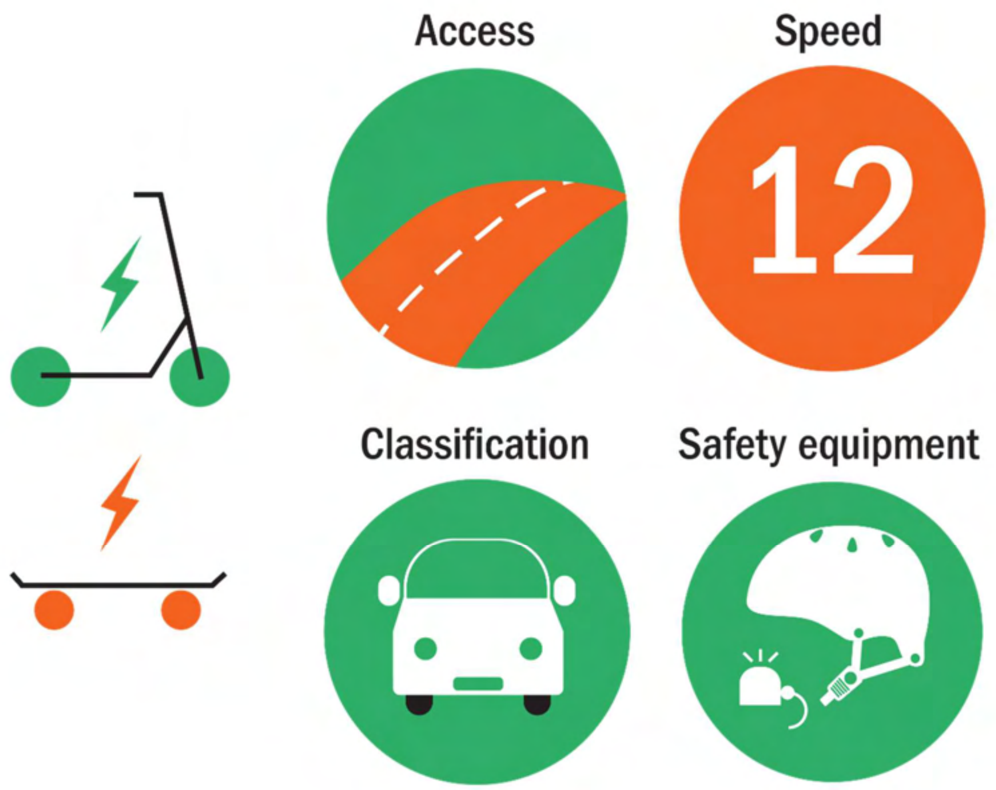
Evaluation

Traffic surveys were undertaken prior to the 1 November 2022 road rule changes and further surveys are planned in 2023 to monitor changes in rider behaviour. Initial insights included that PMD riders already used on-road bike lanes, preferred to travel on separated bike infrastructure, tended to ride faster on footpaths than bike riders, and those with privately owned devices travelled faster and wore a helmet more often than those on hired devices.

Lessons learned

Lessons learned that will be of interest to other jurisdictions, include:

- Broad and regular stakeholder consultation was essential to success. This included a Ministerial roundtable, establishment of a combined government and industry reference group and consultation on all major issues and proposals through a cycle of discussion papers.
- It's better to be proactive when regulating emerging technologies. PMDs are still commonplace in jurisdictions where they are illegal. The Queensland approach has highlighted the importance of staying ahead of the curve and creating a flexible regulatory framework, with bespoke enforcement tools, to support safer outcomes.
- When a new transport mode is brought into an existing system there is potential for conflict. However, there is a need to take a measured approach to dealing with issues that arise, to ensure decision making processes are resilient, and to bring decision makers and community at large on the journey.



Older pedestrians hit by vehicles in the Australian Capital Territory

James Thompson

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Abstract

This study examined the number of older pedestrians (65 years and older) hit by motor vehicles in the Australian Capital Territory (ACT). Collision characteristics, location information, and pedestrian injury outcomes were also examined to understand the crashes, in the context of the ACT and its infrastructure. Police-reported crash data (2011-2020) were analysed. Fewer older pedestrians were hit by vehicles between 2011 and 2020 than younger adult pedestrians (18-64 years). However, they had similar rates of being hit per 10,000 population and older pedestrians had a higher overall rate of serious and fatal injury. Half (50%) of the seriously or fatally injured older pedestrians were hit while crossing busy roads with no protected crossings available. Such protection (with speed management and vehicle design improvements) is vital for the future design of metropolitan and suburban spaces and to achieve a safe ACT road system for pedestrians.

Background

Older pedestrians are a growing and vulnerable road user group. They have an increased risk of serious or fatal injury if hit by a motor vehicle due to their fragility (Baldock et al., 2016; Oxley, 2009; Uddin & Ahmed, 2018). Pedestrian safety is influenced by the design of the road system and available infrastructure. The capital city of Australia, Canberra, is a planned and walkable city. However, the road system may not be optimal for pedestrian safety. This study examined the number of older pedestrians (65 years and older) hit by vehicles in the ACT, with comparisons made to the number of younger adult pedestrians (18 to 64 years) hit by vehicles. Collision characteristics, location information, and pedestrian injury outcomes were also examined to understand the crashes, in the context of the ACT and its infrastructure.

Method

Police-reported data for 595 pedestrians hit by road-based motor vehicles in the ACT (2011-2020) were analysed. Age was recorded for 497 (83.5%) (data excluded if pedestrian age not recorded). Falls and collisions with bicycles, wheelchairs, trains, or trams were excluded. ACT population data were obtained from the Australian Bureau of Statistics and organised by age into 18 to 64 years and 65 and older.

Results

Overall crash involvement of pedestrians

Figure 1 shows the total numbers of pedestrians hit by vehicles (a), rates of pedestrians hit per 10,000 population (b), and proportions of pedestrians seriously or fatally injured (c). Fewer older pedestrians were hit between 2011 and 2020 than younger adult pedestrians. However, they had similar rates of being hit per population. There was considerable year-to-year variation in the data in Figure 1(c). Therefore, proportions of the total pedestrians (across ten years) from each age group who were seriously or fatally injured were examined. The overall proportion of older pedestrians (37.3%) was higher than that of younger adult pedestrians (26.9%), indicating that older pedestrians were more likely to be seriously or fatally injured.

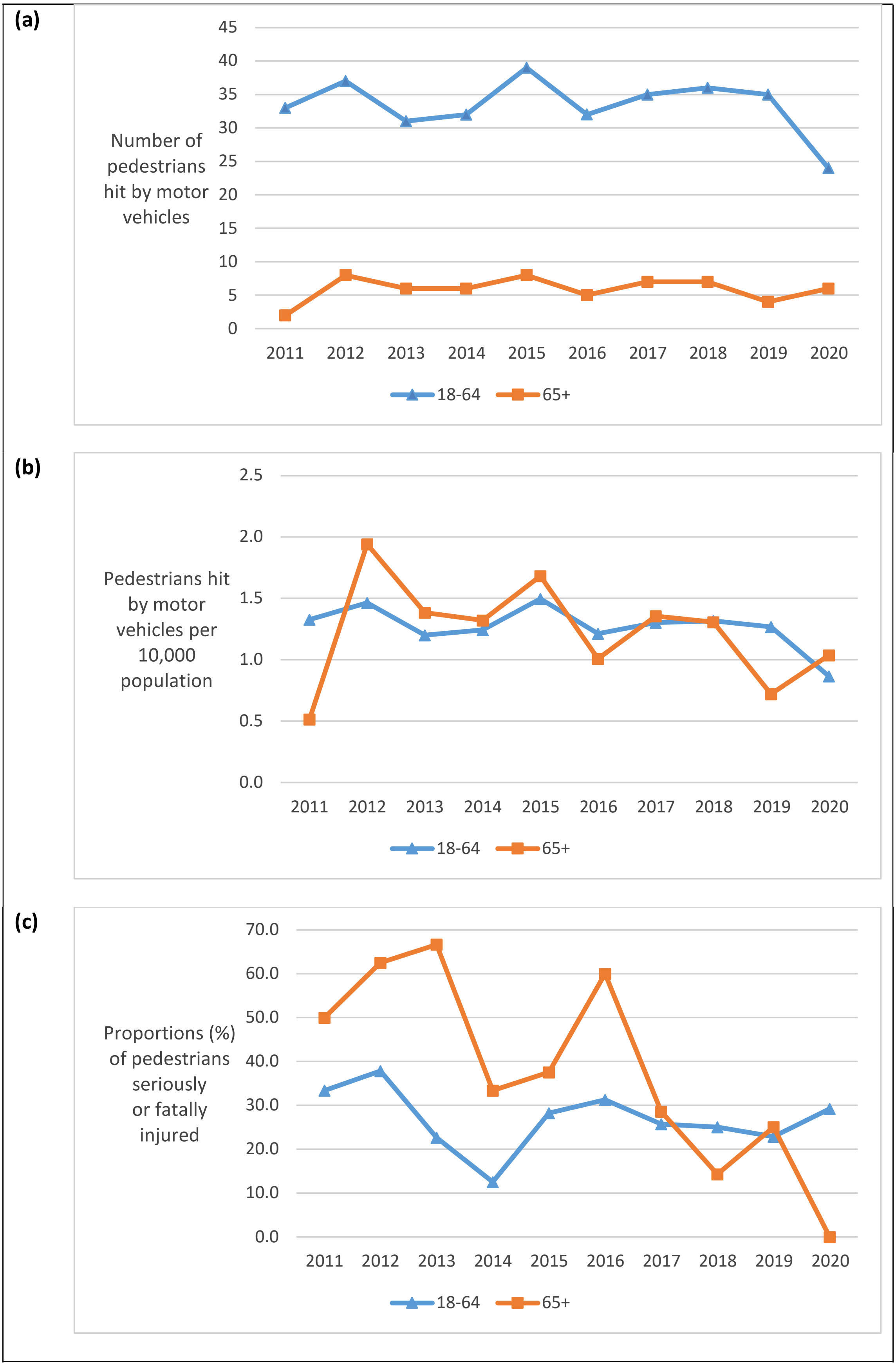

Figure 1. Total pedestrians hit by motor vehicles (a), pedestrians hit per 10,000 population (b) and proportions of pedestrians seriously or fatally injured (c) in the ACT by age group between 2011 and 2020. Note for (c): no older pedestrians were seriously or fatally injured in 2020

Crash characteristics

Table 1. Older and younger adult pedestrians compared in terms of the characteristics and location of their crashes with vehicles

Variable	65 and older (n = 59)	18 to 64 (n = 334)
Time of the day		
00:00 to 05:59	0 (0.0%)	26 (7.8%)
06:00 to 11:59	16 (27.1%)	83 (24.9%)
12:00 to 17:59	33 (55.9%)	135 (40.4%)
18:00 to 23:59	10 (16.9%)	90 (26.9%)
Chi-square test	$\chi^2(3) = 9.5, p = .023$*	
Lighting conditions		
Daylight	48 (81.4%)	219 (65.6%)
Semi-darkness	3 (5.1%)	9 (2.7%)
Dark	8 (13.6%)	106 (31.7%)
Chi-square test	$\chi^2(2) = 8.5, p = .014$*	
Weather conditions		
Fine	51 (86.4%)	300 (89.8%)
Light rain	6 (10.2%)	13 (3.9%)
Heavy rain	1 (1.7%)	12 (3.6%)
Cloudy/overcast/fog	1 (1.7%)	9 (2.7%)
Chi-square test	$\chi^2(3) = 4.9, p = .180$	
Road User Movement Group		
Pedestrian entered road from near side to the vehicle	14 (23.7%)	105 (31.4%)
Pedestrian emerged from behind parked vehicle on near side to vehicle	4 (6.8%)	21 (6.3%)
Pedestrian entered road from far side to the vehicle	13 (22.0%)	85 (25.4%)
Pedestrian walking, playing, working, lying, or standing on road	12 (20.3%)	78 (23.4%)
Pedestrian walking on footpath	12 (20.3%)	27 (8.1%)
Pedestrian struck while boarding or alighting, or by a run-away parked vehicle	4 (6.8%)	9 (2.7%)
Other	0 (0.0%)	9 (2.7%)
Chi-square test	$\chi^2(6) = 13.1, p = .041$*	
Road segment		
Midblock	40 (67.8%)	215 (64.4%)
Intersection	19 (32.2%)	119 (35.6%)
Chi-square test	$\chi^2(1) = 0.3, p = .611$	
Traffic control		
Uncontrolled	47 (79.7%)	200 (59.9%)
Traffic lights	6 (10.2%)	56 (16.8%)
Marked pedestrian crossing	2 (3.4%)	43 (12.9%)
Other	4 (6.8%)	35 (10.5%)
Chi-square test	$\chi^2(3) = 9.1, p = .028$*	

* $p < .05$

Older pedestrians were more likely walking during daylight hours (83% versus 65%) and on the footpath (20% versus 8%) when hit (Table 1). Younger adult pedestrians were more likely walking at night when hit (35% versus 17%). Older pedestrians were more likely hit at uncontrolled road locations (80% versus 60%). Younger adult pedestrians were more likely hit at traffic lights (17% versus 10%) and marked pedestrian crossings (13% versus 3%).
Additionally, 98% of all pedestrians were hit in metropolitan or suburban areas.

Examination of police narratives and locations of serious and fatal older pedestrian crashes
Police narratives and GPS locations were examined for those older pedestrians who were seriously or fatally injured (n = 22). Eleven (50.0%) were hit while crossing busy roads with no protected crossings available.

Conclusions

More pedestrian-protected crossings (zebra crossings and pedestrian signals) should be provided in metropolitan and suburban ACT. Improvements in pedestrian safety can also be achieved through speed management (inner-metropolitan speed limits reduced to a survivable 30 km/h) and associated enforcement, and improvements in pedestrian protection afforded by the design of new vehicles. Protection and prioritising of pedestrian needs must be a fundamental component of the design of metropolitan and suburban spaces and is vital to achieve a safe ACT road system.

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Recruiting for road safety research: vital voices, scams and safeguards

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Abstract

The voice of food delivery cyclists is missing from most road safety research. Food delivery cyclists became vital service providers in many Australian cities during the coronavirus pandemic and this demand is continuing. While food delivery cyclists face the same road safety concerns as other cyclists, there are additional challenges that need urgent attention. There are barriers to engaging this diverse group in research. We encountered roadblocks in recruitment from de-centralised organisational platforms, high turnover, language barriers, complex ethics requirements and an online scam. Despite these obstacles, we recruited more than 50 participants to complete Australia's first comprehensive study of the experience of food delivery cyclists. Insights in terms of access, incentives, awareness of scams and engaging with legitimate participants will be useful for other researchers and practitioners who seek to engage other under-represented or marginalised road user groups.

Background

Direct insights from road users are essential to understand their lived experience on the road. This is particularly so for relatively new road user groups about whom little is known, like food delivery cyclists. By understanding their experiences, as opposed to the often sensationalist media reporting (The West Australian, 2022; Gladstone, 2019), we can identify the specific concerns and the ways in which safety on the road can be improved. Research and planning for cycling focuses primarily on commuters and recreational cyclists. In Australia, commercial cyclists, particularly food delivery cyclists have mainly been observed and their experiences inferred from roadside observations or comparisons with other cyclists and active transport or micromobility users (Oviedo-Trespalacios et al, 2022).

However, to achieve the conference theme of 'safe travel for all', we must engage with all road users. Commercial cyclists have specific needs that should be considered in planning and regulating road infrastructure (Biloria et al, 2019). Road user groups cannot be excluded because they are difficult to access or marginalised in some way (e.g., culturally or linguistically diverse). Our aim in this analysis is to share our successes and our challenges to help others engage with hard-to-reach road user groups.

Method

The initial intention was to survey a large sample of food delivery cyclists and gain an overall impression of experiences on the road. Then, using qualitative cases study analysis (Yin, 2017) conduct a series of in-depth interviews to explore the main road safety concerns for food delivery cyclists. We started with a plan for comprehensive recruitment, working directly with the major delivery platforms, Uber Eats, Door Dash, Domino's, MenuLog and the now defunct Deliveroo Australia. We also met with Milk Run in 2020 and 2021. We also created online recruitment through ads on Meta and YouTube between April and May 2022 that directed users to an online questionnaire. In addition, we direct messaged groups on Facebook, Instagram and LinkedIn, and conducted street intercepts of food delivery cyclists. Participation was incentivised (survey: $150 prize draw; interview: $50 p/hour). Recruited participants were invited to snowball with current/former food delivery cyclist colleagues.

The primary interview data (Sept 2022-March 2023) used semi-structured interviews conducted online (MS Teams or Zoom). All interviews were recorded (audio and video) and transcribed. The project targeted current and former food delivery cyclists in Sydney and Melbourne, across all food delivery platforms. The research was undertaken in accordance with university ethics protocols, which required that the interviews be conducted in English.

Results

The ads resulted in over 16,000 views (Meta: 13,876; YouTube: 2,947) and 93 unique clicks to the survey link. Despite this high level of engagement, no surveys were completed. Participation in the study was limited by English language requirements across all stages. Initially, the complex English expression required by the Human Research Ethics Committee in the survey Explanatory Statement (ES) was a clear barrier. Further, the lack of English language skills among food delivery cyclists limited their willingness to engage.

Initially, the food delivery platforms were enthusiastic about the study and support by senior staff. However, staff turnover and downsizing during COVID-19 contributed to a lack of fruition of support from the delivery platforms. Despite our assurances, there was also a lack of trust, likely influenced by ongoing negative media.

The total sample size was 52 delivery riders (interviews: 52; naturalistic cycling study: 13). Participants in the naturalistic study completed both stages.

A scam was attempted by a male participant (Participant X) who seemed to be motivated by the $50 incentive. Interview 1: Participant X refused to turn on his video camera, claiming poor internet connection. He snowball recruited three ‘friends’ who registered via the study webpage. Interview 2: ‘friend 1’ refused to turn on his camera claiming technical difficulties. Suspicions were raised when a researcher (TR), recognised his voice, anecdotes and linguistic patterns of ‘friend 1’ as identical to Participant X. ‘Friend 1’ interview was completed and the team met to discuss actions address the apparent fraud. During this delay as the team met, ‘Friend 1’ became aggressive, making threats via email and demanding payment for the interview. Payment was made with advice to all registered participants that we would only conduct interviews with the video camera turned on. Following this updated protocol, all Participant X aliases were non-responsive. To safeguard against future scams, use of video cameras to verify each participant’s identity was required (even momentarily turned on).

This is the first in-depth study of road safety for food delivery cyclists in Sydney and Melbourne. The interviews produced important safety insights and recommendations and affirmed many of the positive aspects of this work including flexible work hours, exercise and the enjoyment of getting to ride a bike for work. Footage from the naturalistic study provides insights into route choice, interaction with other road users and gaps in the built environment for cyclists in Melbourne and Sydney.

Conclusions

Negatively portrayed by the media, delivery platforms proved wary about engaging with research. Further recruitment difficulties, including low survey participation rates, ethics requirements and scams, increased barriers to participation and potential advocacy for food delivery cyclists. Despite these setbacks, through a strong street interception and word of mouth campaign, we engaged a sample size with the capacity to investigate safety and regulatory issues in this group of vulnerable road users that will help to achieve safe travel for all. Insights will be beneficial for projects that seek to engage under-represented or marginalised groups and provide new knowledge about scams and safeguards.

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Strategy to address youth PTW crashes in Indonesia

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Abstract

In 2022, road crash fatalities in Indonesia were 27,897, in which 21,202 (76%) associated with powered 2/3 wheelers (PTWs). Moreover, Youth (age 10–19-year-old) Road crashes fatalities were 10,566 where 6,974 (66%) related to PTWs. The number of PTWs in 2022 is around 115 million or 84 percent of total vehicles. An average in Indonesia that one PTW for 2.35 persons or one household owned 1.30 PTWs. Youths' exposure to using PTW is inevitable. Indonesia recently affirmed the new national 2021-2040 road safety strategy (RUNK) and acknowledge the problems of involvement the youth in road crashes as the primary dead causes in Indonesia. This paper presents data that informs the strategies that are addressed by RUNK and discusses the possible contribution to the target if concentration is given to the Youths' Road PTWs related crashes. The recommendation is to set up four programs for reducing road crash fatalities among young people.

Introduction.

Youth (age 10-19 years old) in Indonesia were 46 million or 17 percent to the total population of Indonesia of 275 million in 2022. They also expose the highest road crash fatalities compared to the other age groups. The new Indonesia road safety program (RUNK) recognized road crash is the main causes for youth death (RUNK, 2022). Despite of only 17 percent to total population, Youth contributed 10,566 (38%) of total fatalities of 27,897.

Road safety challenges in Indonesia are significant, given the large of population and the high number of PTWs. The number of PTWs in 2022 is around 115 million or 84 percent of the total motorized vehicles. An average that one PTW is for 2.35 persons, or one household owned 1.30 PTWs. As a result, 6,974 (66%) of youth's road crash fatalities are associated with PTW. High PTW ownerships is also resulting in declining public transport services that makes it difficult to give alternative mobility out from PTWs to youth.

RUNK adopts strategies based on safe system, five pillars coordination and the outcome reducing the social costs. This needs evidence-based strategies from the Police database. The media coverage on road safety is dominated by high fatalities number road crashes i.e., buses and trucks by reckless driving behavior and poor maintenance. This tragic incident of course needs to be prevented. However, the highest fatality in fact is associated with PTWs and young people. Figure 1 shows PTWs exposure and fatalities numbers.

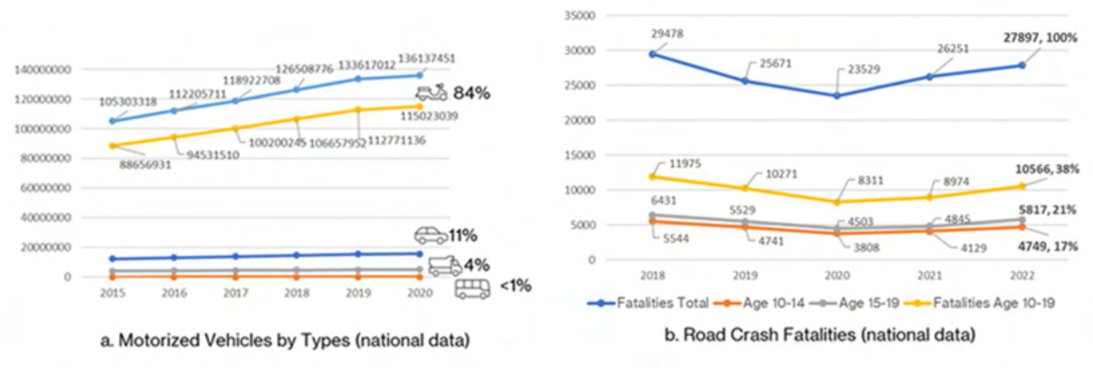

Figure 1. Number of Motorizes Vehicles (a) and Road Crash Fatalities (b) in Indonesia

Study Related Children Depiction Using a PTW for Plaything.

A study in two elementary schools in Depok (Natasha et al., 2015) revealed that parents are the main actors to allow their children to ride and play PTWs at the very early age as young as aged 10 to 12 years old and mostly, they did not wear helm (Figure2). Analysis from the accident data revealed that children under 15 years old road crash fatalities were mostly involved with PTWs and highlighted that 27 percent as perpetrators (Figure 3).

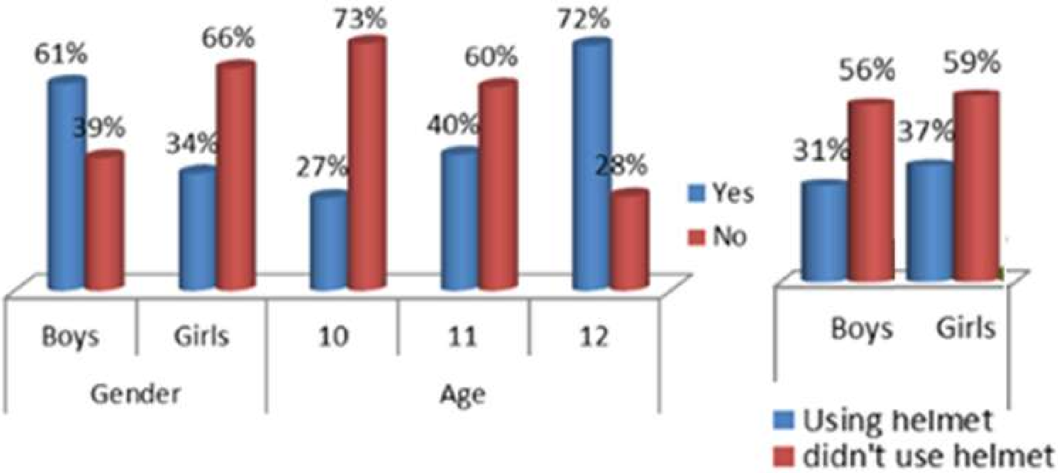

Figure 2. The role Parent to Use PTWs

Adoption RUNK Action Plan for Reducing Youth Road Crashes

The RUNK youth program strategy must deal with parents to understand that PTWs are dangerous. Adults respond tend to under-estimate the death from common causes and vice versa. (Joshia et al., 2018). This is true caused by media covering only high fatalities transportation incidents, while underage PTWs crashes are not covering properly. Parents allowing their children to use PTWs as a plaything is also caused by this phenomenon. Therefore, campaign strategy should concentrate to the parent based on the evident that 38 percent road crash death were youth. It is worth nothing that pediatric information is also needed to understand why wearing helmet is important as part of justified evidence in the helmet campaign.

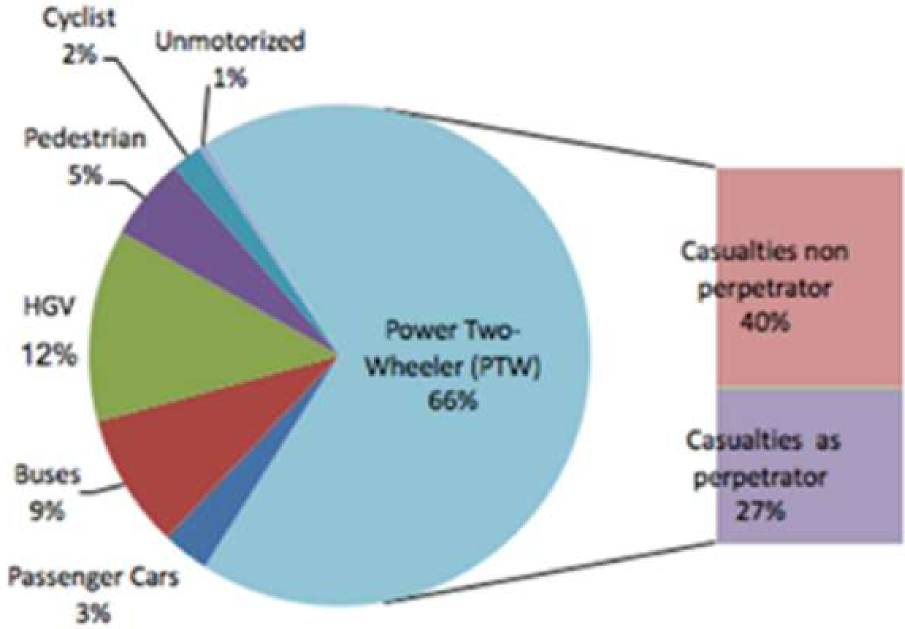

Figure 3. Proportion of Children Crash Fatalities by Modes

In urban areas, reducing exposure of PTWs by introducing public transport or school buses. The main problem is there are no PTWs training facilities in Indonesia. The norm is adults train the youngster to ride PTWs without knowing traffic regulation and how to handle properly such as safe brake. Engagement with community and school it is must. Four programs are recommended for youth road crashes as summaries in Table 1.

Table 1. Four Action Plans for Young People with PTWs in the RUNK

Action Plan	**Target Within Age Group**	**Reduction to Total Fatalities**	**Description**
Banning Underage Children using PTW as a Plaything	Zero Tolerance	±5% by 2030 (100% to perpetrator fatalities)	Starting with a National Campaign with highlighting problem associated with youth that road crash is the main factors of dead caused in Indonesia. Parent possible be prosecuted if underage becomes perpetrator on road crashes.
Child Helmet Loan Programme	100% Wearing Helmet	(need a pediatric Data) ?	Standard helmets for children are very limited and need such as an NGO facilitate for parent can loan helmet with some guarantee mechanism for the helmet.
Active Transportation Initiative for Safer Journey to School.	100% Adaption Safer Journey to School and Safe School Zone	Number of Enrolment: Elementary School: 25 million Secondary School: 15 million ± 30%by 2030 (75% to age 10-19 yr fatalities)	Walking, cycling and use a public transport should become a norm for young people. Safer Journey to School program initiative and Safe School Zone must be promoted to local governments in particular in the urban areas. In the areas where paratransit does not exist or marginal, support must be given for establishing school buses. Public transport safety must also be improved as 9% of children deaths are related with bus crashes
PTWs skill Riding and Traffic Regulation Training for Senior High School	100% riders > 17 year old having PTW driving license.		This program should be established as a part to extra-curriculum in the Senior High School (for age 16 years old) in particular in rural areas and less develop areas in Indonesia where road infrastructure is marginal and/or where there is no public transportation is available as the fiscal capacity of the local governments are also limited, the programme should be funded by central government.

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The Motorcycle Crash Card: a successful collaborative project

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Abstract

Motorcyclists, as a vulnerable road user group, continue to be disproportionately represented in fatal and serious injury statistics on the road network. The Victorian Road Safety Strategy 2021-2030 aims to halve deaths and significantly reduce serious injuries to all road users by 2030. Consistent with Safe System, a strategic focus area in Victoria's vision towards achieving zero deaths, recognises the importance of post-crash care (Department of Transport, 2021). The ability of early responders who attend a crash to access personal and medical information of the crash victims plays a significant role in the provision of post-crash care. The motorcycle Crash Card was distributed by the Department of Transport and Planning (DTP, formally Department of Transport), as a means of providing riders with the ability to carry critical personal information and have it accessible for first responders in the event of a crash, in turn increasing their chances of survival.

Background and Purpose of the Project

The ‘golden hour’, the time immediately post-injury is considered one of the most critical determinants of resuscitation and stabilisation post-injury (Harmsen et al., 2015). A decreased odds of mortality is frequently associated with shorter response or transfer times. In the road trauma setting, minimising the time from injury to definitive care is in line with optimising post-crash care (Govorko & Meuleners 2018). Based on the premise that knowing the identity and pre-existing medical conditions of crash victims are crucial towards facilitating such a timely response, the DTP undertook the task of establishing a means of assisting first responders (FRs) attending to motorcyclists in the event of a crash.

The Crash Card, originally created by the UK Ambulance Service in 2009, is a small card that can be inserted into helmets of motorcyclists and their passengers. It notes personal details including medical conditions which can be used by FRs. A bright red sticker is placed on the side of the helmet to indicate to FRs the presence of a Crash Card in the helmet (Figure 1).

Figure 1. Crash card (left), red sticker indicates presence of crash card in helmet (right)

Description of the Project

Within the DTP, a Crash Card distribution strategy was developed with the communication and marketing team, targeting social media, websites and a media launch. One hundred thousand (100,000) cards were printed and distributed to numerous stakeholders, including at regional licensing offices and at motorcycling events. To date, the regional and suburban licensing offices have exhausted the initial allocation. The development and distribution of the Crash Card was successful due to the collaborative efforts of the road safety partnership including the major trauma units and Ambulance Victoria. Ambulance Victoria provided clarity around practices for first responders and DTP consulted with a multitude of stakeholders to ensure the delivery of the crash card was facilitated through all distribution points, with Customer Service Centres and authorised motorcycle Graduated Licensing Trainers providing a critical role in its promotion and distribution.

The distribution of the Crash Card was used as an opportunity for Victoria's Road authority (DTP) to engage with motorcyclists and create road safety awareness for the rider. It not only encouraged discussion about a rider's vulnerability, but also connected all sectors with aspects of post-crash care.

Results

While no scientific evaluation of the success of the Crash Card in Victoria has been conducted to date, a retrospective analysis of the success of the Crash Card is being developed. Measures including the reach of the card to riders, the exhaustion of the cards in various locations, feedback from riders and FR who may have come across crash victims with the cards are being considered. Early metrics are positive, with publications in the Herald Sun and high metrics for social media posts reaching over 69,000. Based on the now exhausted distribution of 100,000 cards over a 5-month period, the card is likely to be well utilised by motorcyclists, and well-received by FRs.

Implications and Next Steps

DTP are currently in the process of printing and distributing another 100,000 cards and reaching out to broader industry groups to expand the distribution of the crash card with the aim of facilitating timely post-crash care and improving trauma outcomes for riders. A retrospective evaluation of the success of this initiative is being considered.

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Update of the AASHTO Highway Safety Manual

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Abstract

The American Association of State Highway and Transportation Officials (AASHTO) *Highway Safety Manual* (HSM), published in 2010, provides analytical tools, techniques, and procedures for quantifying the potential effects of decisions made by transportation professionals. It is the premier guidance document for practitioners and researchers in the United States for incorporating quantitative safety analysis in the highway transportation project planning and development processes. The second edition of the HSM (i.e., HSM2) is being developed to incorporate relevant ongoing and completed to expand the scope and quality of the HSM, to increase its application and improve its usability. This presentation will focus on the updated chapter outline of HSM2, significant differences between the first and second editions, and any critical implementation issues for agencies to consider.

Background

The HSM provides information on:

- Human factors and the fundamentals of traffic safety;
- The roadway safety management process including:
  - Network screening (identify sites with potential for crash or severity reduction);
  - Site assessment (diagnosis, countermeasure selection, economic appraisal);
  - Project prioritization;
  - Safety effectiveness evaluation;
- Predictive methods for infrastructure improvement project alternative analysis and development/design, including:
  - Use of national safety performance functions (models) developed to predict crashes by severity for specific facility types and base conditions; and
  - Associated crash modification factors (CMFs) to estimate the potential effects of design alternatives or changes from base conditions.

Development of the HSM began from a Transportation Research Board (TRB) conference session and a workshop, both held in 1999, that identified the need for a traffic safety document analogous to the role of the *Highway Capacity Manual* for traffic operations. The HSM was developed over a 10 to 15 year period and is intended to be used in conjunction with related publications such as the *Roadside Design Guide*, the *Human Factors Guide* (NCHRP Report 600), the *Highway Capacity Manual*, the *Policy on Geometric Design of Highways and Streets*, and the *Manual on Uniform Traffic Control Devices*.

The HSM provides practitioners with the best information and tools available to consider safety when making decisions related to design and operations of roadways. The HSM assists practitioners in selecting countermeasures and prioritizing projects, comparing alternatives, and quantifying and predicting the safety performance of roadway elements considered in planning, design, construction, maintenance, and operations. Prior to the HSM, there was no widely accepted tool available in the United States to quantitatively assess the impact of infrastructure decisions on safety.

Update of the Manual

Currently there is a research project to update the manual with ongoing and completed research. In addition to updating existing chapters, six new chapters are planned for the manual, including chapters on:

- Areawide approach to roadway safety management (i.e., macro-level safety planning)
- Pedestrians and bicyclists
- Systemic approach to roadway safety management
- General concepts for applying crash prediction models
- Selecting crash modification factors
- Applying crash modification factors

When the new manual is published, it is anticipated that it will incorporate results from 25 or more National Cooperative Highway Research Projects (NCHRP) initiated since 2010 into one or more chapters, and it is estimated that more than 200 new references will be incorporated into HSM2 and include more than 400 SPFs addressing rural two-lane roads, rural multilane highways, urban and suburban arterials, freeways, and ramps. This presentation will highlight the updated chapter outline of HSM2, significant differences between the first and second editions, select examples, and critical issues for agencies to consider when implementing HSM procedures.

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Pedestrian and bicycle safety performance functions for segments and intersections

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Abstract

The objective of this research was to develop pedestrian and bicycle safety performance functions (SPFs) to better inform planning, design, and operations decisions. To accomplish this objective, three approaches to collecting data and developing pedestrian and bicycle SPFs for roadway segments and intersections were followed:

- Using negative binomial regression analysis, pedestrian and bicycle SPFs were developed for urban and suburban roadway segments and intersections including exposure measures for motor vehicles, pedestrians, and bicycles and other geometric and traffic control elements.
- Pedestrian and bicycle SPFs were developed by adapting crash prediction models used by the U.S. Road Assessment Program.
- Regression models were developed to estimate the potential of a pedestrian or bicycle crash occurring in the absence of pedestrian or bicycle exposure data.

The final pedestrian and bicycle SPFs were recommended for incorporation into the American Association of State Highway and Transportation Officials *Highway Safety Manual*.

Background

The crash prediction models in Part C of the *Highway Safety Manual* (HSM) are most suited for estimating expected frequencies of multiple- and single-vehicle motor-vehicle crashes, excluding pedestrian and bicycle crashes. With the exception of a comprehensive pedestrian safety prediction model for urban and suburban signalized intersections, the models in HSM estimate pedestrian and bicycle safety based on the proportion of pedestrian and bicycle crashes to motor-vehicle crashes. This generalized approach for determining site-specific estimates of pedestrian and bicycle crashes is not sensitive to site-specific conditions that influence pedestrian and bicycle crashes and provides little guidance for evaluating the site-specific effects of proposed projects intended to improve pedestrian and bicycle safety. Explicit consideration of pedestrian and bicycle safety is critical for implementation of future editions of the HSM (Torbic et al., 2022).

Research Objective

The objective of this research was to develop pedestrian and bicycle SPFs for transportation practitioners at all levels to better inform planning, design, and operations decisions including roadway segments and intersections in rural, urban, and suburban areas for potential incorporation into the HSM.

Methodology

To accomplish the research objective, three separate approaches to collecting data and developing pedestrian and bicycle SPFs for roadway segments and intersections were followed.

- *Develop Pedestrian and Bicycle SPFs Incorporating Available Exposure Data for Pedestrians and Bicyclists*: Using traditional crash-based modeling techniques (e.g., negative binomial regression analysis), pedestrian and bicycle SPFs were developed for urban and suburban roadway segments and intersections, and the models incorporated both motorized (i.e., motor vehicles) and non-motorized (i.e., pedestrian and bicycle) exposure

measures. These SPFs were limited to urban and suburban areas as this was where pedestrian and bicycle count data were available for model development.
Three levels of models were developed, as appropriate:

- A reduced model to estimate total pedestrian/bicycle crashes (i.e., all severity levels combined) that primarily includes exposure measures for motor vehicles and pedestrians/bicycles.
- An expanded model to estimate total pedestrian/bicycle crashes (i.e., all severity levels combined) that includes exposure measures for motor vehicles and pedestrians/bicycles as well as other geometric, traffic control, and site characteristic features found to be significant predictors of total pedestrian/bicycle crashes.
- A reduced model to estimate fatal-and-serious injury pedestrian/bicycle crashes (i.e., fatal and suspected serious injury crashes) that primarily includes exposure measures for motor vehicles and pedestrians/bicycles.

  As an example of the negative binomial regression models estimated in this study, the following functional form was used for roadway segments:

$$\lambda_i = e^{\beta_0} \times L^{\beta_1} \times AADT^{\beta_2} \times NMVol^{\beta_3} \times e^{(\beta_4 X_4 + \cdots + \beta_n X_n)}$$

where:

λ_i	=	predicted number of crashes on roadway segment *i*.
e	=	exponential function.
β_0	=	regression coefficient for constant.
L	=	roadway segment length (mi).
$AADT$	=	average annual daily traffic (veh/day).
$NMVol$	=	average annual non-motorized traffic volume (i.e., AADP or AADB) (ped/day or bike/day).
β_1	=	regression coefficient for segment length.
β_2	=	regression coefficient for AADT.

- *Develop an Approach to Pedestrian and Bicycle Crash Prediction for the HSM based on Procedures Implemented in the U.S. Road Assessment Program (usRAP)*: Pedestrian and bicycle SPFs were developed for rural two-lane roads, rural multilane highways, and urban and suburban arterials by adapting crash prediction models used by the U.S. Road Assessment Program (usRAP) and its international partner the International Road Assessment Program (iRAP). The RAP models for pedestrian and bicycle crashes were developed for worldwide application and were adapted to fit with United States (U.S.) highway safety practice and terminology and format of the HSM.

As an example, the bicycle crash prediction model for bicycle movements along the road had the following form:

$$N_{unadjusted-biker} = Likelihood_{biker} \times Severity_{biker} \times MVTSF_{biker} \times MVTFF_{biker} \times BFF_r \times \left(\frac{L}{0.062}\right)$$

where:

$Likelihood_{biker}$	=	crash likelihood factor for bicycle crashes involving bicycle movements along the road for a specific roadway segment.
$Severity_{biker}$	=	crash severity factor for bicycle crashes involving bicycle movements along the road for a specific roadway segment.
$MVTSF_{biker}$	=	motor-vehicle traffic speed factor for bicycle crashes involving bicycle movements along the road for a specific roadway segment.
$MVTFF_{biker}$	=	motor-vehicle traffic flow factor for bicycle crashes involving bicycle movements along the road for a specific roadway segment.
BFF_r	=	bicycle flow factor for bicycle crashes involving bicycle movements along the road for a specific roadway segment.
L	=	length (mi) of a specific roadway segment.

- *Develop Models to Estimate Pedestrian and Bicycle Safety Performance Based on Crash Data in the Absence of Pedestrian and Bicycle Exposure Data*: Regression models were developed to estimate the potential of a pedestrian or bicycle crash occurring in the absence of having pedestrian or bicycle exposure data. In other words, no direct estimate of pedestrian and bicycle volume (e.g., daily volume, peak-hour volume, 2-hr count, etc.) along the roadway or at an intersection was included in the model development; however, other indirect measures of pedestrian and bicycle exposure (e.g., population) were included in model development. Models were developed to estimate the potential of a pedestrian or bicycle crash occurring on various roadway segment and intersection types when pedestrian or bicycle exposure data are not available.

Results

Comparisons were made between the models developed as part of this research and existing models in HSM Part C. The first figure below provides a comparison of the predicted average total pedestrian crash frequency from the expanded four-lane undivided roads (4U) model and the predicted average total pedestrian crash frequency and total crashes (i.e., multiple-vehicle + single-vehicle + pedestrian + bicycle crashes) from the existing HSM Part C model for urban four-lane, undivided roads. The second figure provides a comparison of the predicted average total bicycle crash frequency from the expanded two-lane undivided roads (2U) model and the predicted average total bicycle crash frequency and total crashes (i.e., multiple-vehicle + single-vehicle + pedestrian + bicycle crashes) from the existing HSM Part C model for urban two-lane, undivided roads. The final pedestrian and bicycle SPFs were recommended for potential incorporation into the HSM. Spreadsheet tools were also developed and/or updated to incorporate the pedestrian and bicycle SPFs for use with HSM procedures.

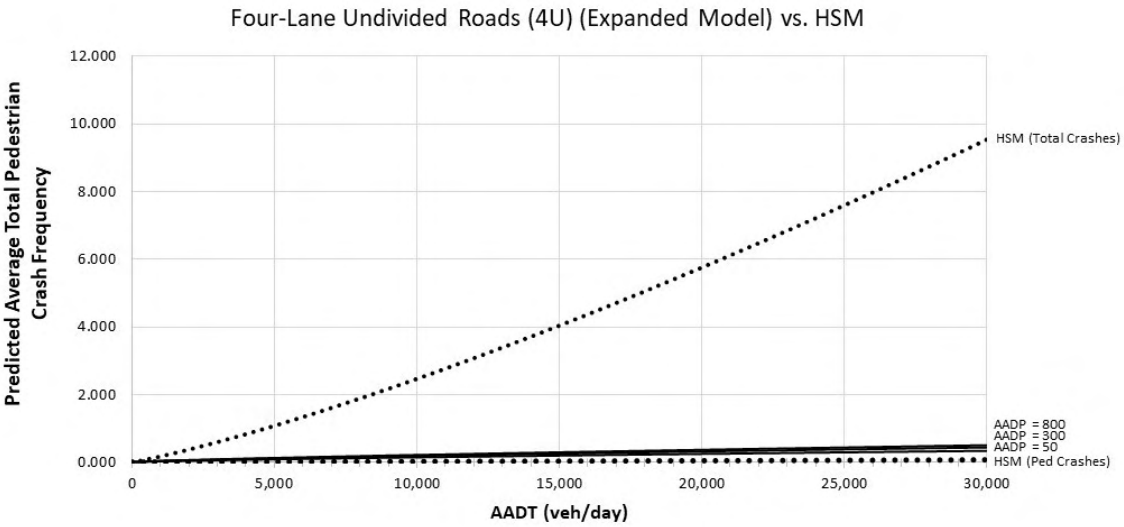

Figure 1. Comparison of SPF for Total Pedestrian Crashes on Four-Lane Undivided Roads (Expanded Model) and Existing HSM Model

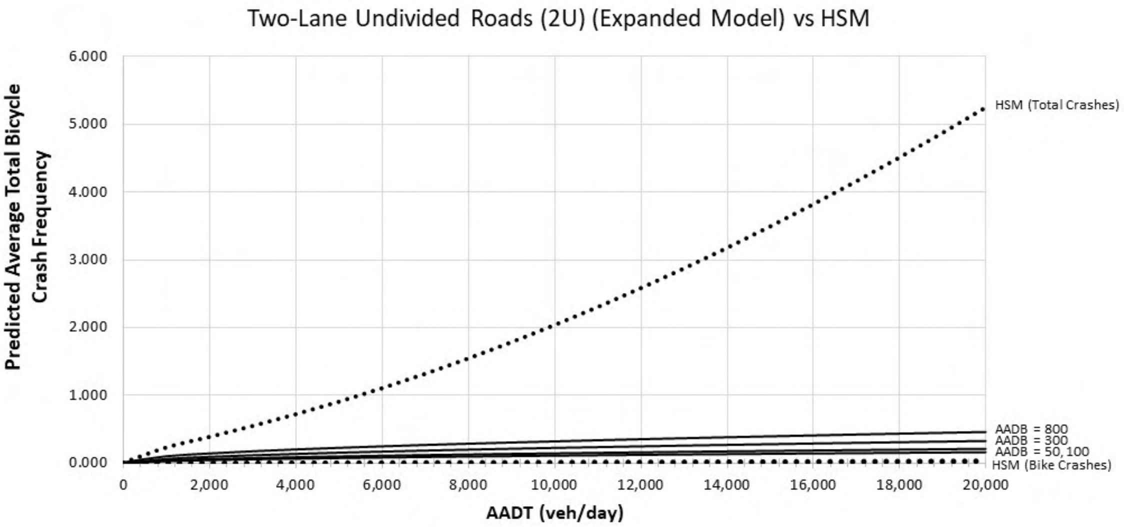

Figure 2. Comparison of SPF for Total Bicycle Crashes on Two-Lane Undivided Roads (Expanded Model) and Existing HSM Model

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Promoting cycling safety for children in Vietnam

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Abstract

Cycling is a mode of active transport with numerous benefits; however, it can be dangerous for children who lack road safety-related experience, knowledge of safe practice, and riding skills necessary to avoid crashes and reduce injury severity if crashes happen. This abstract explores the impact of the *Bike to School campaign* program launched by AIP Foundation, with support from Fondation Botnar and Global Road Safety Partnership. The program provided training on safe cycling and raised awareness among teachers, parents, community members, and local authorities to improve road safety for children. It targeted 19 secondary schools, with 18 thousand students in Pleiku city. The program's interventions successfully brought about a positive change in the student's knowledge and attitudes toward cycling safety, improving their cycling safety and experience. This success has set the scene for the following phase of advocating for temporary and permanent separate lanes for cyclists in the city.

Background

Cycling is a mode of active transportation with numerous benefits. However, it presents many risks to young cyclists who do not have adequate knowledge and skills. In Vietnam, there are 5.9 million students in secondary schools (GSO, 2022), with about 1/5 cycling to schools in urban cities (Nguyen et al., 2021). The risks for these students become more serious when the number of personal motorized vehicles in the country is growing fast while there is a lack of dedicated cycling infrastructure and prioritized cycling safety education. 233 Vietnamese cyclists aged 10-19 died in 2019 due to road injuries. This number is remarkably high compared to other countries in the region, like Cambodia (44) and Thailand (72) (IHME, 2019).

Project Purpose

In response to this issue, in 2022, AIP Foundation, with support from Fondation Botnar and Global Road Safety Partnership, launched the *Bike to School campaign* program and took initial steps to improve road safety for children cycling to schools in Pleiku, a central highland of Vietnam. The program was deployed in 19 secondary schools, targeting more than 18 thousand students. It is part of a long-term effort that aims to ensure road safety for all children on their way to school.

Program Approach

The program used a multi-faceted approach and focused on three vital components: cycling safety education, raising awareness for multiple targets, and providing safety equipment to students.

- The education component equipped the school teachers and 18,117 students with the knowledge of safe preparation before riding, safe cycling practices, and the skills needed to navigate the road safely. The program also provided them with information on the benefit of cycling.
- The awareness campaign targeted various people, from cyclists like students to motorcyclists and other drivers like teachers, parents and community members. Under this component, a massive "Bike marathon" campaign was organised to encourage students to use bicycles to school to enrich their cycling experience and to raise attention toward cycling safety.
- To promote helmets as safety equipment, bicycles and helmets were distributed to students in families with poor economic conditions.

Furthermore, the program worked closely with the local authorities from the education and transport department to seek their buy-in, support and collaboration.

Evaluation

Pre- and post-intervention evaluations were conducted to measure the impact of the program. A structured questionnaire was used to assess the student's attitudes and knowledge of cycling safety (safe preparation and safe cycling). A representative sample of 5587 and 5471 students participated in these evaluations.

Result

The number of students with excellent and good scores on cycling safety knowledge grew from less than 72 percent pre- to more than 84 percent post-evaluation. Positive attitudes toward cycling changed from 24 percent to more than two and a half, at 65 percent.

Conclusion

The *Bike to School Campaign* program has demonstrated success in raising students' knowledge and attitudes toward cycling, which contributes to the road safety of young cyclists. It also set the scene for the following phase to advocate for temporary and permanent separate lanes for cyclists in the city.

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Factors affecting the severity of bridge-related crashes in New South Wales

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Abstract

This research investigates factors contributing to the severity of bridge-related crashes, using historical crash data (2016-2021) in New South Wales (NSW). A total of 471 bridge-related crashes were identified from the data. Modelling results using ordinal logistic regression showed that the severity of bridge-related crashes may be significantly affected by traffic and infrastructure factors, including speed limit, road type, lighting condition and the number of vehicles involved. Future research should further explore other factors such as: traffic volume; bridge length, width or clearance; and driver behaviour, and also consider data from other jurisdictions.

Background

A bridge-related crash is a traffic crash in which a vehicle collides with a bridge, potentially resulting in fatalities and injuries. Bridge-related crashes include those involving vehicles travelling on the bridge or bridge approaches, i.e., over-bridge crashes, or travelling on an underpass beneath the bridge, i.e., under-bridge crashes (Ogden, 1989). Bridge-related crashes may result in more severe outcomes because physical aspects and typical operational features of bridges are significantly different, in comparison with other roadways (Jalayer & Zhou, 2016; Mehta et al., 2015; Retting et al., 2000; Truong, 2022). Even though several studies have been conducted on bridge-related crashes, limited research has been conducted to identify and compare the factors influencing the severity of bridge-related crashes. The limitation in data collection, the relatively lower frequency of bridge-related crashes and the lack of data relating to bridge characteristics can make it more difficult to identify contributing factors. This research aims to investigate factors contributing to the severity degree of bridge-related crashes in New South Wales from 2016 to 2021, using ordinal logistic regression.

Method

In this research, crash data in NSW (2016-2021) was obtained from opendata.transport.nsw.gov.au. Bridge-related crashes were identified using information about the objects struck. Among bridge-related crashes, over-bridge and under-bridge crashes were identified if at least one of the objects struck was a bridge or an underpass, respectively. A total of 471 bridge-related crashes were identified during the 2016-2021 period in NSW, including 379 over-bridge and 92 under-bridge crashes. The dependent variable, degree of severity, had four levels which included: non-casualty (towaway), moderate or minor injury, serious injury, and fatalities. Given the ordered nature of the severity variable, ordinal logistic regression was adopted to explore the effects of various factors on the degree of severity. Two models were developed for the severity of bridge-related crashes and over-bridge crashes only. Independent variables (factors) included speed limit (lower than 50 km/h, 51 – 70 km/h, 71 - 90 km/h, or 91 – 110 km/h), road type (2-way undivided road or others), lighting condition (good lighting condition i.e., daylight and night-time with street lighting or others), number of vehicles involved (single vehicle or multiple vehicles) and type of vehicles involved (heavy vehicle or others). Models were estimated using R.

Results

Table 1 presents the results of the ordinal logistic regression models for the severity levels of all bridge-related crashes and over-bridge crashes only. The results indicated that bridge-related crashes at a high-speed limit, on 2-way undivided road, with multiple vehicle involvement and in good lighting condition tend to be more severe. For bridge-related crashes within the 71-90 km/h and 91-110 km/h speed limits, the odds of being more severe is 1.83 higher and 2.36 higher, respectively, as compared to the 50 km/h speed limit. Bridge-related crashes with 2-way undivided traffic were 1.45 times more likely to be more severe than on "other" road types. In good lighting conditions, the odds of being more severe was 1.5 higher than in "other" conditions. A possible reason is that drivers tend to be more concentrated and avoid risky driving behaviours under poor lighting conditions. Bridge-related crashes involving a single vehicle were about 0.52 times as likely to be more severe than those involving multiple vehicles. There was limited evidence that bridge-related crashes involving heavy vehicles would be less severe (only significant at $p < 0.1$). On the other hand, for over-bridge crashes, only three factors were significant, including speed limit over 90 km/h, 2-way undivided traffic and lighting condition.

Table 1. Results of the ordinal logistic regression models for bridge-related crashes and over-bridge crashes only

Variables	Bridge-related crashes				Over-bridge crashes only			
	Estimated	SE		OR	Estimated	SE		OR
Speed limit								
50 km/h (ref)								
51 – 70 km/h	0.3	0.27		1.36	0.33	0.31		1.4
71 – 90 km/h	0.6	0.28	*	1.83	0.44	0.32		1.55
91 – 110 km/h	0.86	0.24	***	2.36	0.73	0.27	**	2.07
Road type								
2-way undivided vs Others (ref)	0.37	0.19	*	1.45	0.43	0.21	*	1.54
Lighting condition								
Good lighting condition vs Others (ref)	0.41	0.19	*	1.5	0.44	0.21	*	1.55
Number of vehicles involved								
Single vs Multiple (ref)	-0.66	0.25	**	0.52	-0.36	0.29		0.7
Type of vehicles involved								
Heavy vehicles vs Others (ref)	-0.5	0.28	•	0.61	-0.3	0.31		0.7
Intercepts (Thresholds)								
Non-casualty | Minor	0.1	0.37			0.19	0.42		
Minor | Serious	1.66	0.37			1.86	0.43		
Serious | Fatal	4	0.46			4.24	0.52		
Residual Deviance			1058.6				868.6	
AIC			1078.6				888.6	
Sample size			471				379	

Note: • p<0.1; * p<0.05; ** p<0.01; *** p<0.001; SE = Standard error; AIC = Akaike information criterion

Conclusion

In summary, modelling results indicated that a higher speed limit, 2-way undivided traffic, lighting condition and multiple vehicle involvement could significantly increase the severity of bridge-related crashes. Speed limit, 2-way undivided traffic and lighting condition were also found to be key factors influencing over-bridge crashes. It was, however, important to note that the study only looked at a small sample of bridge-related crashes occurring in one jurisdiction. Therefore, the results may not be generalisable to all bridge-related crashes in other locations. There is also a need for further research taking other factors into account such as: traffic volume; bridge length, width or clearance; and driver behaviour.

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Technology to avoid being caught for phone use while driving

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Abstract

The availability of applications such as Google Maps, Apple Maps, Waze and social pages/groups that can share locations of enforcement for phone use while driving has been increasing. As such, this study aimed to understand the impact of these technologies on phone use while driving. Two studies were conducted. First, 15 Australian police officers were interviewed to obtain an enforcement perspective on this problem. Next, a cross-sectional survey (n = 622) was conducted to obtain an understanding from a driver's perspective. Overall, the results confirm these technologies can impact illegal phone use while driving. However, the way in which the technologies impact behaviour is dependent on how it is used. The findings have important implications for road safety initiatives and policy.

Background

Hand-held phone use while driving has been demonstrated to significantly increase crash risk (e.g., Dingus et al., 2016), prompting authorities to increase penalties and introduce more enforcement initiatives for this behaviour. Despite this, it has been found that many drivers avoid being caught when engaging in this behaviour (Oviedo-Trespalacios et al., 2018; Truelove et al., 2021). The use of certain technologies may be contributing to this problem. For example, navigation applications such as Waze, Apple Maps and Google Maps can notify drivers of enforcement locations while driving. Further, Facebook groups and pages have been introduced where members can share enforcement locations. These technologies may be used to undermine the effectiveness of enforcement initiatives, including mobile phone detection cameras that have been introduced in various jurisdictions across Australia. However, research has yet to explore this issue for phone use while driving. Therefore, a mixed-methods approach was undertaken. First, interviews with Australian police officers were conducted to determine how these technologies impact enforcement of phone use while driving. Next, a survey was implemented to understand how the technologies impact phone use while driving behaviour.

Method

Study 1

In total, 15 police officers who had experience with enforcing phone use while driving were interviewed to determine how the use of the technologies can impact phone use enforcement.

Study 2

A survey was conducted with 622 drivers (58.7% female). Participants were asked about their demographics, phone use while driving behaviours, use of the technologies and deterrence related perceptions.

Results

Study 1

A thematic analysis was used to analyse the data. A total of three themes were identified. Based on responses from the police officers, it was suggested that the use of the technologies 1) can encourage dangerous driving and allow drivers to avoid punishment more often, 2) do not impact police enforcement of the phone use while driving law and 3) can promote exposure to enforcement.

Study 2
A cluster analysis was conducted to categorise drivers into low frequency and high frequency phone offenders, acknowledging differential deterrability. Next, a hierarchal binary logistic regression was conducted, and it was found that using Facebook police location sites and Apple Maps predicted being in the high frequency phone offender cluster. After the use of these technologies was controlled for, avoiding being caught and punished for the behaviour also predicted being in the high frequency phone offender group.

Conclusions
The findings identify the complexities associated with the impact of these technologies on phone use while driving. Study 1 demonstrated that the technologies can be used as a tool to promote exposure to enforcement. However, both Study 1 and Study 2 also identified that the technologies can be used by offenders to avoid being caught and punished. The way in which the technologies influence behaviour is suggested to be impacted by how they are used by the driver. The findings have important implications for stakeholders and policy and also identify ways the technologies could be used to promote deterrence.

Funding

This study was funded by the Motor Accident Insurance Commission (MAIC).

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Achieving safer road outcomes for Powered Two Wheelers (PTWs) in Indonesia)

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Abstract

Indonesia formerly adopted the Safe System approach in their 2021 to 2040 national road safety strategy (RUNK, 2022). The road safety challenges in Indonesia are significant, given the large population, the high number of vulnerable powered 2/3 wheelers, the high risks faced by pedestrians due to PTWs and poor infrastructure. A multi-agency approach is necessary to address each of the RUNK goals and achieve the system-wide changes required to reduce deaths by 50% by 2030. This presentation will focus on the main goals that are the responsibility of Bina Marga (the national highways agency) and the important changes that are necessary to highway infrastructure to address the risks faced by PTWs. Both a reactive and proactive approaches are to be applied. This presentation will discuss the reactive approach, that focuses on reducing crashes at blackspots. The proactive approach looks at improving most highways to three star or better. Examples of suitable improvement options include advanced stop lines at traffic signals, segregated slow lanes (rather than wide general traffic lanes) and traffic calming on narrow substandard rural roads. Significant gaps in knowledge exist, particularly in building safer infrastructure (safer roads) for PTWs.

Background

Indonesia's latest national road safety strategy (RUNK 2022) has a large number of goals (actions), broken down by safe system pillars and organization(s) responsible. Bina Marga (national highways) have responsibility for the safer road and mobility goals as they related to the national road network (which is around 11% of all roads, at 47,000km). A key task for Bina Marga is to identify, investigate and treat high crash locations (blackspots or hotspots). Given the low reporting rates for non-fatal crashes, incomplete crash records and concerns around location accuracy, in some situations a black-route approach for high-risk corridors is preferred. Given the high prevalence of powered 2 and 3 wheelers (PTW) the diagnosis of problems and selection and assessment of treatments needs to be different to that undertaken in car dominated (western) countries. While some common car orientated treatments maybe effective in addressing PTW crashes, some are less effective, and new treatment types need to be developed. The predominate crash types for urban PTWs is head-on and rear-end, with the former being a rare crash type in urban areas in car dominated countries.

Safer Roads – Treatments based on PTW proportion.

Table 1 (developed by the authors; based in part on motorcycle design guidelines and research) shows some of the safety interventions that are likely to be effective at various proportions of PTW in the vehicle fleet. Examples are given of cities that fall within each usage category. Most Indonesia cities (eg. Jakarta, Denpasar and Surbaya) fall within the high (40 to 69%) and very high (70% plus) usage categories. At these usage levels there needs to be much greater efforts to design roads for PTWs. This needs to be more than just motorcycle lanes (which are suitable up to moderate usage levels), as in most cases a single motorcycle lane is not sufficient to accommodate all PTW on an Indonesian street. At high usage levels the motorcycle lane may still be required, but for the slower moving PTWs.

Table 1 – Safety Interventions by Proportion of PTWs

Usage Level	Proportion of PTW	Example Cities (to validate)	Safer Road Interventions
Very Low	Up to 9%	London, New York, Sydney, Auckland	Raise awareness of motorcyclists, wider lanes and shoulders at intersections and good surfacing
Low	10 to 19%	Rome, Barcelona, Madrid, Lima	As above, plus motorcycle lanes* on routes with greater 20% PTWs, avoid shared lanes (at Intersections)
Moderate	20 to 39%	Naples, Milan, Manila, Mumbai	Motorcycle lanes*, wide lanes & shoulders. Add motorcycle boxes/space and avoid shared lanes at intersections. Curve treatments & good surfacing
High	40 to 69%	Jakarta, Denpasar, KL, Bangkok, Karachi	Design roads for PTWs** – motorcycle lanes# provided for slower moving PTW and other VRUs (bikes and e-scooters).
Very High	70% plus	Lagos, Ho Chi Minh, Hanoi	As above, plus trial options that treat other vehicles as special vehicles (like buses) e.g. separate phases at traffic signals

*Need to consider push bikes and micro-mobility user safety
** Due to mixed traffic speeds need to be managed (especially when not congested)
# These slow vehicle **motorcycle lanes** need to accommodate all VRUs

Powered Two-Wheeler Safety Treatments

Treatments need to be identified and evaluated both on mid-block sections and intersections. Some common all-country treatments are to install medians (with suitable u-turning slots) and make streets one-ways. These treatments reduce/eliminate the amount of wrong-direction riding down a street in high PTW cities and countries, which is a major causes of fatal head-on crashes.

Figure 1 shows some intersection treatments that have been trialed in Denpasar, Bali and in a number of other provinces (Mulyadi et al., 2022). The traffic-conflict evaluation from this trial indicates that there are less conflicts between vehicles when motor-bike boxes and approach lanes are provided. Countdown timers (to red) have also been shown to reduce the number of larger vehicles stopping in the bike boxes when red signal.

Figure 1. Various motorcycle bike boxes, some with lead in motorcycle lanes

Conclusion

Work to date in Indonesia indicates the importance of identifying and targeting blackspots and black-routes and using treatments that address safety risks specific to PTWs and the more vulnerable road users, including Pedestrians. Further work is required with respect to safer road designs

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e-scooter-related workers compensation claims in Queensland

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Abstract

The Queensland Office of Industrial Relations (OIR) Workers Compensation Regulator provided data on e-scooter-related workers compensation claims occurring between December 2018 and October 2022 as part of a larger e-Personal Mobility Device (ePMD) study by Jamieson Trauma Institute (JTI). The first 4 years of data collection was self-funded by JTI and involved analysis of the emergency department injury surveillance data spanning November 2018 to June 2021. The Royal Automobile Club of Queensland (RACQ) and the Royal Brisbane and Women's Hospital (RBWH) Foundation contributed 2 years of joint funding to enable an extension of the e-PMD injury data collection activities from 2022-2024, expanding surveillance to include workers compensation data, linked health data and patient interviews. Key findings from the initial workers compensation data analysis were used by RACQ, JTI and RBWH Foundation to inform safety messaging, with workers compensation claims for e-scooter crashes having tripled over the past three years.

Background

Queensland has been a front-runner on e-scooter usage and regulation, and it is critical to better understand the related injury patterns and outcomes. Use of e-scooters for both leisure and work-related trips continues to grow, and while previous research has described patterns of injuries treated at hospital, there has been no research examining work-related compensation claims in Queensland.

Method

A descriptive analysis of the overall patterns and trends in OIR workers compensation claims for e-scooter-related injuries between December 2018 and October 2022 in Queensland was conducted.

Results

There were 421 e-scooter-related workers compensation claims recorded between December 2018 and October 2022 (69% males, 31% females), with the most common age group being the 25-34 year-olds (35%) followed by the 35-44 year-olds (26.1%) (Table 1).

Table 1. Age and gender of e-scooter-related injury claimants in Queensland, Dec 2018-Oct 2022

	Female		Male		Total	
Age groups	**N**	**%**	**N**	**%**	**N**	**%**
<18yrs	1	0.8%	3	1.0%	4	1.0%
18-24yrs	16	12.4%	36	12.3%	52	12.4%
25-34yrs	46	35.7%	101	34.6%	147	34.9%
35-44yrs	29	22.5%	81	27.7%	110	26.1%
>54yrs	17	13.2%	27	9.2%	44	10.5%
45-54yrs	20	15.5%	44	15.1%	64	15.2%
Total	**129**	**100.0%**	**292**	**100.0%**	**421**	**100.0%**

The number of claims rose over the period, with an average of under 5 claims per month during 2019 and an average of almost 16 claims per month in 2022, with variations across the year and some dips during periods where COVID restrictions were in force (see Figure 1). The average number of claims per month varied by age and gender over this period, rising from less than one claim per month up to almost 6 claims per month for females, and from 4 claims per month to almost 10 claims per month for males.

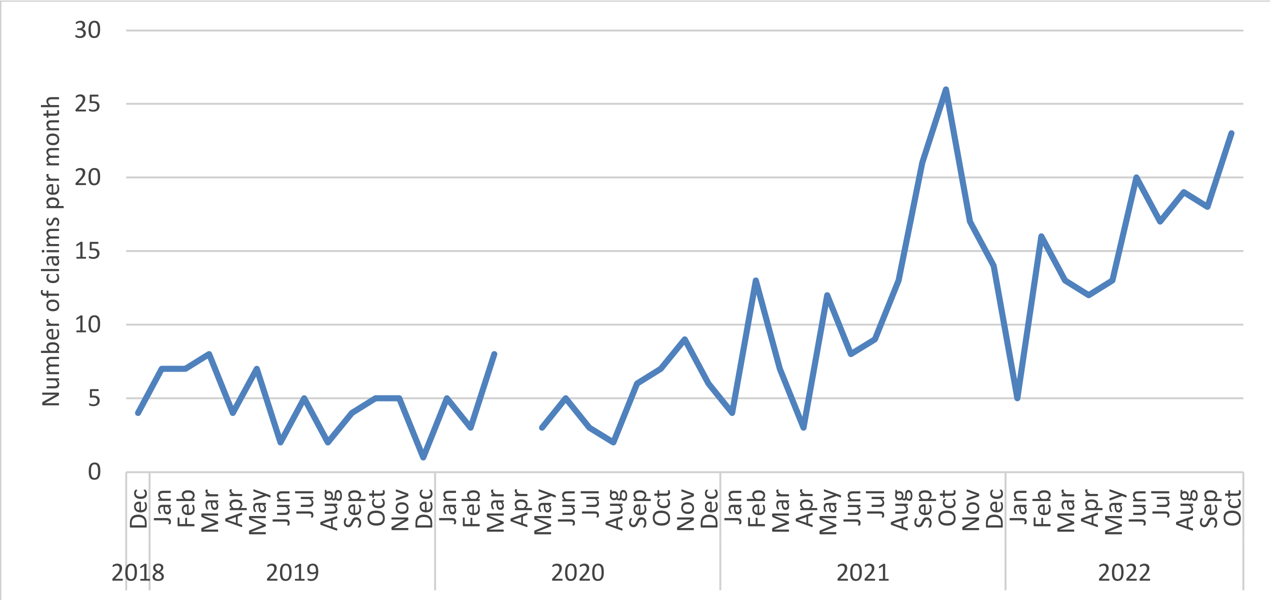


Figure 1. e-scooter work-related injury claims over time in Queensland, Dec 2018-Oct 2022

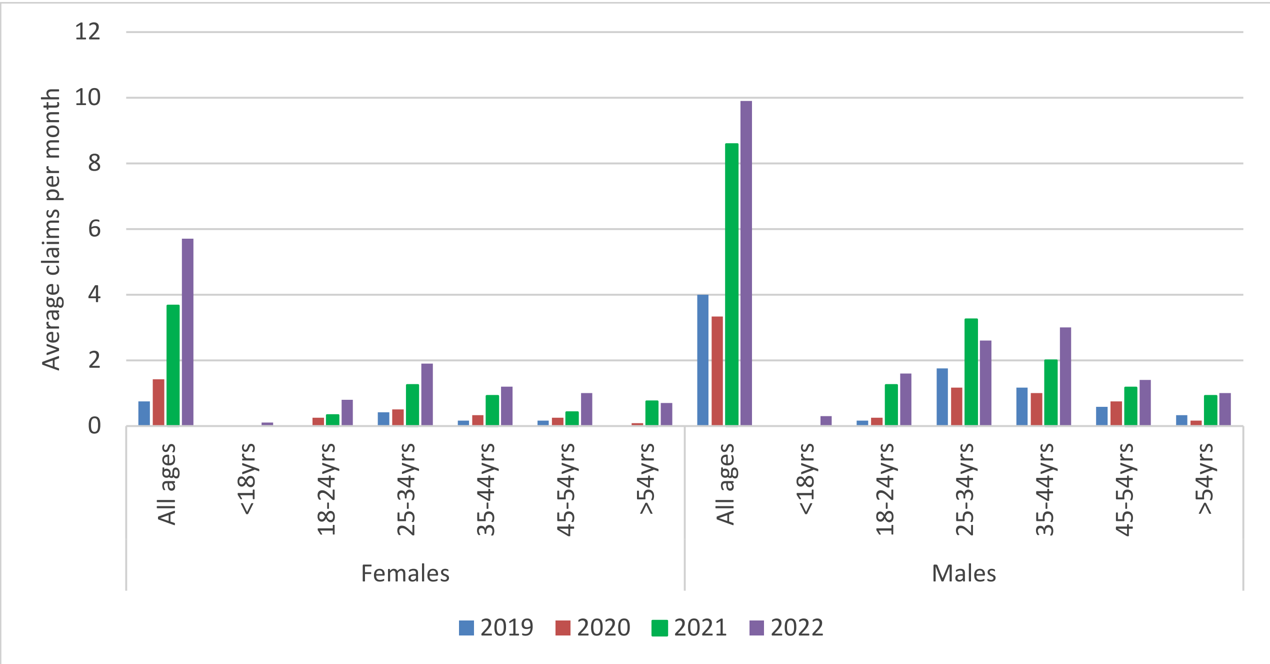


Figure 2. Average number of e-scooter work-related injury claims per month by age group and gender in Queensland, 2019-2022

The most common day of the week for e-scooter-related work-related injury claims was Tuesday (around 22%), followed by Wednesdays with almost 19 percent and Thursdays with almost 18 percent of claims occurring on those days. The trip to work accounted for 36 percent of incidents, making it the most common time of the workday for injury to occur while 29 percent occurred on the trip home from work.

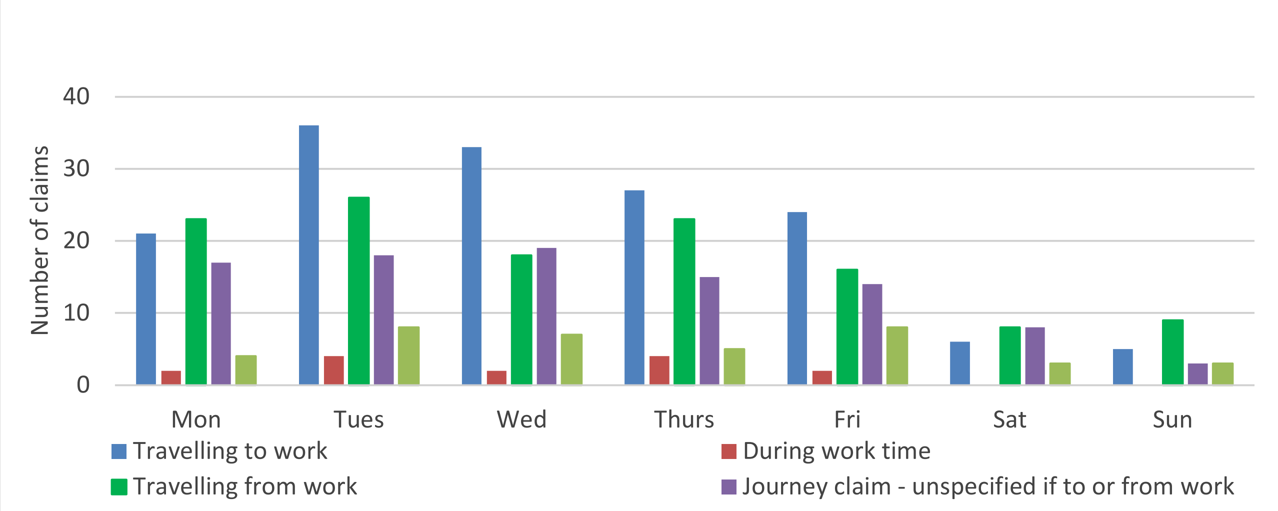


Figure 3. Period of workday and day of week for e-scooter work-related injury claims in Queensland, Dec 2018-Oct 2022

Just over 90.5 percent of work-related claims were submitted by the rider of the e-scooter, with the remainder submitted by other road users – most commonly pedestrians (accounting for 5% of all claims) and cyclists (accounting for 2% of all claims). This varied by gender with just 7 percent of the e-scooter related claims being from males who weren't the rider of the device compared with a larger 15 percent of e-scooter related claims for females who weren't the rider of the device.

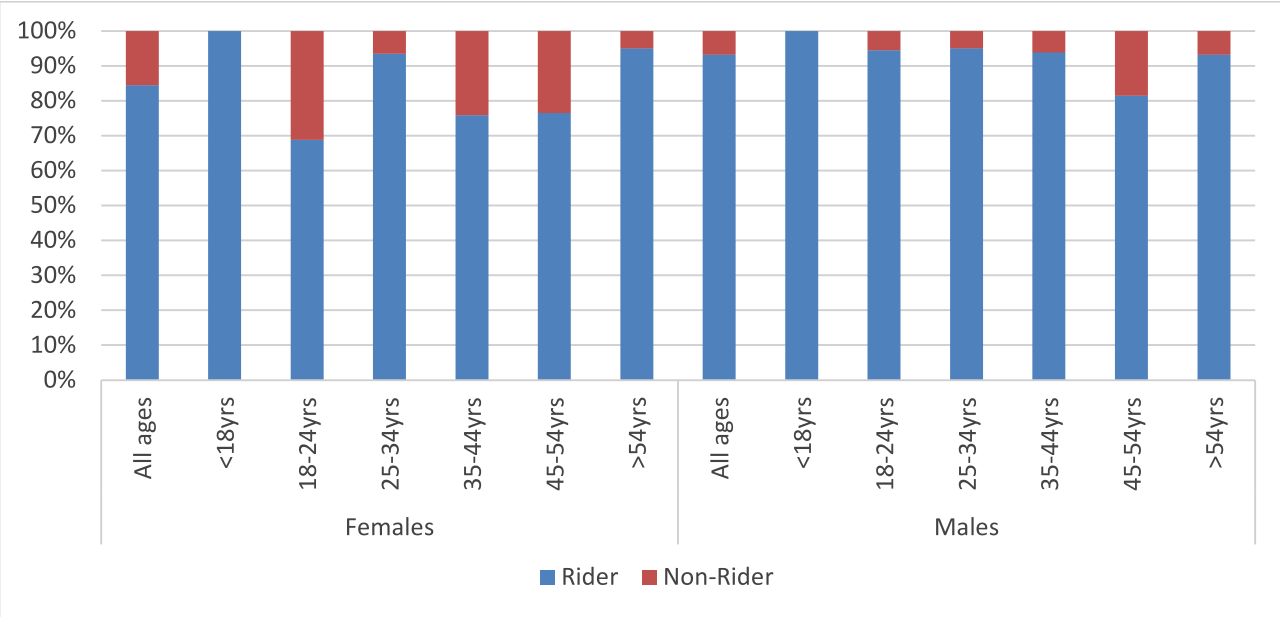


Figure 4. Proportion of rider to non-rider claims for e-Scooter work-related injury claims over time in Queensland, Dec 2018-Oct 2022

This data was publicized by RACQ, RBWH and JTI, with 30 media items generated from the article published on RACQ's website and pitched to Queensland newspaper The Courier Mail (https://www.racq.com.au/about-us/news-and-media/news/2023/3/ns070323-e-scooter-crashes-increase-in-morning-commuter-rush).

This activity was followed-up with multiple radio and TV interviews and syndication of the Courier Mail story. The messages reached a potential audience of 1.8 million, raising awareness of current e-scooter injury rates.

Conclusions

The figures provided by the Queensland OIR provide insights into the most common demographics involved and diurnal patterns of e-scooter-related workers compensation claims. Analysis shows a clear increase in claims over time and suggesting the morning commute was a more common time when incidents occurred. Safety messaging encouraged Queenslanders to allow extra time for their commutes, to wear appropriate safety equipment and obey road rules.

Pilot results of road safety incident investigation camera

Vanessa Vecovski, Kerry Shaz and John Wall

Transport for NSW

Abstract

The Road Safety Technology team, at Transport for NSW, trialled a new mobile safety incident investigation tool. The Road Safety Incident Investigation Camera (ROSIICAM) used artificial intelligence to automatically detect on-road incidents including crashes, near-misses, and unsafe road user behaviours at two rural locations. Video footage of all incidents was captured and displayed on a dashboard. Incidents were classified using road user movement codes, vehicle type, speed, and a range of other metrics. The system can be used to gain an in-depth understanding of the behaviours at specific locations. Analysing near-misses before they become serious crashes is a proactive method that can help to predict crash risk. This technology has the potential to be a valuable tool that will enable the development of more customised and effective road safety treatments. In the next stage, we will investigate whether the technology works in other environments, including urban locations.

Background

NSW has set a target of zero fatalities and serious injuries on our roads by 2056, known as the Towards Zero strategy. Being proactive in our approach to road safety will help realise this goal. Analysing 'near-misses' is a proactive method that can help to predict crash risk.

Conventional techniques tend to focus on crash data – specifically, analysis of police and hospital data. However, analysis of video footage may provide greater insights due to the richness of the information. It could potentially enable comparisons in the crash data with contributing factors observable in the video of the incident.

Existing techniques require a considerable amount of time before data related to a crash is processed, validated and available. ROSIICAM allows for analysis of an incident as soon as the footage is obtained, providing earlier detection of potential problems. This reduced time lag may be beneficial when evaluating the effectiveness of a treatment after it has been implemented.

Most instances of minor crashes, near-misses and dangerous driving behaviour go unreported. More information about these incidents can support better policy, planning and design.

Method

Two rural intersections in NSW were identified for the four-week trial. Community concerns about crash problems at these intersections had been raised at both sites; however, there was insufficient historical crash data to corroborate such anecdotal evidence. One site consisted of a T-intersection with substandard sight distance in both directions. The other site was noted to cause confusion amongst road users regarding right of way due to the road alignment and existing signposts. This second site also had a high number of cyclists passing through.

Portable solar powered cameras were installed at the two sites for four weeks. The technology protected the privacy of all road users with identifiable features automatically blurred.

Results

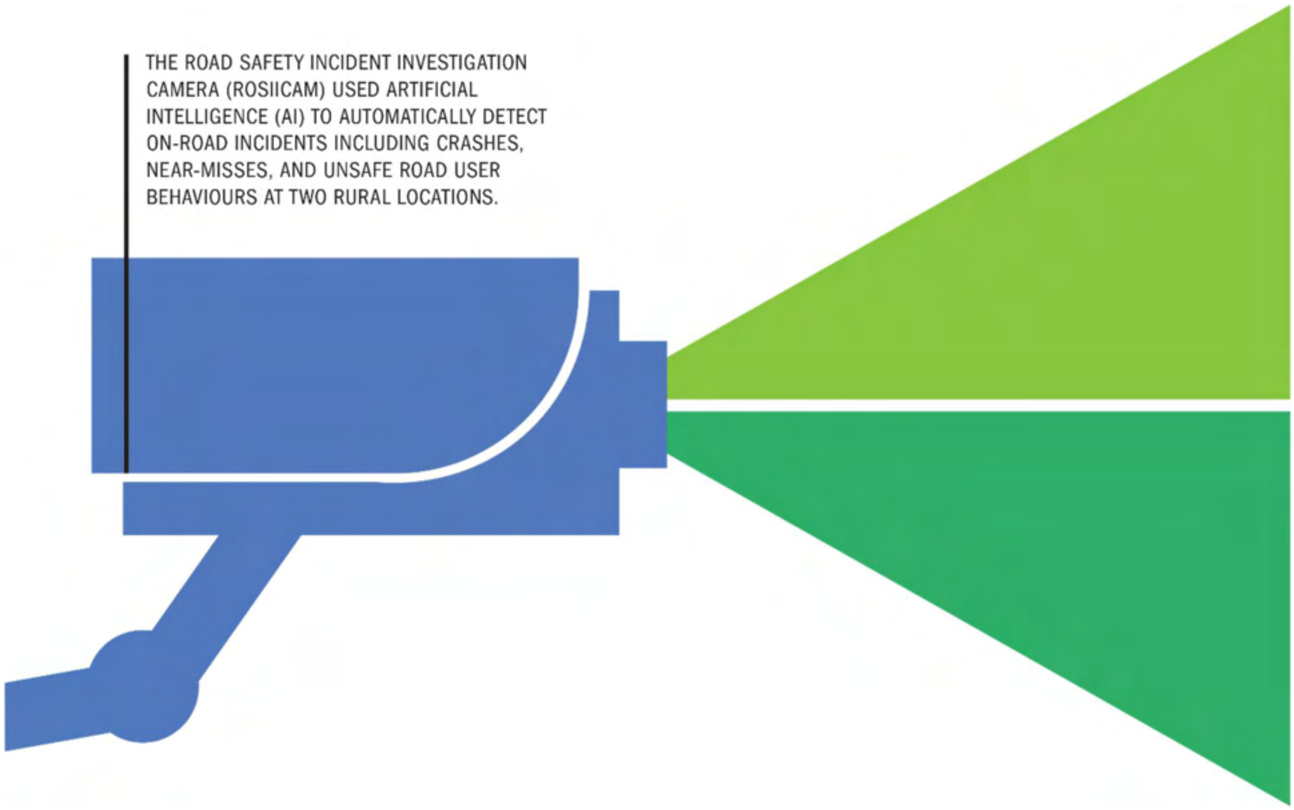
The video footage was analysed for near-misses using a 'Post Encroachment Time' (PET; the time difference of two vehicles occupying a given space) to determine the severity of the near-miss. A dashboard was created whereby practitioners could filter on incidents according to:

- PET
- Severity of incident
- Location
- Road User Movement (RUM) code

The technology identified 183 near-misses at one site, with 80 being classified as 'severe'. The average maximum speed of these incidents was 21 km/h. At the other site, 34 near-misses were detected. Ten were classified as 'severe' and the average maximum speed of vehicles was 51 km/h. Preliminary results suggest that the technology was able to detect and classify vehicles, measure vehicle speeds, and record video of near-misses. More in-depth analysis is currently underway to further explore the benefits of this technology.

Conclusion

There is preliminary evidence that ROSIICAM can support road safety analysts to gain an in-depth understanding about the number and nature of incidents at a site. In the next stage, the dashboard will be enhanced to enable filtering by time of day, speed and vehicle type. The technology will also be trialled at a range of new locations.



Safety Performance Indicators: observational studies in New South Wales

David Wakelin, Sophie Elliott and Ralston Fernandes

Transport for NSW

Abstract

The 2026 Road Safety Action Plan sets NSW on a path towards zero road trauma to ensure safe travel for all and includes specific actions to move towards new road trauma reduction targets for 2030. These actions rely on having a robust system for managing road safety performance linked to trauma outcomes. The use of safety performance indicators (SPIs) is an internationally recognised approach to improving road safety management. In 2020, Transport for NSW (TfNSW) identified that three SPIs - share of seatbelt wear in light vehicles, share of motorcycle riders wearing helmet and protective gear use and share of bicycle riders wearing helmets. TfNSW conducted an observational study in 2020 to get baseline data on these indicators and has recently conducted a second observational study to monitor the prevalence of these behaviours. This paper introduces NSW's SPIs, presents the findings of the 2023 study, draws comparisons to the findings from the 2020 study and outlines future research plans.

Background and purpose

SPIs are key measures of risk in the road system. They highlight what we need the road system to look like - across road users, roads, vehicles and travel speeds - to create safe mobility for customers. Improvements in performance across indicators show that the system is being made safer and more survivable for road users. In NSW, ongoing monitoring of performance indicators will occur alongside tracking of trauma outcomes. This will help refocus priorities where needed to drive future trauma reductions. This paper will address the sub-theme 'All road users and transport modes', as SPIs are intended to provide monitoring across the system.

Building a robust evidence base through quality data and strong research is critical to ensuring the measures implemented save lives and reduce serious injuries into the future. TfNSW reviewed the data available for all SPIs and identified that there were three road user behaviours that required baseline prevalence measures and could be immediately delivered. These road user behaviours are:

- Share of seatbelt wear in light vehicles
- Share of riders wearing specific protective gear
    - For motorcyclists, helmets and protective gear,
    - For cyclists, helmets only

Approach

TfNSW conducted research in 2020 with the aim of baselining these SPIs and has repeated this research in 2023 with the aim of monitoring prevalence of these road user behaviours and comparing to the 2020 baseline findings.

The 2020 study utilized 31 sites across metro and regional NSW - 16 for light vehicle and motorcycle observation and 15 for bicycle observations (Transport for NSW, 2021). In total, over 9,000 light vehicles, 2,700 motorcycles and 2,900 bicycles were observed. Observations were conducted at signalized intersections for light vehicles and motorcycles and at varying locations for bicycles, including shared paths and bike paths.

The 2023 research will be completed in May, with the findings to be shared publicly. This research utilises the lessons learnt from the 2020 study, including updated observation sheets for enhanced data collection, conducting observation sessions in remote locations, observing back seat passengers in light vehicles (where possible) and capturing data on food delivery riders.

Research findings

The 2020 research found that across NSW, over 99.3 per cent of all observed drivers and front seat passengers were wearing their seatbelt correctly fitted and adjusted. Although not an SPI, light vehicle driver mobile phone use was also observed and 96.9 per cent of drivers in NSW were observed not holding a mobile phone (3.1% of drivers observed were holding a mobile phone).

Over 99.9 per cent of observed motorcyclists were wearing a helmet. Only 31.5 per cent of riders wore complete protective gear, including a helmet as well as protective jackets, gloves, pants and boots.

Most bicycle riders wore helmets, with 91.9 per cent of observed cyclists wearing a helmet. Of those wearing a helmet, 99.0 per cent wore a fastened helmet.

Findings from the completed 2023 research will be made available during this presentation and compared with the findings from the 2020 research.

Next steps

This research will be conducted again in the coming years as part of TfNSW's commitment to monitoring SPIs.

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Let’s talk about parking

Jeanette Ward, Shane Turner and Aini Fayaz Mansoor

Abley

Abstract

On-street parking provides a core function in some of our streets for servicing various land uses but its provision needs to be balanced with the other roles of our streets and provided in a way that ensures people are safe from harm. Research was undertaken to examine the road safety and multi-modal impacts of on-street parking. This focused on urban on-street parking rather than off-street parking which is subject to different management regimes and types of risk. Road safety was examined from a perspective of eliminating death and serious injury, and how perceived risk might affect travel behaviour, particularly walking and bicycling activity. A range of regulatory, road user behaviour, safety campaigns, design guidance and crash data collection measures were considered to help address parking related safety issues and contribute to better multi-modal outcomes.

Background

Over the last century, many of our roads have been designed around the increasing prevalence of private vehicle movement and parking. Both can affect the look and feel of a street and thus the experience for people travelling by a range of modes. With limited space on our road corridors, achieving multi-modal outcomes often involves road space reallocation in existing streets. On-street parking is sometimes removed when road space is reallocated. In some cases, there is public resistance to reducing or changing on-street parking, which can create challenges in delivering the multi-modal outcome sought and/or have negative safety impacts when parking is retained or provided in a suboptimal way.

There is a lack of aggregated evidence about how on-street parking can impact safety and multi-modal outcomes, particularly in the New Zealand transport context, and the potential benefits that changes in parking arrangements can bring. It is likely that the same issue exists in similar countries such as Australia, and hence the findings of this research could be useful for other jurisdictions.

Research method

A literature review examined New Zealand and international research on the relationship between safety, multi-modal outcomes and parking; this included identifying approaches in planning and design guidelines that may offer mitigation strategies. An interrogation of New Zealand Crash Analysis System (CAS) data focused on identifying any relationships between safety and on-street parking. The CAS analysis was focused on death and serious injuries (DSIs). The existing mitigation strategies identified were further developed, with some new strategies emerging. Where these strategies could be imbedded into best practice guidance was identified.

Findings

The majority of DSI crashes involving parking were vehicle collisions with parked cars. Many of these crashes were due to loss of control, visibility being obscured (sunstrike or fog), a medical event or inattentive driving. Vulnerable road users (pedestrians, cyclists and motorcyclists) made up almost half of all serious injuries from parking related crashes (as shown in Table 1) and over two-thirds of all deaths in parking related crashes in this five-year period.

Table 1. Parking related DSIs by mode

Injury Severity	Pedestrian	Cycling	Motorcyclists/mopeds	Car occupants
DSI	40 (13% of DSIs)	73 (25% of DSIs)	32 (11% of DSIs)	150 (51% of DSIs)

Cycle DSI crashes related to parking are the highest for vulnerable road users, the crash types are shown in Figure 1.

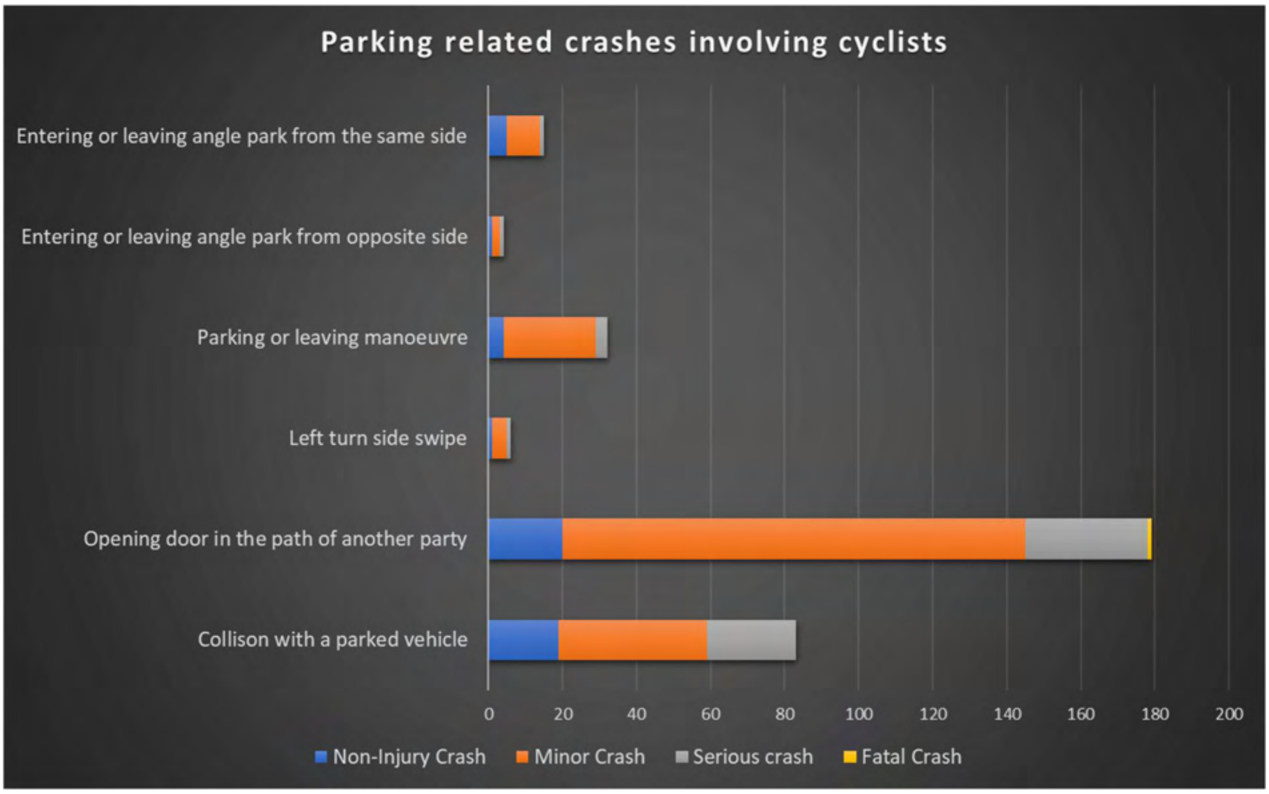

Figure 1. Parking related crashes involving cyclists

There are several clear causes for parking related DSI outcomes, these are:

- Car door opening into cyclists path
- Cyclists colliding with parked cars
- Pedestrian crossing the road from the drivers left side and being struck by the vehicle

The risk associated with these outcomes can be mitigated to some extent through road user and road environment changes. These could contribute to the Road to Zero target of a 40% reduction in DSIs by 2030.

This presentation will outline the crash data and some potential measures to help address parking related safety issues and contribute to better multi-modal outcomes.

Roadside drug testing and risky driver behaviour

Angela Watson[a,b] and Vy Le[a,c]

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Abstract

The risks posed by drug driving are well established in road safety data and research. However, understanding the characteristic differences between drivers/riders testing positive to one or more types of illicit drugs requires further investigation. Using Roadside Drug Testing (RDT) data obtained through the Queensland Police Service (QPS), this study aimed to examine and compare the characteristics of drivers/riders testing positive to THC only with those testing positive to an amphetamine type stimulant (ATS). These cohorts were also compared to a random sample of the general driving/riding population to identify any differences in terms of traffic infringement history and crash involvement. The findings indicate that the ATS drivers/riders are the most likely to engage in risky and illegal driving behaviour. However, THC only drivers/riders are still more likely to engage in these behaviours compared to the average Queensland licensed driver/rider.

Background

Data and research have continued to demonstrate the increased risks associated with drink and drug driving. Similar to alcohol consumption and poor road user behaviour, the impairing effects of illicit drug use on driving performance and crash risk or culpability is well documented (Alcohol and Drug Foundation, 2022; Drummer et al, 2004; Kelly et al., 2004). However, there is a limited body of evidence which examines the profile and characteristics of drug drivers, especially in the context of previous crash involvement and traffic history.

The purpose of this study is to examine differences, if any, between the characteristics of drivers/riders testing positive to THC only or ATS (including those testing positive to both THC and ATS). The analysis includes an examination and comparison of licensing, crash and infringement histories across the two drug driving cohorts and a third cohort drawn from a random sample of the general driving/riding population.

Method

Data for detections via the RDT Program were provided by Statistical Services, QPS for the period 1 January 2016 to 31 December 2020.

The drivers/riders with a detection were then categorised into two cohorts:

- THC only
- Amphetamine type stimulant (methamphetamine, MDMA, or combination), including those that also tested positive to THC in combination with an ATS

A third cohort of drivers/riders representing the general driving/riding population (control cohort) were also selected. These were a random sample (10%) of drivers/riders with a current licence on 1 January 2016 with no drug detections between 1 January 2016 and 31 December 2020.
For these three cohorts, licensing, infringement, and crash histories were extracted for inclusion in the analysis. Chi-square tests and logistic regressions were performed to compare the cohorts.

Results

Results showed that males, those aged 16-39 years, and provisional licence holders were over-represented in both the THC only and ATS cohorts, while motorcycle licence holders were over-represented in the ATS cohort.

Compared to the THC only cohort, the ATS cohort had a higher proportion of those aged 30-49 years, unlicenced, heavy vehicle licence holders, and motorcycle licence holders. However, the ATS cohort had a lower percentage of males, those aged 16-24 years, and provisional licence holders.

After controlling for the characteristic differences between the three cohorts, the THC only cohort had almost 4.1 times the odds of having a previous traffic infringement and 1.9 times the odds of previously being involved in a crash compared to the control cohort. The ATS cohort had 9.8 times the odds of having a previous traffic infringement and 2.7 times the odds of previously being involved in a crash compared to the control cohort.

Conclusion

The findings indicate that the characteristics of those detected for THC only and those detected for ATS are markedly different from the general driving population and also different from each other. It seems that the ATS drivers/riders are the most likely to engage in risky and illegal driving behaviour. However, THC only drivers/riders are still more likely to engage in these behaviours compared to the average Queensland licensed driver/rider.

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Serious road crash injury data linkage in Queensland

Angela Watson[a,b], Gisoo Pishdad[a], Vy Le[a,c], Belinda Holden[a] and Jesani Catchpoole[a,d]

[a]Road Safety Data Bureau, Transport and Main Roads, [b]Queensland University of Technology, [c]Queensland Police Service, [d]Queensland Health

Abstract

The Road Safety Data Bureau (RSDB) is a cross-agency team whose purpose is to facilitate data linkage between agencies and establish a linked database with road crash, hospital admission, emergency department, ambulance, and compulsory insurance claim data to allow for more accurate counting and understanding of serious road crash injuries in Queensland. The RSDB has gained approvals and established processes with custodians and the Queensland Health linkage team for linkage to occur. The linked data being used by the RSDB will inform whole-of-government decision-making and approaches to road safety policy and practice. Progress and preliminary findings of this work will be presented.

Background

The Road Safety Data Bureau (RSDB) is a cross agency, Motor Accident Insurance Commission (MAIC) funded team established in September 2019. The RSDB's purpose is to consolidate, integrate and analyse road crash related data from member agencies to inform whole-of-government decision making and approaches to road safety policy.

The RSDB are currently undertaking the Serious Road Crash Injury project to improve the measurement of non-fatal serious road crash injury in Queensland. By linking Transport and Main Roads (TMR) road crash data with road crash related data from other agencies allows for a more complete understanding of the influences on road crash involvement. Increasing the understanding of contributing factors will help to inform the development of effective, targeted countermeasures as well as assist with identifying potentially opportune times for early intervention.

The aims of this project are to:

- Implement a data linkage process between the Queensland Crash Analytics Reporting System (CARS), the Queensland Hospitals Admitted Patients Data Collection (QHAPDC), Emergency Data Collection (EDC), Cause of Death data (COD), MAIC CTP Personal Injury Register (PIR), and Queensland Ambulance Data (eARF).
- Produce reports relating to serious road crash injury for seven years of linked data (January 2015 to December 2021).

This project will provide data sets to RSDB for two purposes: 1) additional variable fields for those crash-related injuries held within the CARS and 2) all hospitalised land transport injuries (including those not held within CARS). The person linkage between CARS, QHAPDC, EDC, PIR, and eARF are being conducted by the Data Linkage Queensland, Statistical Analysis and Linkage Unit, Queensland Health.

Progress and next steps

Memorandums of Understanding have been established with MAIC, TMR, and Queensland Health to allow data for linkage to be provided. Approvals from custodians and relevant Chief Executives have been provided for all data to be released to RSDB. The RSDB is establishing processes for ongoing annual linkage of serious injury data for reporting, monitoring, and evaluation. The RSDB is currently designing, developing, testing, and implementing a database to hold and securely store the linked data sources. Reports and dashboards are being developed to present serious road crash injury data to key stakeholders.

Conclusion

Data linkage across government agencies will allow better counting of serious injuries, particularly for vulnerable road users such as cyclists and motorcyclists, which are currently under-reported in road crash data. It will also provide an in-depth understanding of injury types as well as confirm hospital admission, all of which will improve modelling and predicting road-related trauma. The linked data being used by the RSDB will inform whole-of-government decision-making and approaches to road safety policy and practice.

An evaluation of the Road Attitudes and Action Program (RAAP)

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Abstract

The Road Attitudes and Action Program (RAAP) is a program run by Queensland Fire and Emergency Services in secondary schools to promote safe road behaviours. An evaluation to assess the extent to which program goals are achieved is being conducted. A pre- and post-online survey was developed to evaluate participants' changes in behavioural intentions and approaches to road safety as a passenger and/or driver. Post-program data (*n* = 273) has been analysed with positive findings concerning intentions not to engage in risky driving behaviours and being willing to speak up to a driver engaging in risky behaviours. Female (56%) participants reported more positively on intentions not to drink and drive, ability to plan ahead, and willingness to speak up to a driver not wearing a seatbelt and/or using a mobile phone while driving. Approximately 75 percent of participants believe they will act on the messages delivered in RAAP.

Background

The Road Attitudes and Action Program (RAAP) reaches approximately 30-45,000 Queensland Year 11 students each year (predominantly pre-learner and learner drivers). RAAP is a Queensland Fire and Emergency Services initiative, and the program is delivered by operational firefighters. The program is a preventative strategy that teaches young people how to make informed decisions regarding driving risk.
RAAP includes:

- Fatal 5,
- ripple effect, and
- strategies to speak up to a driver and to plan ahead.

The in-school presentation generally takes 1.5 hours and the diversity of ways that information is presented ranges from statistics and graphs, pictures and videos, and real-life scenarios.

Method

An evaluation is being conducted on RAAP delivered in Queensland public schools. An 11-item online survey was developed for the evaluation, including questions concerning demographics (age, gender, school level), program specifics (e.g., how willing the young person is to speak up to a driving engaging in a variety of risky behaviours), the firefighter role (e.g., how knowledgeable do you think firefighters are about road safety), driving behaviour intentions and risk perception.

To date, post-program data has been collected over four school terms (Terms 2-4, 2022 and Term 1, 2023). Additionally, pre- and post-program data has been collected during Term 2, 2023 and will be analysed prior to presentation at the conference.

Results

The post-program evaluation included 273 participants (56.0% female; 90.1% Year 11). Participants reported being unlikely to: (1) drive over the speed limit (70.3%), (2) use a mobile phone while driving (83.5%), (3) allow passengers to distract you (75.1%), (4) drive while tired

(73.4%), (5) drive unlicensed (89.4%), and (6) drive after drinking alcohol/using illicit drugs (90%); and (7) likely to wear a seatbelt (93.4%).

Most participants (80-89%) stated they would be willing to speak up when a driver was not wearing a seatbelt, speeding, using a mobile phone, driving while tired, driving unlicensed, or driving after drinking alcohol/using illicit drugs. Respondents reported they were least likely, of all the behaviours, to speak up if a driver was being distracted by passengers (73.8%).

Female participants, compared to males, were more likely to report being unlikely to drive after drinking alcohol, were more likely to believe they would plan ahead more to get places safely, felt more confident about safety decisions as a passenger and future driver, and were more willing to speak up when a driver is not wearing a seatbelt, and when a driver is using a hand-held mobile while driving.

Participants from urban areas were more likely to plan ahead to ensure they had multiple options to get home safely compared to those in regional areas. In regard to making safety decisions as a passenger, those in more rural areas felt more confident compared to participants from urban and regional areas. Urban and Outer Regional participants reported they would be more willing to speak up if a driver was driving after drinking alcohol or driving unlicensed compared with Inner Regional participants.

Around three-quarters of participants (70.6%) reported they are likely to act on the road safety messages from RAAP.

Table 1. Perceived influence of RAAP on future behaviours

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel stronger about making safety decisions as a passenger	3 (1.1%)	4 (1.5%)	20 (7.3%)	57 (20.9%)	137 (50.2%)
I feel stronger about making safety decisions as a driver	0 (0.0%)	2 (0.7%)	21 (7.7%)	53 (19.4%)	145 (53.1%)
I will plan ahead more on how to get places safely	0 (0.0%)	6 (2.2%)	24 (8.8%)	55 (20.1%)	136 (49.8%)
I will plan ahead more on multiple options to get home safely	1 (0.4%)	3 (1.1%)	25 (9.2%)	60 (22.0%)	132 (48.4%)

Conclusions

The evaluation of RAAP is ongoing, with pre- and post-program data being collected in 2023. The information obtained from this evaluation can be used by QFES to optimise the program and contribute to developing safer young drivers.

Acknowledgments

The following QFES personnel have been involved and contributed to the collaboration with CARRS-Q to undertake the evaluation of RAAP: James Haig, Kristyna Dillon, Tom Simpson, Clinton Pilon, Joshua Alpen, Katie Tiddy, Helen Vance.

Addressing the issue of hoon driving behaviours: four case studies

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Abstract

The potential risks to drivers, their passengers, and bystanders due to hooning behaviours are substantial. Communities perceive hooning as threatening, negatively impacting their sense of safety and security. The full extent of the impact is difficult to quantify with many crashes unlikely to be reported. An increase in hooning has been shown to be associated with an increase in hooning-related crashes. A systematic literature review and four consultations with Australian jurisdictions that are addressing hooning were conducted. 36 papers were identified that discussed interventions that address hooning. The literature and consultations identified interventions that included legislation (e.g., vehicle impoundment), enforcement (e.g., targeted large-scale operations), road engineering (e.g., traffic calming), and education and community engagement (e.g., hoon hotlines). Findings from this research identified that coordinated efforts between police, councils and transport departments are more effective than isolated efforts. Moreover, community engagement prior to implementing an intervention is critical to its success.

Background

Hooning is Australian vernacular that defines antisocial driving behaviour including street racing and speed trials, burn outs, donuts, drifting and other skids, and unnecessary speed or acceleration (Leal et al., 2007). Hoon driving behaviours are a perceived threat to communities and have the potential to inflict substantial harm to drivers, their passengers, and bystanders. Regardless that a small number of road crash fatalities and serious injuries are recorded as a result of hoon driving, research has shown that an increase in hooning leads to an increase in hooning-related crashes (Vingilis et al., 2014). It is difficult to substantiate the full extent of this road safety issue given the reluctancy for hoon drivers and bystanders to report crashes. The aim of this study was to explore current and previous interventions that have been implemented to address hoon behaviours, and to determine what has been effective and ineffective in reducing these behaviours.

Method

A systematic literature review was undertaken according to PRISMA guidelines (Moher et al., 2009) examining international and Australian literature. The following search terms were used to capture international studies, “street racing”, “speed racing”, and “drag racing” (general terms applicable to most jurisdictions), “boy racers” and “stunt driving” relevant to New Zealand, the UK and Canada, “Mat rempit” (Malaysian), and “hashiriya” (Japanese). Searches were conducted during July 2022 using databases (Scopus, PsycINFO, Safetylit, TRID) and police, government, and legal websites (specifically for legislation). An initial 1,838 papers were identified with 36 final papers (14 Australian and 22 international studies) included that addressed interventions to reduce hoon behaviours.

The consultations were conducted with four Australian jurisdictions across four states. Jurisdictions were selected to provide a diversity of perspectives on approaches that address hoon behaviours. The interview schedule focused on what interventions had worked and what had not worked, community sentiment, and the outcomes of the initiatives. The project was reviewed and approved by the QUT Human Research Ethics Committee.

Results

Australian and international literature was summarised separately. There were five key findings in the Australian literature:

- vehicle impoundment and forfeiture legislation is perceived to be severe,
- legislation appears to reduce intentions to hoon, but not the behaviours,
- forfeiture legislation encourages police avoidance behaviours,
- legislation deters subsequent, not first, hoon offences, and
- hoon-specific legislation can additionally reduce other traffic offences.

Findings from the consultation included:

- while by-laws can eliminate hoon behaviours, they may just shift the behaviours to neighbouring communities,
- hoon drivers tend to adapt the location and nature of their hoon behaviours in response to legislation and enforcement,
- community engagement enhances support for interventions contributing to better outcomes,
- road engineering success depends on location, community needs, and type of hoon behaviours involved, and
- car enthusiast groups are distinct from hoon drivers and can be a source of information concerning hoon behaviours in the local area.

Conclusions

Further research is recommended since there was limited Australian literature that examined hoon driving interventions. It is important to consider sustainable and cost-effective solutions. Enforcement can be costly over time and engineering efforts such as skid-resistant road treatments are expensive and may shift and not deter or prevent hoon behaviours. However, the likely cost-effectiveness of hoon-related interventions is likely to be enhanced if they have additional positive impacts on road safety.

Acknowledgements

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Driving instructor accreditation, learner driver training and young driver crashes

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Abstract

Young drivers are overrepresented in road trauma with the most at-risk phase within the first year of driving independently. Research shows learner driver training is delivered ad-hoc and inconsistently between driving instructors, with supervision often provided by parents who are mostly inexperienced trainers. There are minimal requirements for driving instructor accreditation in Australia, with accreditation training reported to vary across registered training organisations. A review of accreditation standards was undertaken across 33 countries and six Australian states with an overarching aim to develop minimum standards for instructor accreditation requirements that will influence minimum standards for learner driver training. Information extracted included requirements for driving experience, accreditation and ongoing training, and whether professional lessons are mandated. Key findings included recent mandated ongoing instructor training by some countries and a focus on advanced driver assistance systems. This review highlights deficits in Australia's accreditation requirements that impact training standards and potentially young driver safety.

Background

Young novice drivers are overrepresented in road crash fatalities and serious injuries. Given the highest crash risk faced by young people is immediately after independent licensure, learner driver training is a critical element of the young novice driver system that can influence their safety. Research with young learner drivers revealed:

- Young drivers believe they do not have sufficient skills once driving independently.
- It is difficult to find an instructor to teach them more than the road rules.

In observations of young learner driver lessons it was found (Watson-Brown et al., 2020):

- Lessons focus on vehicle control and road rules.
- Higher-order instruction (teaching beyond vehicle control to develop safer drivers) was approximately 15% of lesson content.
- Distraction, and personal and situational risk are areas of training that are lacking.

Interviews with driving instructors informed (Watson-Brown et al., 2021):

- Accreditation training is not current.
- Instructors feel their skills are inadequate and learn on the job (sufficiently skilled at 5 years on the job).
- Standards between instructors are diverse.

Method

A scoping review of 33 countries and six states within Australia was conducted to examine the following key aspects of driving instructor accreditation requirements (Figure 1):

- Minimum age, checks (e.g., criminal, health).
- Driving experience and educational prerequisites.
- Training requirements including length of training, content, and testing requirements.

In addition to these accreditation requirements, information regarding ongoing training requirements such as professional development, ongoing standard or skills checks, mandated professional lessons, and stipulations for lay supervision was also extracted. Searches were conducted between 2022-2023 via government websites and authors' networks. A subset of these results is reported.

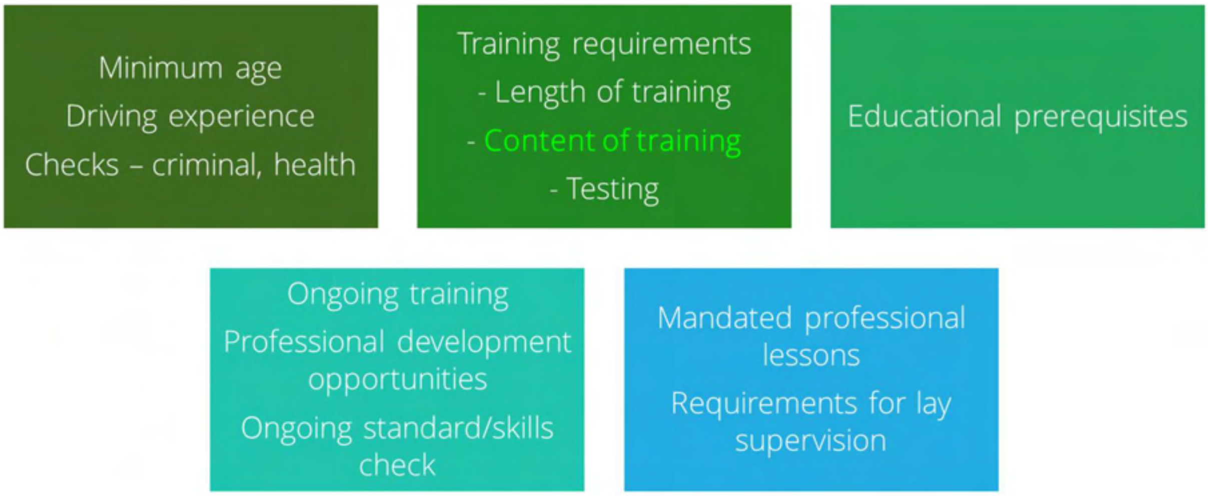

Figure 1. Categories of data extracted from the review on driving instructor accreditation standards

Results

Key findings discussed here include the diversity in length of time to train as an accredited instructor and critical improvements concerning instructor training currently being addressed internationally.

Three key countries (Norway, Austria, Germany) were identified as having high accreditation standards. Instructor training in Norway and Austria is informed by best practice to date, the Goals for Driver Education (GDE; Hatakka et al., 2002). The GDE was developed more than 20 years ago by European road safety and driver training experts and includes competencies and levels of training necessary to develop a safe driver. Norway requires two years full-time study to train as an instructor. However, while this training is 90 percent theoretical, it sets the standard for the theoretical component of training instructors. The minimum required length of training across countries examined was 154 hours in Lithuania. In Queensland, for example, there are no minimum time requirements to complete the Certificate IV required for accreditation and most RTOs advertise completing the course in 4-8 weeks which is the equivalent of 150-300 hours and similar to countries such as Hungary and Lithuania.

Current focus of improvements to driving instruction standards internationally includes training instructors to incorporate advanced driver assistance systems into learner lessons. Additionally, some jurisdictions are considering mandating ongoing training and professional development to maintain accreditation as a driving instructor.

Conclusions

Better standards in Australian driving instructor accreditation requirements have the potential to improve the driver training industry so that substandard trainers cannot compete. There are potential implications for the safety of young drivers via improved and empirically informed training delivered by professional instructors.

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A guide to designing and manufacturing motorcycle protective clothing

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Abstract

Motorcycle protective clothing can reduce the risk of injuries in a crash. However, many products fail to provide the protection expected, while riders commonly choose not to wear protective gear, particularly as a result of thermal discomfort. A Guide for manufacturers was developed to encourage improvements to motorcyclists' protective clothing by supporting the industry with information about design, testing and performance of common materials and construction methods. The challenge for manufacturers is satisfying the protective functions of motorcycle clothing without restricting rider movement, causing fatigue or physiological stress. Aligned with the conference theme, the ultimate goal of the Guide is improving access to better protective clothing and 'safe travel for all' riders. Continued industry engagement and ongoing monitoring of garment performance will be central to the Guide's success.

Background

Effective motorcycle protective clothing can reduce the risk and severity of injuries in a crash (de Rome et al., 2011). In most jurisdictions around the world, however, motorcycle protective clothing is not required to comply with any minimum standards. More than a quarter of garments fail under crash conditions (de Rome et al., 2011). Many garments impose significant thermal strain in summer conditions and may compromise safety through impaired functioning and fatigue (de Rome et al., 2015; de Rome, 2019). Moreover, thermal discomfort leads many riders to choose to ride unprotected.

Ongoing testing conducted by the Motorcycle Clothing Assessment Program (MotoCAP) indicates improvements can be made to the protection and breathability of clothing on the market. There is a need to support industry to produce more effective gear.

Purpose of the project

The purpose of this project was to develop a Guide detailing scientific information on the design and performance of motorcycle protective clothing. The Guide aims to allow manufacturers to choose well-performing specifications without requiring extensive, often cost-prohibitive, research and development. Additionally, the Guide will help to inform importers' of motorcycle clothing in their retail investment decisions. Aligned with the conference theme, the ultimate goal is improving access to better protective clothing and 'safe travel for all' riders.

Development of the Guide

The Guide draws on academic literature, international standards, MotoCAP protocols and the expertise of Deakin University who conduct motorcycle clothing testing for MotoCAP. Guidance is provided for all major elements of design and manufacture including injury protection, thermal management, visibility and conspicuity, construction, sizing and ergonomics, labelling, durability, and advice for international manufacturing.

A key feature of the Guide is a series of test results comparing common materials (e.g. Figure 1), with similar results available for common construction methods and for thermal management. These results are generated following relevant test methods in international standards and to MotoCAP protocols.

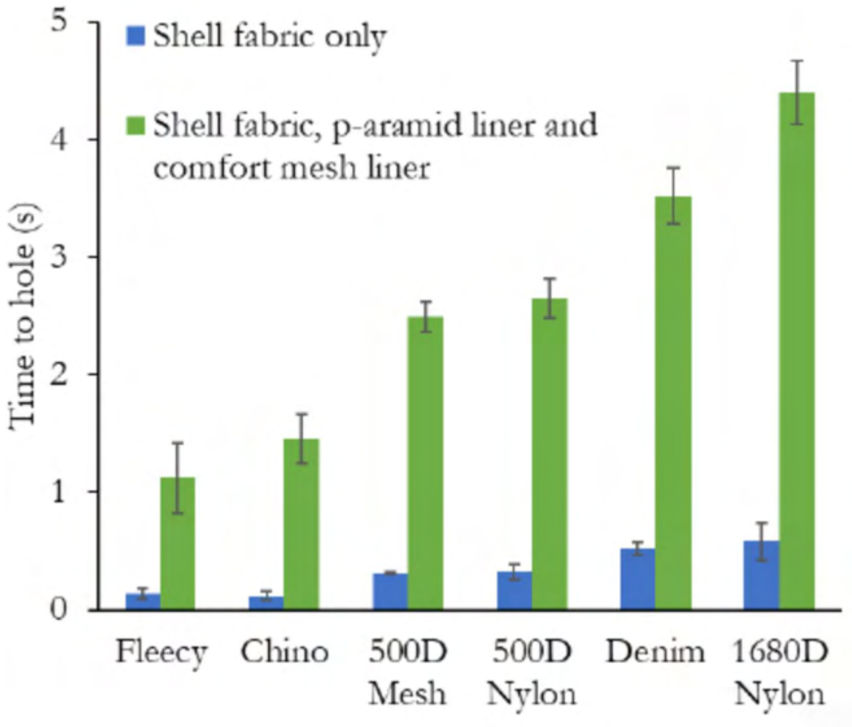

Figure 1. Impact abrasion times for different outer fabrics and double jersey, para-aramid-lined outer fabrics

Local and international motorcycle clothing manufacturers and distributors were consulted at multiple stages during the project, including in identifying challenges and information needs of manufacturers, as well as providing feedback on the final document.

Next Steps

The Guide is a comprehensive resource supporting manufacturers and retailers to supply safer motorcycle clothing to consumers. Continued engagement with industry and promotion of the Guide will be critical to its success. Changes in the performance of motorcycle clothing will be monitored though ongoing testing in the MotoCAP program.

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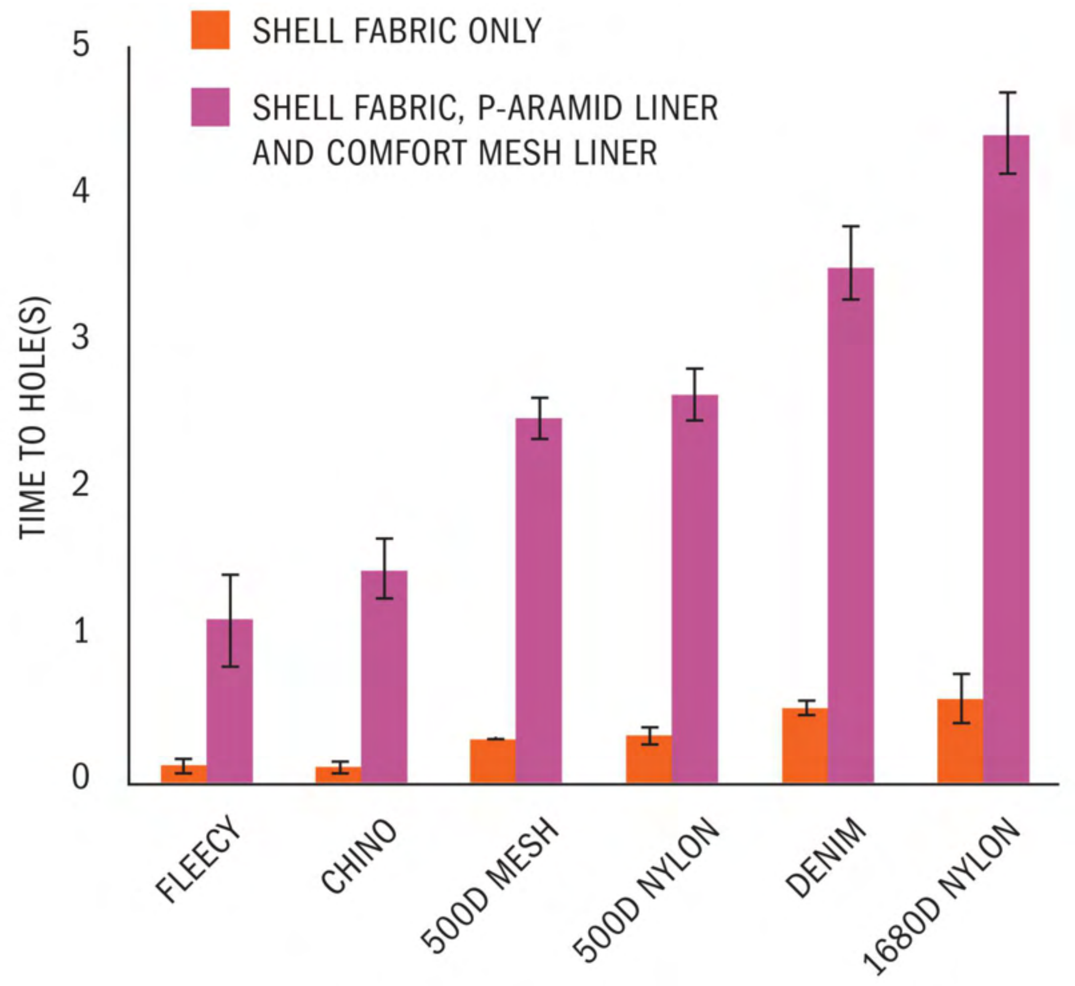

FIG. 1: IMPACT ABRASION TIMES FOR DIFFERENT OUTER FABRICS AND DOUBLE JERSEY, P-ARAMID-LINED OUTER FABRICS.

How to make McLaren Vale Australia's safest wine region

Brett Williams and Morgan Ellingham

The City of Onkaparinga

Abstract

Extending across the southern fringe of metropolitan Adelaide, the City of Onkaparinga hosts a variety of urban and rural environs including the world-renowned McLaren Vale wine region. McLaren Vale's grid-based road network with crossroad junctions provides good accessibility but also increases the potential for crashes and trauma. A series of traumatic crash events prompted council to take action. Our audit, technical analysis and political advocacy resulted in $4.2 million funding from the South Australian government to upgrade safety at 21 intersections. With community expectations, budget and timeframes posing significant challenges, council and the State Government have worked collaboratively to implement a range of lower-cost, proactive road safety upgrades and South Australia's first compact rural roundabout that utilises raised safety platforms. This presentation will highlight how the community, spheres of government and technical experts can work together to deliver safe travel for all and ultimately, meet the Vision Zero target.

Background

McLaren Vale has a history of road trauma, with the cost to upgrade numerous crossroad intersections making mass action difficult. A series of three fatal and serious injury crashes occurring within two months deeply impacted the community, prompting council to consider a different approach.

Road safety issues are ideally addressed through proactive, systemic action that delivers network-wide solutions by considering the major causes of trauma. This approach is challenging for councils who often lack budget and delivery mechanisms to implement mass action, resulting in uncoordinated reactive action such as black spot funding which relies on trauma to become eligible for funding.

In response to community concerns, council took proactive action via an audit, technical analysis, and political advocacy for targeted road safety upgrades of 21 intersections throughout the McLaren Vale wine region, resulting in a successful election pledge of $4.2 million from the South Australian government for a range of upgrades, to be delivered by June 2024.

Purpose

Implementing established infrastructure solutions to improve safety at rural crossroads, such as conventional roundabouts or staggered-T intersections, could take decades to fund and deliver. Our approach recommended lower cost treatments not typically utilised in South Australia, including a compact rural roundabout, a staggered-T intersection with 'teardrop' shaped islands, and a low-cost version of vehicle-activated warning signage.

To identify and implement suitable solutions, we developed a highly collaborative partnership with the Department for Infrastructure and Transport (DIT), who have acknowledged the opportunity to trial and showcase a range of low-cost intersection treatments in South Australia, making McLaren Vale Australia's safest wine region.

Evaluation

Our process to identify and prioritise high-risk intersections considered simple attributes including crash history, traffic volumes and speeds. The funding towards this proactive program is a positive outcome, however we should not rely on the devastating impact of road trauma to prompt action. Councils manage 75.3 percent of Australia's roads by length, totalling 660,597km (Commonwealth of Australia, 2023). Without substantial federal and state support, proactive action could take decades, exposing communities to risk.

If the $110 million annual federal Black Spot funding was distributed on a per-kilometre basis to all councils, this equates to roughly $167/km. Could this approach then lead to funding for more proactive upgrades? Black spot funding still has a role to address critical safety deficiencies, however this approach should also be combined with a balanced program of mass action to reduce the road toll.

Lessons Learned

Waiting for trauma to occur is not sustainable nor acceptable, and for any chance of meeting Vision Zero targets (Commonwealth of Australia, 2021) we must use better decision-making tools. Both national and state road safety strategies acknowledge the need to build road safety capacity and capability in local government.

Next Steps

The collaboration between council & DIT has been an exceptionally positive experience, with all upgrades to be delivered by June 2024. This process could be used as an example of how more state and federal government assistance can be used by local government to implement proactive, prioritised action.

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Understanding the causes of child pedestrian fatalities in Australia

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Abstract

Land transport crashes are the most common cause of death for children aged 0 to 14 years. This project used a previously published system safety approach to investigate interactions between contributing factors associated with fatal crashes involving child pedestrians aged 10 years and under from all jurisdictions in Australia between 2001 to 2019. Coronial cases were coded using a classification system designed for this project. The results showed a range of causal patterns which were influenced by various contributing factors (age of the child, location of the crash, road environment, level of supervision of the child and involvement of safety devices and equipment). The results provide further insights to support the development of evidence-based interventions to reduce child road trauma.

Background

Road traffic crashes are a leading cause of death and serious injury in children, with estimates that across the world, a child is killed on the roads around every four minutes (WHO, 2015). These events cause pain, suffering and grief for families, friends, the driver and any witnesses involved. Child pedestrian fatalities are tragedies that present a significant burden on society in general so there is a strong rationale to prevent them.

Effective road safety programs for preventing road trauma rely on good quality data on road safety risk. Even though most crashes are the result of a combination of factors, most analyses into the causes of road fatalities identify an individual factor which becomes the focus of interventions to reduce fatal crashes. As a result, these analyses fail to show why that factor occurred which will hinder efforts to identify important causal factor/s.

This paper describes results of an analysis of the wider circumstances of fatal pedestrian crashes involving children aged 10 years and under from all jurisdictions of Australia for the period 2001 to 2019 inclusive. This is a major component of a project funded by a Commonwealth Road Safety Innovation Fund grant awarded to the non-for-profit Little Blue Dinosaur Foundation Limited (LBDF).

Method

This study used data from the National Coronial Information System (NCIS) as this includes a record for every unexpected, unnatural, or violent death including road/vehicle-related deaths in Australia and New Zealand. These records contain detail of the circumstances of the death and may include police, autopsy and toxicology reports as well as the Coroners findings. Ethical approval was obtained to access this data from all jurisdictions.

Search terms used for all closed NCIS cases for the period 2001 to 2019 inclusive were:

- *Mechanism of Injury = Blunt force* and *Transport injury event*,
- *Vehicle Mode = Pedestrian,*
- *Age range <= 10 years of age.*

One member of the project team read and extracted information from the electronic coroner's files, coded and classified it using a coding system designed for the project, and then entered it in a de-identified form into a secure electronic database held at UNSW. The extracted database contained information on the casualties, road and environmental conditions, vehicle and crash characteristics and other contributing factors. Check coding was conducted on a random sample of 40 cases by a separate coder.

Results and Conclusions

The final database included 335 child pedestrian fatalities aged 10 years and under. Nearly two-thirds involved males, although the gender difference varied greatly by age and type of crash. Most crashes occurred on roads (43.3%), involved children aged two years and older and males. More than one-third of crashes occurred in driveways (38.5%) and involved children aged one to two years and boys and girls equally. The analysis looked in depth at the circumstances of crashes and showed that they also differed significantly by factors including supervision, road and other environmental factors and safety equipment. The findings suggested more targeted interventions to prevent child pedestrian fatalities in the future.

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Understanding the impact of penalties on illegal mobile phone use

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Abstract

Queensland introduced substantially increased penalties (fine and demerit points) for illegal mobile phone use while driving. The introduction of new technology enforcement cameras then followed. A survey was undertaken at three points in time to understand whether there was a change in the attitudes, behaviours, and/or future intentions of a sample of Queensland drivers to illegal mobile phone use while driving. The results from the surveys show a reduction over time in the proportion of drivers who self-reported using a mobile phone illegally while driving, from 52.3 percent in the initial survey, to 47.6 percent in the third survey. However, the findings also show there remains the opportunity to increase the perception of certainty of detection, and minimise events of non-detection, for those who continue to use a mobile phone illegally while driving.

Background

Driver distraction is one of the 'fatal five' dangerous driving behaviours that contributes to the number of lives lost on Queensland roads every year. Recent changes aimed at reducing driver distraction from illegal mobile phone use while driving included increasing the fine and demerit points for the offence in February 2020, a trial of mobile phone and seatbelt detection cameras from July to December 2020, and the introduction of the cameras for enforcement as of July 2021. In Queensland, it is illegal to hold a mobile phone in your hand or have it resting on any part of your body, such as your lap, when driving, including when stopped in traffic.

Survey of Queensland motorists

A tailored survey of 1000 licensed Queensland motorists was undertaken at three time points. The survey focused on illegal mobile phone use while driving, and included elements of classical deterrence theory (severity, swiftness, certainty), and Stafford and Warr's indirect and direct punishment avoidance. The Time 1 survey was conducted before increased penalties came into effect (November 2019) while the Time 2 survey was undertaken 15 months after the increased penalties were in place (May 2021). The Time 3 survey was undertaken 12 months after issuing of fines and demerit points from mobile phone and seatbelt cameras came into effect (November 2022). Survey respondents were recruited through commercial research panels. Quotas were used to ensure the sample broadly matched by gender, age distribution, and geographic location, the licensed driver population in Queensland. Survey respondents were categorised into two groups (users or non-users) based on responses to eight behaviours focussing on illegal mobile phone use while driving.

Results

At all three data collection times, respondents classified as mobile phone users scored higher on both the direct and indirect punishment avoidance items than non-users. The difference in mean scores was greatest at Time 3 (see Table 1). Mobile phone users also scored lower on the certainty items at all three times compared to non-users, indicating they perceive less certainty of getting caught for using a mobile phone illegally while driving. This difference in means for the certainty items was also greatest at Time 3. There was no similar pattern of responding over the three surveys for the other classical deterrence items (severity, swiftness).

A positive finding at Time 3 was that 73.1 percent of respondents categorised as mobile phone users reported that the introduction of mobile phone and seatbelt detection cameras reduced how often they use a mobile phone illegally while driving.

Table 1. Mean scores of participant responses to the certainty and punishment avoidance items

	Time 1 ***M*** **(SD)**		**Time 2** ***M*** **(SD)**		**Time 3** ***M*** **(SD)**	
Survey item	Users *n*=523	Non-users *n*=477	Users *n*=486	Non-users *n*=514	Users *n*=476	Non-users *n*=524
Indirect punishment avoidance	2.74 (1.40)	1.88 (1.30)	2.44 (1.38)	1.69 (1.13)	3.18 (1.46)	2.09 (1.43)
Direct punishment avoidance	2.15 (1.38)	1.17 (0.70)	2.00 (1.36)	1.29 (0.91)	2.86 (1.55)	1.46 (1.15)
Personal certainty	4.89 (1.19)	5.25 (1.23)	4.82 (1.29)	5.19 (1.30)	4.05 (1.45)	4.70 (1.49)
Subjective certainty	4.30 (1.29)	4.61 (1.37)	4.16 (1.40)	4.54 (1.35)	4.20 (1.39)	4.64 (1.51)

Note: All differences between user and non-user means were significant at 0.001 level (2-tailed) at each data collection time. All items scored on a 6-point Likert scale, with 1 indicating "strongly disagree" and 6 indicating "strongly agree".

Implications

The results have implications for enforcement targeting illegal mobile phone use while driving in Queensland. The results show there is the opportunity to increase perception of certainty of detection for those using a mobile phone illegally while driving. There is also the opportunity to increase the specific deterrent effect on those who continue to use a mobile phone illegally while driving by minimising events of non-detection, as previous studies have found direct punishment avoidance to be a strong predictor of offending behaviour (Szogi et al., 2017).

Acknowledgements

The Authors wish to acknowledge the assistance of the MAIC/UniSC Road Safety Research Collaboration team at the University of the Sunshine Coast in establishing this research project, and particularly with development of the initial survey.

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Cycling under low-light conditions: insights from Australian cyclists

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Abstract

Reduced conspicuity is an important factor contributing to cycling crashes and fatalities at night-time. This online survey explored concerns, attitudes, and behaviours regarding visibility for cyclists who ride under low-light levels. Respondents included 689 cyclists, who reported riding under low-light conditions. Concern about visibility was high and respondents used various strategies to increase their visibility to other road users. Importantly, 21 percent reported that they did not use any form of reflective elements (clothing, accessories and/or bike frame), and this was associated with younger age, male, less cycling experience, and less concern about visibility. Most respondents agreed that visibility is important for their safety when cycling on the road. They agreed that they were visible and easy for motorists to see on roads, yet disagreed that motorists perceive cyclists as highly visible. The findings of this survey highlight the ongoing need to promote effective visibility strategies for cyclists under low-light conditions.

Background

Night-time cycling is dangerous. Despite relatively low night-time cycling exposure, cyclists are 55 percent more likely to be involved in a crash at night than in the day (Johansson et al., 2009), with more severe injuries (Twisk & Reurings, 2013). A key factor in vehicle-cycle crashes is poor cyclist visibility (Lacherez et al., 2013), with drivers often reporting failure to detect cyclists in time to stop (Räsänen & Summala, 1998). This study explored concerns, attitudes, and behaviours regarding visibility for cycling in low-light, to better understand how to support cyclists to optimise their visibility and increase safety.

Method

Data were collected using an anonymous online survey (Qualtrics platform), advertised through cycling forums and social media between August-December, 2021. The survey explored concerns regarding visibility to other road users when cycling in low-light, strategies used to increase visibility, attitudes towards clothing choices, importance of visibility and perceptions of their own visibility to other road users. Demographic information included age, gender, and riding patterns. Statistical analyses included descriptive and logistic regression analyses.

Results

Respondents included 689 cyclists who cycled under low-light conditions. The majority were 45-64 years (60%), identified as male (75%) and cycled in a capital city (73%). 97 percent cycled for leisure/exercise, 72 percent for commuting and 1 percent for work (delivery rider). Over half (55%) cycled <50km/week in low-light.

Overall, respondents reported high levels of concern regarding their night-time visibility to other road users (M=8.7±1.8; 10-point scale, higher values represent more concern). Multiple strategies were reported to increase visibility to other road users, which predominantly involved bike lights (99%) and road position (81%). Use of reflective elements varied, many using some form of reflective clothing (72%), reflective shoes (39%), reflective accessories (wrists/ankle straps) (4%) and/or reflective tape on the bike frame (7%) (Figure 1). Importantly, 21 percent did not use any reflective elements, which was associated with being younger (p=.004), male (p=.016), less cycling experience (p=.033) and less concern about low-light visibility (p<.001). 31 percent of respondents judged reflective strips on moveable joints (wrists, ankles, knees and elbows) as the most effective visibility aid, in agreement with previous studies (Wood et al 2012; Wood et al., 2022). However, 69 percent selected less effective conspicuity strategies: a jacket comprised entirely of reflective material (43%), reflective strips on a fluorescent vest (19%), or a plain fluorescent vest (7%).

Most agreed that visibility is important for safety when cycling on roads (95%) and that they were visible to drivers (81%), however, disagreed that drivers perceive cyclists as highly visible (74%).

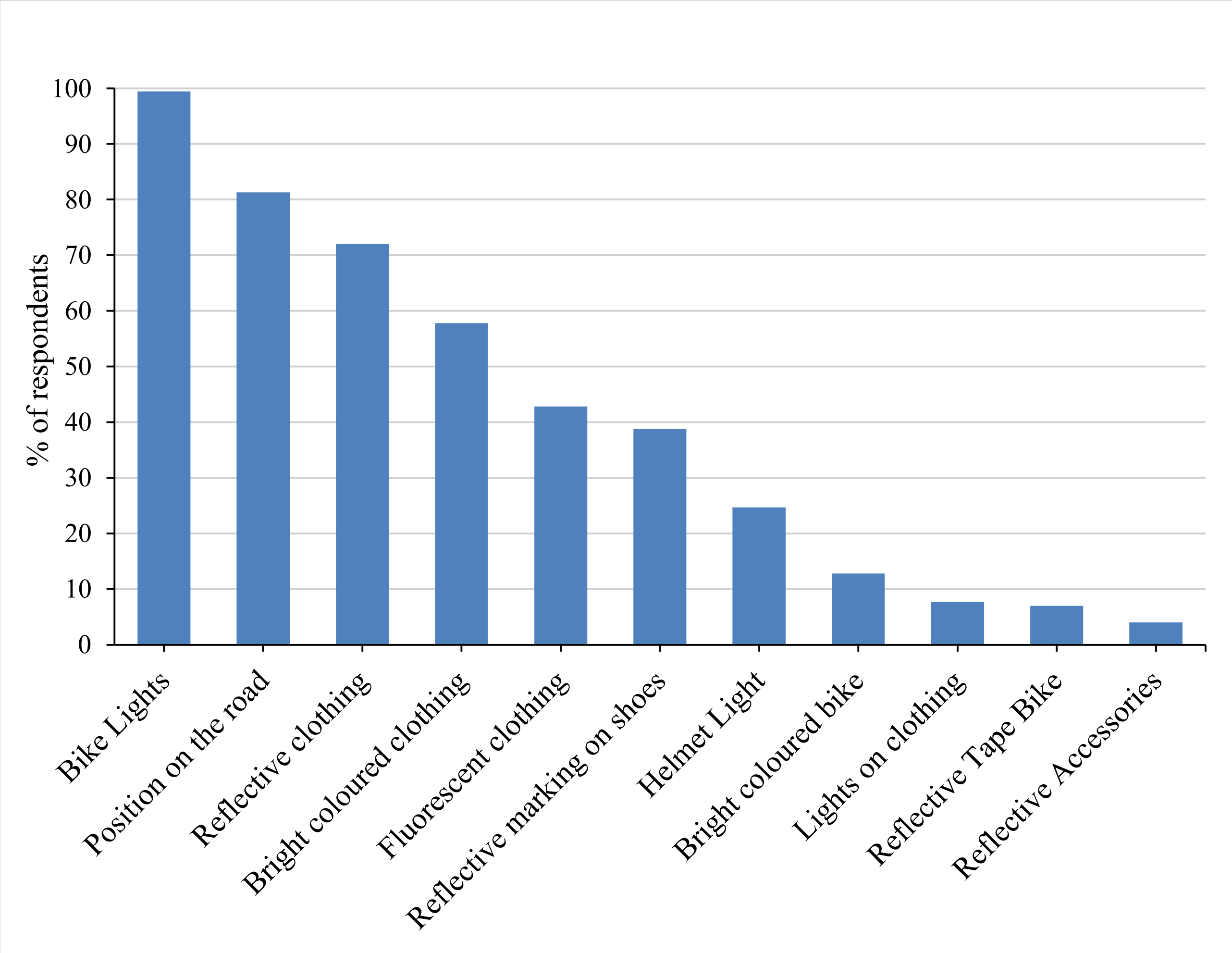

Figure 1. Percentage of respondents who selected various methods to increase their visibility under low-light conditions.

Conclusions

Findings demonstrate that cyclists acknowledge that visibility is important and express concerns about their visibility in low-light. However, their perceptions and behaviours regarding the most effective ways to increase visibility do not always reflect evidence-based conspicuity strategies that include reflective strips on the moveable joints. While the uptake of cyclists wearing reflective clothing in low-light is increased compared to Lacherez et al., (2013), a more systematic approach towards cyclists' education is needed, including awareness of effective placement of reflective material/elements to maximise visibility in low-light.

Acknowledgements

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Exploring older drivers' perceptions of ADAS and AVs

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Abstract

Perceptions of Advanced Driver Assistance Systems (ADAS) and Automated Vehicles (AVs) were explored in two focus group studies of 42 older drivers with and without age-related declines. Study 1 explored perceptions regarding ADAS and AVs, focusing on visual, auditory, physical, and cognitive factors. Study 2 extended this, by additionally exploring perceptions following exposure to videos and static vehicle demonstrations of an ADAS and highly automated (Level 4) AV. Findings highlighted the potential for ADAS and AVs to assist those with age-related declines and the need to increase flexibility of warning system alerts to suit abilities of drivers and reduce the complexity of vehicle interfaces. Participants were also concerned that while AVs would assist older drivers, there was a perceived risk of becoming disengaged from driving and unable to takeback vehicle control. Collectively, findings demonstrated the importance of engaging older drivers with and without age-related declines in designing ADAS and AVs.

Background

Driving is a complex task involving coordination of sensory, cognitive, and physical functions. However, these functions decline with increased age which can negatively impact on driving ability and safety (Anstey et al. 2005). ADAS and AVs have the potential to increase mobility and independence of older drivers (Classen et al., 2019; Rakotonirainy & Steinhardt, 2009), however, there has been limited research assessing perceptions towards these advanced technologies in older drivers, particularly in those with age-related declines. This research explored perceptions towards ADAS and AVs, in older adults with and without age-related declines, with a specific focus on visual, auditory, physical, and cognitive factors.

Methods

Ten focus groups were conducted (five in each study). Study 1 involved 20 participants aged 69 to 85 years (*M*age = 74.7, *SD* = 4.3; 11 males). Study 2 involved an additional 22 participants aged 68 to 84 years (*M*age = 74.3, *SD* = 4.5; 14 males). All participants were licenced drivers, with most reporting driving either 5,000km or less (*n*=14) or between 5,001-10,000km (*n*=17) in a typical year. Participants completed a 30-minute questionnaire which included questions regarding demographic characteristics, vision and eye health, hearing, memory, health and medical conditions, and health status, as well as information regarding their own vehicle and its available technologies, such as ADAS. Study 1 explored initial perceptions regarding benefits and challenges associated with ADAS and AVs, while Study 2 extended this by exposing participants to informative videos and static vehicle demonstrations of an ADAS-equipped vehicle (Level 2) and a highly automated (Level 4) AV. A semi-structured interview guide was used to initiate and guide conversations in the focus group discussions and deductive thematic analysis used for analysis (Braun & Clake, 2006).

Results

Participants had a range of visual, hearing, memory, and health characteristics which impacted on their daily life (Table 1). In both studies, participants reported that ADAS and AVs would assist them to drive as they age and increase their mobility and independence; Table 2 provides examples of participant quotes in relation to visual, auditory, physical, and cognitive factors. In both studies, participants with a vision impairment preferred audio alerts and participants with a hearing impairment preferred visual display alerts. Furthermore, many participants expressed reassurance of the viability of AVs post-exposure to the informative videos and static vehicle demonstrations. Participants also reported that while they believed that AVs would assist older drivers, there was a perceived risk of a driver becoming disengaged from the driving task and therefore, unable to effectively takeback vehicle control.

Table 1. Summary of participants visual, hearing, memory, and health status

		Study 1 ***n (%)***	***Study 2*** ***n (%)***
Vision Status			
Spectacles (or contact lenses) when driving	No	10 (50)	7 (32)
	Yes	10 (50)	15 (68)
Ocular condition(s) (Number)	None	8 (40)	11 (50)
	One	9 (45)	3 (14)
	Two	3 (15)	7 (32)
	Three	0 (0)	1 (5)
Hearing Status			
Hearing aids for driving	No	15 (75)	16 (73)
	Yes - Unilateral	1 (5)	0 (0)
	Yes - Bilateral	4 (20)	6 (27)
Hearing Handicap Inventory (HHIE)*	No handicap	15 (75)	13 (59)
	Mild-moderate Handicap	5 (25)	6 (27)
	Severe Handicap	0 (0)	2 (9)
Memory Status			
Memory Complaint Questionnaire (MAC-Q)	No memory complaint	16 (80)	15 (68)
	Clinically significant memory complaint	4 (20)	7 (32)
Health Status			
Number of Medical Conditions	0	0 (0)	3 (14)
	1-2	8 (40)	7 (32)
	3-4	7 (35)	8 (36)
	5+	5 (25)	4 (18)
Common Medical Conditions	Arthritis	12 (60)	12 (55)
	Hearing	9 (45)	7 (32)
	Vision	9 (45)	9 (40)
	Hypertension	7 (35)	12 (55)

*One participant did not respond to the Hearing Handicap Survey questions

Table 2. Examples of participant quotes

Themes	***Focus group 1***	***Focus group 2***
Visual factors	"With my eyes failing and I'm sort of conscious of the fact that some time or other I've got to give my licence up. But until that point comes, I'd probably be happy with the assistance those things [ADAS] would give me." "I think that it's fantastic to get the warning beforehand because I think as you get older you sort of trying to look at everything that you can look at, but you need to concentrate on your driving and what you're doing."	"I think we all probably have some eye deficiencies... …Shadows are hard to see and things of that nature and more capacity from the automated system to tell you when you're in danger would be a great advantage." "I think that's one of the potential dangers with technology is if you rely completely on technology and don't, in a case like that, turn your head and have a look, then it could be dangerous." "I can't drive at night, I can't drive in the rain, I can't drive at speed because of my eyesight… But you will be able to with all of this [in an AV]… I still wouldn't have the confidence… Because you still need to be able to take over."
Auditory factors	"…I think as you get older it's hard enough as it is without people talking at you. The more things you've got in the car like bells and whistles, it must be harder as you get older, I think"	"My only real concern is that if you've got buzzers going off and flashing lights and you're thinking, "What am I looking at? What am I hearing?"
Physical factors	"I like driving but as I get older, it takes more and more out of me. Takes it out of me physically. But it (sic) but if it wasn't for cruise control it would take more out of me, because once you're on the open road, as you say, one thing you don't have to worry about is the speed. All you got to do is aim it." "Often you get a bit arthritic in the neck or something, and it's sometimes difficult to be turning your head to see if there is a bollard in behind or something."	"People who can hardly walk get in and drive. I think for the elderly, any help we can get, I'm all for it" ".. my interest in things like automated cruise control and automated driving is that I have peripheral neuropathy with my feet. There'll come a time where I can't feel enough to drive." "That would be an advantage. I could get in the car and say "GO," and I don't have to worry about my feet or getting cramps or anything like that."
Cognitive factors	"It's one of the biggest problems us old people is we can get the instruction on a Monday, and we've forgotten most of it by the time we get home in the car."	"I'm a bit overwhelmed by how much technology I would have to learn before I could get in the car to drive it."

Conclusions

In older adults with a range of age-related declines, perceptions of ADAS and AVs were generally positive. Themes emerging from focus groups highlighted the need to increase the flexibility of alert modes for warning systems to suit the varying needs of drivers and to reduce the complexity of vehicle interfaces. Allowing more flexibility would greatly assist drivers with vision, hearing, physical, and/or cognitive impairments, allowing them to maximise the benefits of these vehicles to increase their mobility, independence, and quality of life.

Acknowledgements

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Mobile phone use while driving: application of situational action theory

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Abstract

Mobile phone distracted driving (MPDD) is an ongoing issue for road safety. Earlier research has utilised theories to investigate how risk perception, peers, and environmental factors influence phone use behaviours; however, these studies only explain a limited amount of variance in the offending behaviour. Situational action theory (SAT; Wikström, 2004) is a criminological theory that explains an individual's engagement with criminal behaviours using morality, self-control, situational, and external influences. SAT has been used to explain speeding behaviour but not yet MPDD and could be deemed to have considerable predictive utility. This cross-sectional study used a survey to predict Queensland drivers' phone use intentions while driving with the constructs of SAT. This novel research expects to successfully identify interpersonal and environmental factors that might influence drivers' intentions to engage in illegal mobile phone use while driving. The implication drawn from this research will give a deeper understanding of MPDD.

Background

The illegal use of mobile phones while driving is a significant yet avoidable contributing factor to driver distraction (Budget Direct, 2023). MPDD has shown to double a driver's crash risk, yet drivers still engage in the behaviour despite knowing that it is risky (Dingus et al., 2016). *Situational action theory* (SAT) (Wikström, 2004) is a recent theory in crime which has been used to predict engagement in various criminal behaviours but has yet to be applied to MPDD. SAT (Figure 1) proposes that the intent to engage in crime is the result of the environment and the morals elicited by that environment. Specifically, when an individual perceives crime as a plausible course of action, a person's past offending habits and associated morals influences their intentions for future offending. Rational deliberation is intentional and oriented towards a person's perception of choice, which is contingent upon high or low levels of self-control and deterrence (Wikström, 2004). SAT has shown considerable predictability in an individual's participation in various crimes like white collar crime (Craig, 2019), speeding (Rose, 2022), and shoplifting (Hirtenlehner & Treiber, 2017). Specifically, weak morals have been associated with increased participation and intention in speeding (Rose et al., 2022). Further, peers have shown considerable influence in an individual's propensity for crime which increased with lower morality levels (Chrysoulakis, 2022). As such, it can be suggested that SAT will have predictive utility for MPDD. To fill this research gap, this study intends to investigate how the constructs of SAT can predict an individual's intention to engage in mobile phone offending while driving.

Method and Analysis

This study will be of a cross-sectional design and will aim for a sample size of approximately 500 participants, who are licensed Queensland drivers, aged 18 years and over. A survey will be shared via online recruitment platforms (i.e., Footprints and TakePart). Participants will complete questions relating to their demographic data, including crash history, drivers licence type, driving frequency in hours, previous mobile phone infringements; followed by questions regarding morality, self-control, external factors, and situations in residential/urban, highway, and stopped traffic scenarios. Analysis will comprise of three regressions to understand how the constructs of SAT predict intent to engage in mobile phone use while 1) driving in residential/urban areas, 2) driving on a highway, and 3) stopped in traffic. Data collection will begin in May and the results will be available to report by August 2023.

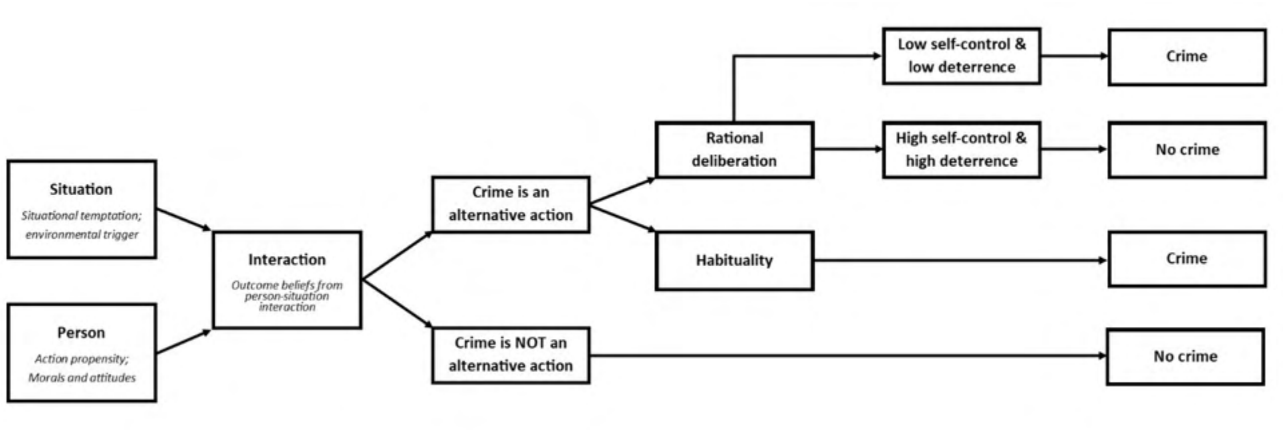

Figure 1. Processes and situational factors in crime causation according to situational action theory
(Source: Wikström, 2004)

Conclusions

The findings from this study will provide a more comprehensive understanding of the factors contributing to the engagement of phone use offending while driving. As such, findings can be used to support future research and develop more effective and specific countermeasures to mobile phone offending while driving.

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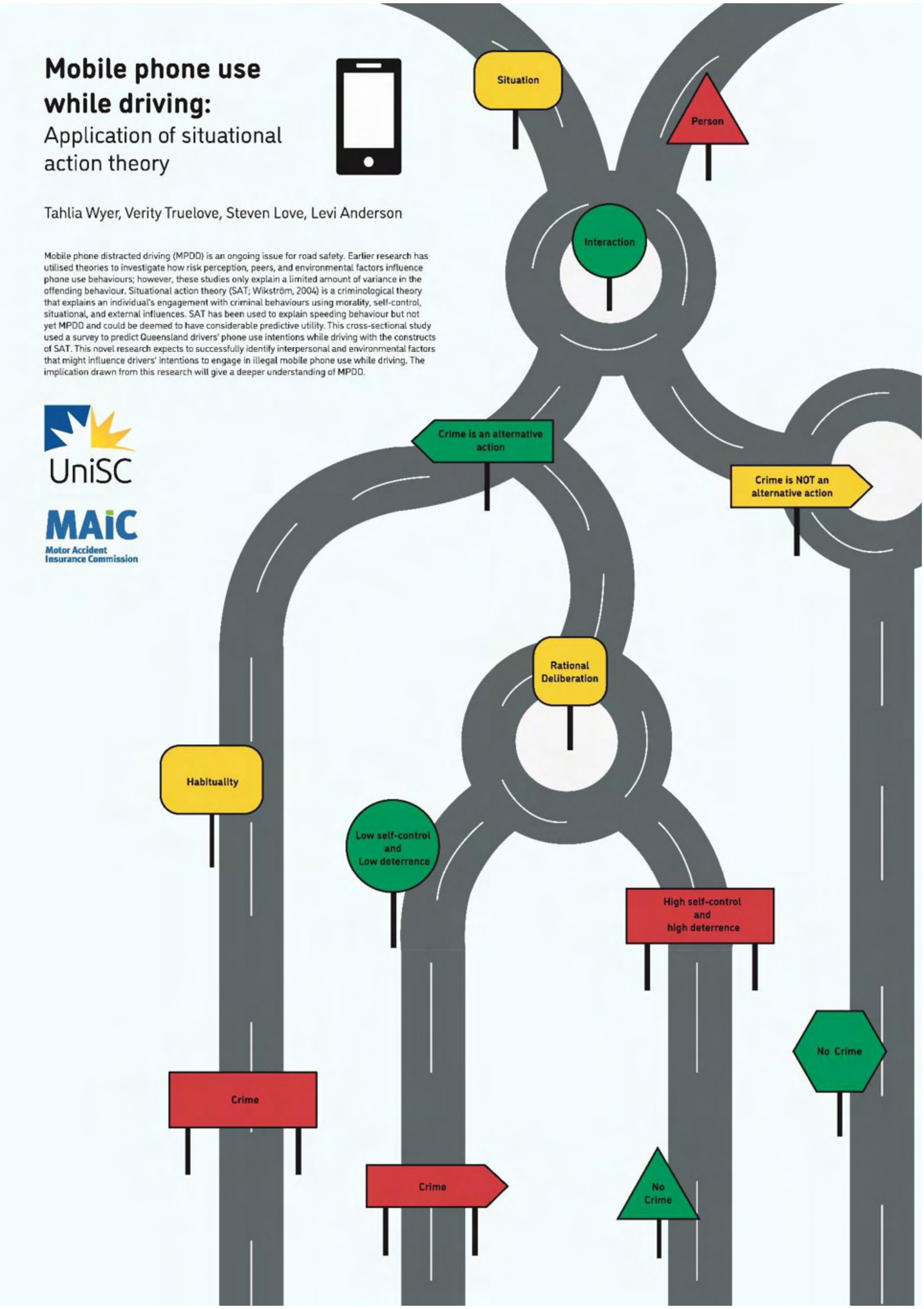
Mobile phone use while driving:
Application of situational action theory
Tahlia Wyer, Verity Truelove, Steven Love, Levi Anderson
Mobile phone distracted driving (MPDD) is an ongoing issue for road safety. Earlier research has utilised theories to investigate how risk perception, peers, and environmental factors influence phone use behaviours; however, these studies only explain a limited amount of variance in the offending behaviour. Situational action theory (SAT; Wikström, 2004) is a criminological theory that explains an individual's engagement with criminal behaviours using morality, self-control, situational, and external influences. SAT has been used to explain speeding behaviour but not yet MPDD and could be deemed to have considerable predictive utility. This cross-sectional study used a survey to predict Queensland drivers' phone use intentions while driving with the constructs of SAT. This novel research expects to successfully identify interpersonal and environmental factors that might influence drivers' intentions to engage in illegal mobile phone use while driving. The implication drawn from this research will give a deeper understanding of MPDD.
UniSC
MAIC
Motor Accident Insurance Commission
Situation
Person
Interaction
Crime is an alternative action
Crime is NOT an alternative action
Rational Deliberation
Habituality
Low self-control and Low deterrence
High self-control and high deterrence
No Crime
Crime
Crime
No Crime

MASH TL4 crash of safety roller barriers: numerical simulation

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Abstract

In this paper, a sophisticated numerical vehicle model was constructed in accordance with the Manual for Assessment of Safety Hardware (MASH) to mimic the crash response of vehicles into an emerging road safety barrier system known as safety roller barrier (SRB). SRB has shown significantly better safety over traditional barriers, such as W-beam barriers, in crash accidents. The geometries of barrier components were recreated and simplified based on real barrier systems that have been installed in several Australian cities. Quasi-statical and dynamic mechanical properties of the constructing materials were experimentally obtained for finite element simulation using ANSYS/LS-DYNA. Toyota Yaris weighing 1100 kg was used in the simulation to assess the crashworthiness of SRB system. The results showed close agreement between simulation results and full-scale MASH TL4 crash test data. The verified vehicle crash model was then used to investigate the influence of geometric parameters such as post spacing and roller height on the safety protection capability of SRB system. The result showed that dynamic and permanent working width slightly increases with the post spacing, and a higher roller height resulted in a higher ridedown acceleration. The study can greatly facilitate the design of the safety roller barrier.

Background

According to the report by World Health Organization (WHO), approximately 1.35 million people die each year globally as a result of road traffic accidents. Especially, road injuries are a leading cause of death for people between the ages of 5 and 29. Road safety barriers are designed to increase safety levels on roads and highways by protecting occupants and vehicles in cases of accidents. They contribute to not only the reduction of casualties but also serious injuries in road accidents (Papadimitriou et al., 2022). However, according to the latest report, it is challenging to achieve the objectives that have been set in Australia’s National Road Safety Strategy 2021-2030 (Infrastructure and Transport Ministers, 2021) and Vision Zero plan, with the fatality rate being far higher than the target and the number of hospitalised injuries increasing (BITRE, 2021). Therefore, it is an opportune time to reconsider conventional barriers such as wire barriers, W-beams, and concrete beams. In the past decade, a new type of barrier system has been emerging, known as safety roller barriers, in which posts covered by polymer foam rollers have been used to absorb shock energy and guide vehicles to slide along guardrails in running-off road accidents (Zahoor & Sharma, 2017). However, scientific research on this type of new barrier is still limited. This paper established a sophisticated numerical model to investigate the safety protection mechanism of the safety roller barrier and the influence of its geometric configurations.

Method and Results

Table 1 lists the components that are ultilised in the finite element model of SRB system. The post cap and rail cover cap were excluded from the model since they are less relevant in vehicle crashes. The ethylene-vinyl acetate (EVA) foam roller is the key component in SRB and was meshed with eight-node reduced integration hexahedral solid elements. Material properties of the roller were obtained from quasi-static and dynamic compressive tests. The posts and rails are made of SS400 steel, and their material properties were obtained from quasi-static and dynamic tensile tests. Shell elements and rigid material were used for the bolts and nuts, while spring elements were used to simulate the connection between the bolt and nut. The spring reflects the stiffness of the bolt, which was determined by the material properties, cross-section areas, and length of the bolt. The soil was meshed with eight-node hexahedral solid elements, and soil properties were obtained from literature (Li et al., 2021).

Figure 1 shows the vehicle crash model that contains both the safety roller barrier and the vehicle. In the simulation, vehicles crash with SRB at a velocity of 97.5 kph and at an angle of 25°. The impact point is located approximately 1.0 meters upstream of the rail joint. The simulation was then validated by the MASH test conducted in Christchurch, New Zealand, in 2012. The simulation results show close agreement with test data in terms of the global deformations and vehicle trajectories. Both the test and simulation showed similar lateral OIV, THIV, dynamic/permanent working widths, exit angle, exit speed, and PHD values. Parametric study revealed that increasing the post spacing resulted in a slight increase in dynamic and permanent working width. However, increasing the roller height led to a much higher lateral RA that exceeded the MASH standard limit.

Table 1. Component list of the safety roller barrier

No.	Component	In simulation
1	Long post	Yes
2	Short post	Yes
3	Inner post	Yes
4	Shock absorbing roller	Yes
5	Safety rail	Yes
6	Long sleeve rail	Yes
7	Short sleeve rail	Yes
8	Stopper board	Yes
9	Long bolt	Yes
10	Short bolt	Yes
11	Post cap	No
12	Rail cover cap	No
13	Pipe	Yes

Figure 1. Finite element model of Toyota Yaris crashing into a segment of safety roller barrier

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Light Insight Trial (LiT): enabling a community through technology

David Young, Helen Reddan, Jake Johnson and Mary Collins[a]

Transport Accident Commission

Abstract

In September 2022 the TAC commenced the Light Insights Trial (LIT) in partnership with See.Sense, Deakin University and the iMOVE CRC. The purpose of the trial was to investigate the benefits of smart bike light technologies considering these as a mechanism for gathering road safety data as well as understanding how effective they are as a tool for engagement with community and key stakeholders.

While the data and insights gathered and analysed was pivotal to the trial a focus on engagement with both participants and advocates for cycling safety was also central to its success. To ensure successful engagement numerous methods were implemented. This well thought out and executed plan led to a successful engagement. This success was shown through high engagement rates with technical webinars and at physical activations, positive sentiment expressed in surveys, low drop off in participants and high open rate for electronic direct mail (eDM) communication.

Background

TAC data shows that a total of 102 cyclists have lost their lives on Victorian roads from 2013 to 2022 with no notable upwards or downwards trend. During the same time very serious injuries, defined by MAIS 3+ injury severity, have shown a steady increase (Figure 1).

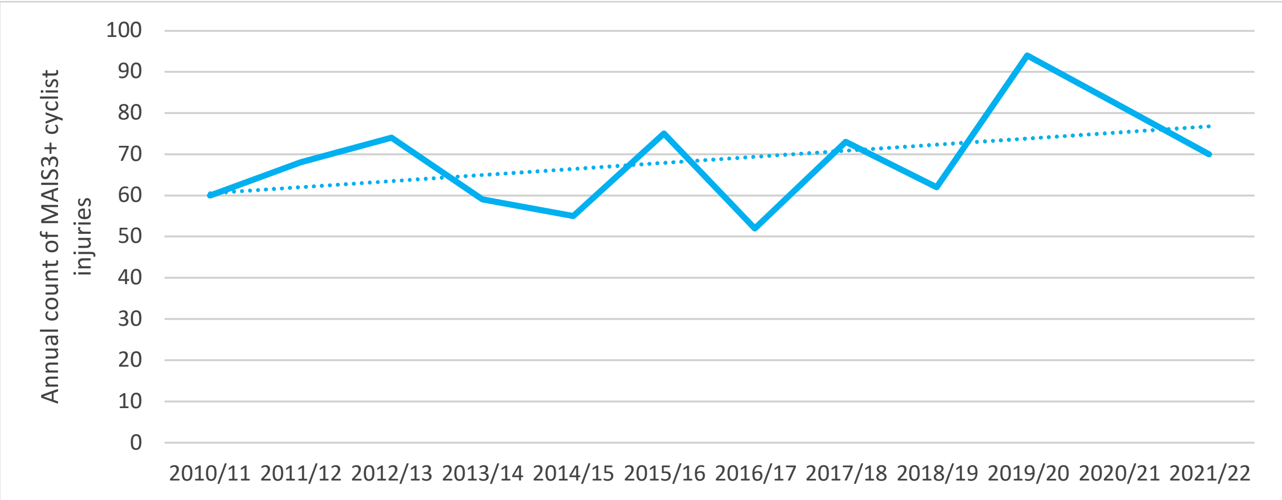

Figure 1. Trends in cyclist MAIS 3+ injuries in Victoria - July 2010 to June 2022

These indicate a need to understand how cycling can be made a safer. The Light Insights Trial (LIT) was launched in September 2022 in response. The trials' objectives were to:

1. investigate the benefits of smart bike light technologies considering these as a mechanism for gathering road safety data, and
2. understand how effective this mechanism of engagement with community and key stakeholders is.

This submission details the trials approach to and assessment of Objective 2.

The Technology

Trial participants were provided with See.Sense's ACE bike light. The light and associated app collect data on acceleration and deceleration, swerving, road surface and speed. In addition to this riders can also provide:

- Ride Surveys (Close pass, Collision, Pothole, Obstruction, Other), and
- Infrastructure requests

Program Logic

Planning for the trial included developing a thorough Program Logic. A program logic maps high priority problems, project inputs, activities, outputs and outcomes (Figure 2). This process identified that the project required a comprehensive and multifaceted approach to engagement.

Next, trial evaluation criteria and key performance indicators were set. Evaluation of the engagement was undertaken by Painted Dog, a qualitative research agency.

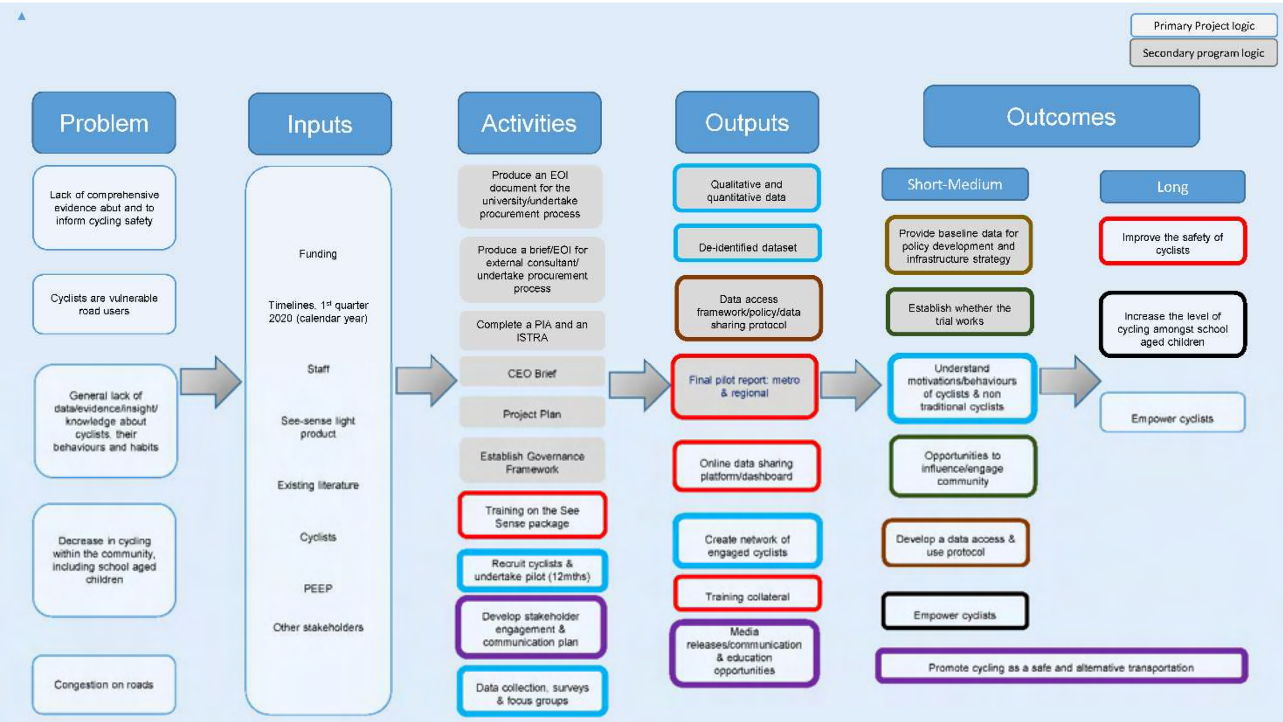

Figure 2. Light Insights Trial Program Logic

Approach to engagement

In parallel to the establishment of the program logic and the monitoring program a detailed stakeholder map was developed. As a part of this process seven main stakeholder groups were identified. These groups were then mapped against a total of 14 engagement methods.

A timeline illustrating selected engagement methods used during the trial is shown in Figure 3.

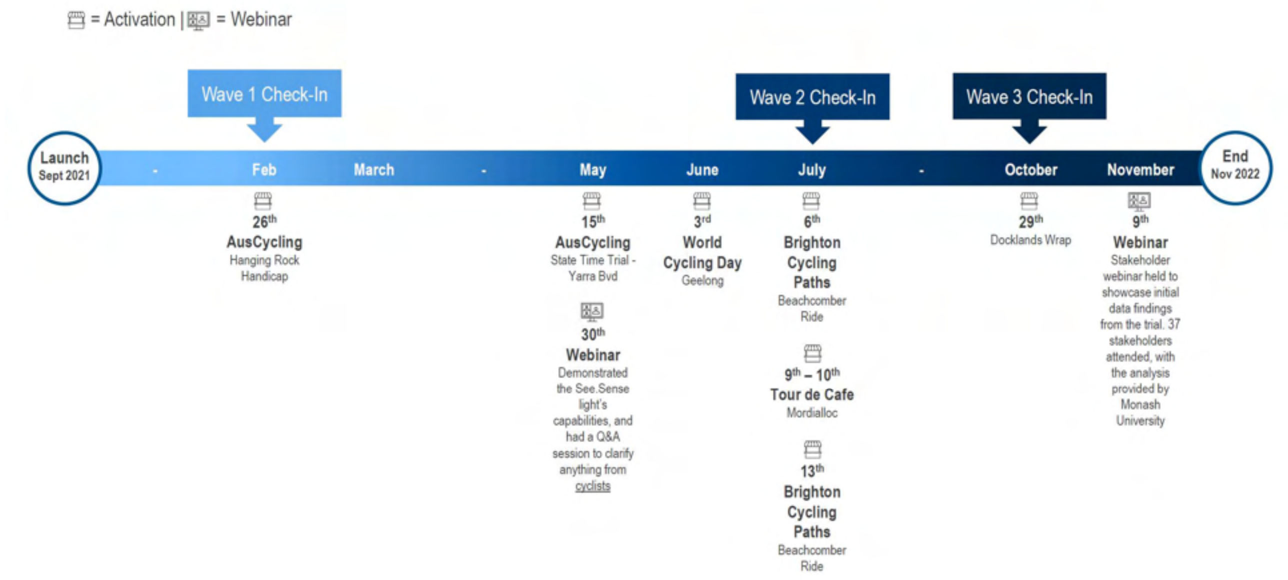

Figure 3. Mapping of a sample of engagement to evaluation activities.

Outcomes of engagement

Figures 4 and 5 below summarise the main results of the trial's engagement. These indicate how the engagement plan enabled groups to develop a deeper understanding and ownership of the project, reflecting the way their participation was able to effect the trial and the potential future for the technology.

The conclusions of the evaluation were:

- Satisfaction remained around 8 in 10 over the 3 waves of interviews.
- Main motivators to join and remain part of the trial throughout was to support safer cycling and to be part of the cycling community.
- 84 percent or participants have expressed interest in remaining part of the trial.

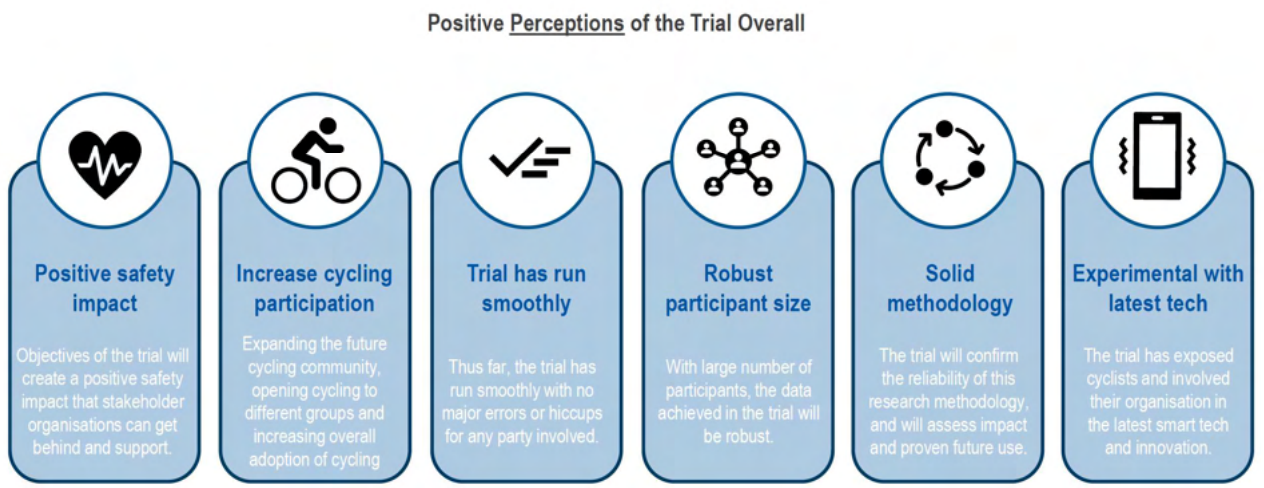

Figure 4. Summary of feedback from trial stakeholders

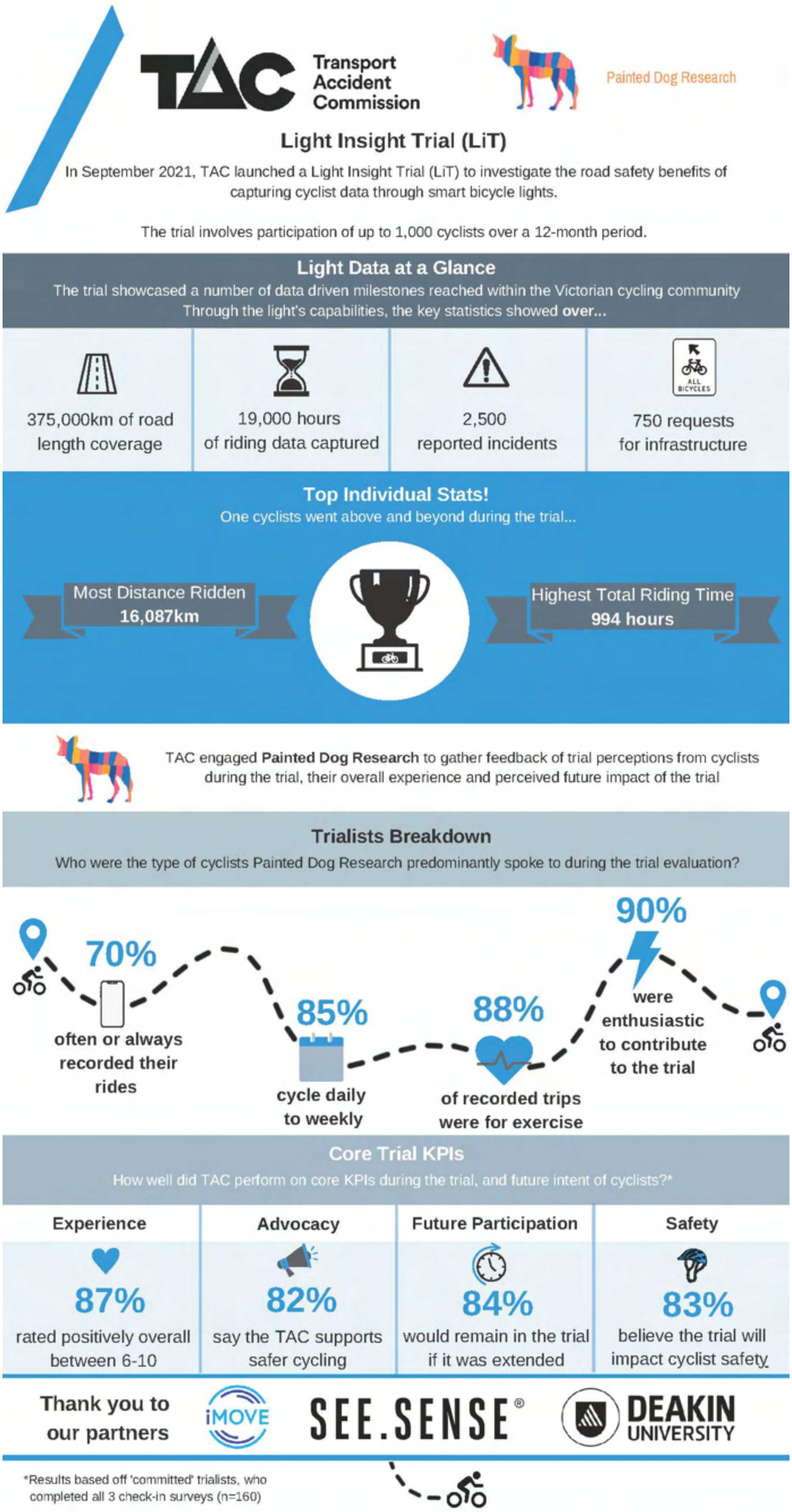

Figure 5. Summary of feedback from trial participants

Acknowledgements

Research was funded by iMOVE CRC, the TAC, and Deakin University, and supported by See.Sense.

The evaluation of the engagement workstream was delivered by Painted Dog while the combined evaluation was delivered by Dr Hafez Alavi from HA Consulting, with the support of Professor Narelle Haworth from QUT.

Remotely piloted aircraft (drones) for safe road bridge inspections

Diana Zagora and Houman Hatamian

Transport for NSW

Abstract

The use of drones in road bridge inspection is an emerging technology with potential to revolutionise the way that road bridge inspections are carried out. This paper explores the advantages of using drones for bridge inspection, including increased safety for bridge inspectors, improved efficiency, and enhanced data collection. Transport for New South Wales (TfNSW) has been at the forefront of exploring the use of drones for bridge inspection, including the testing of various types of drones for different applications, such as confined space and water-resistant drones. TfNSW has taken a proactive approach to scope and develop a standard for the use of drones in the bridge industry. In a separate initiative, drone pilots are being trained to operate these drones safely and effectively. The adoption of drones will lead to improved safety and efficiency in road bridge inspections and maintenance, and efforts in this area demonstrate a commitment to safe and effective use of the technology to improve workplace safety for bridge inspectors.

Background and Purpose of the Project

The use of drones in road bridge inspection has become increasingly popular in recent years internationally. In Australia, TfNSW has also been exploring the use of drones in bridge inspection as a way to enhance the safety (of the asset as well as for bridge inspectors) and effectiveness of its bridge inspection and maintenance programs. This paper outlines the benefits and challenges of using drones in bridge inspection for TfNSW, as well as the road safety benefits in utilising the technology to decrease the risk exposure for bridge engineers and inspectors.

Asset Technology Program

Traditional techniques to assess the condition of infrastructure assets such as bridges, typically involve visual inspection by trained inspectors, combined with relevant decision-making systems. This traditional asset inspection process is labour-intensive, time-consuming, experience-dependent and exposes the asset inspectors to various levels of safety risk, such as working at height, use of scaffold systems, barges and safety in confined spaces. Furthermore, conventional visual inspection requires post processing of the captured images, which is time consuming and in some cases may be subjective.

An Asset Technology Program project was initiated in 2020 to explore improving bridge inspection method by employing remotely piloted aircraft technology including advanced signal/image processing methods and deep learning techniques for developing a drone system backed by an artificial intelligent system for real-time detection of defects (e.g., cracks, corrosion, spalling etc.) in concrete and steel bridges.

The Asset Technology Program also covers development and delivery of training for the use of drones in asset inspections. Inspectors are trained and qualified for the safe use of drones in road bridge inspections. The Remotely Piloted Aircraft Operators certification (ReOC) includes practicing with drones in the field for approximately 150 minutes. There is considerable time benefits of using drones in the field for undertaking bridge inspections.

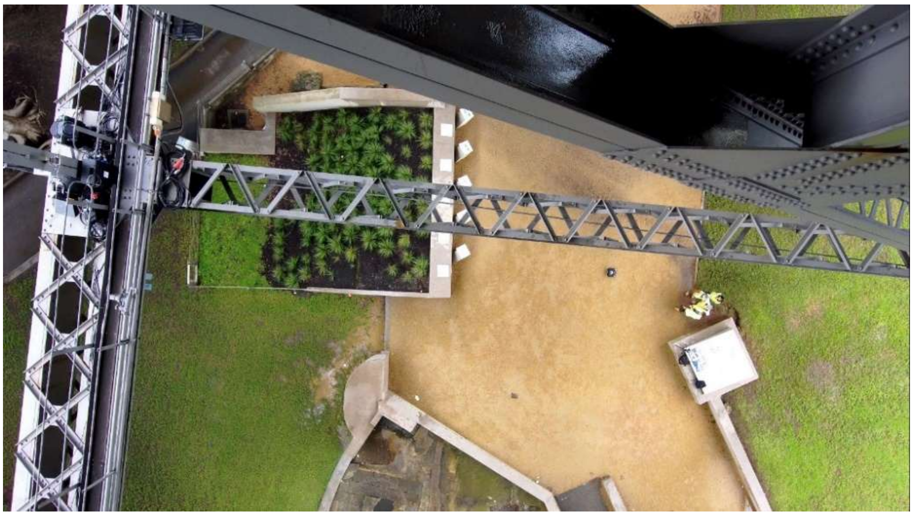

Figure 1. Sydney Harbour Bridge high resolution drone inspection photo

Benefits of Using Drones in Bridge Inspections

There are several benefits of using drones in bridge inspections, as outlined in sub-sections below.

Safety and Accessibility

One of the main advantages of using drones in bridge inspections is that it reduces the need for inspectors to physically access the bridge. This significantly reduces the workplace safety risk that inspectors are exposed to. Specifically, inspectors can operate the drones from a safe location away from roadside hazards, as well as reduced physical risks of injury associated with manual inspections. Drones can also reach areas of the bridge that are difficult or impossible for inspectors to access, such as underside the bridge or at the top of the steel truss/towers, and provide high-resolution images and video footage of the bridge condition.

Improved Efficiency and Cost Savings

Using drones in road bridge inspection also increases the efficiency of the inspection process, allowing inspectors to cover more ground in less time, from a safe vantage point. With drones, inspections can be carried out in timely manner and accurately, reducing the risk of errors or oversights. This allows TfNSW to identify and address potential safety issues with the asset in an appropriate manner, mitigating emerging risks and minimizing disruption to traffic. Traditional bridge inspections are costly and require extensive manpower and resources, with teams of inspectors and engineers required to physically access and inspect the bridge. Using drones can significantly reduce the time and resources required for inspections. These efficiencies also reduce the amount of fatigue experienced by inspectors, reducing overall workplace safety risk.

Conclusions, Implications and Next Steps

For TfNSW, using drones in bridge inspection can significantly improve safety of the asset as well as bridge inspectors by reducing the need for physical access to the bridge, increase efficiency by allowing inspections to be carried out promptly and accurately, and save costs by reducing the time and resources required for inspections. In additional to all of the benefits that can be achieved with this technology, it also improves the workplace safety of bridge inspectors by reducing expose to road side risk, physical risk from conducting manual inspections and fatigue on site.

Comparing sliding window and iRAP methods to identify high-priority road sections

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Abstract

In this article, two methods (one proactive and one reactive method) have been used to identify high-crash and high-risk sections of Neyshabour-Sabzevar road. For this purpose, first based on the recorded 3-year police crash data (2020 to 2022), the high-crash sections of the Neyshabour-Sabzevar road were identified using the sliding window as described in the Highway Safety Manual. Then, using the results of the International Road Assessment Program (iRAP) study conducted by Road Maintenance and Transportation Organization (RMTO) in 2020, the high-risk sections were identified. The results of comparing corresponding sections showed that 62 percent of the identified high-crash sections are compatible with the iRAP one-star high-risk sections.

Background

According to a 2022 report of the Iran Legal Medicine Organization 16,556 people were killed and 317,120 people were injured in traffic crashes in Iran (LMO, 2022). In Khorasan Razavi province, with 8.1 percent of country population, 1,024 deaths (6.2% of the country) and 27,071 injured (8.5% of the country) have been recorded in 2022. Based on the Global Plan for Decade of Action for Road Safety, specific measures in each one of five pillars based on Safe System approach (road safety management, safer roads, safer vehicles, safer road users, post-crash response) have been suggested to be used by world countries. Several interventions have been proposed under safer roads pillar among which the following items emphasize the need to identify high-crash locations in which risk mitigation and crash prevention strategies can be implemented (WHO, 2021)

- Focus on proactive and preventive approach instead of reactive approach
- Identifying crash-prone sections based on crash data analysis
- Periodic assessment of the safety of existing roads to identify high-risk sections
- Conducting road safety audits
- Monitoring and evaluating the impact of implemented road infrastructure safety measures

Method

There are different strategies in identifying road network safety problems, which are generally divided into two categories: proactive and reactive approaches. Risk-based methods such as safety audits and iRAP are in the proactive category, and methods based on crash history, such as black spot management, are in the reactive approach category.

In this article, two methods (one proactive and one reactive method) have been used to identify high-crash and high-risk sections of Neyshabour-Sabzevar road. For this purpose, first based on the recorded 3-year police crash data (2020 to 2022), the high-crash sections of the Neyshabour-Sabzevar road were identified using the sliding window as described in the Highway Safety Manual. Then, using the results of the iRAP study conducted by RMTO in 2022, the high-risk sections were identified.

According to the AASHTO Highway Safety Manual (HSM) definition, a road segment is a part of the road which has a fixed cross section and is defined by two starting and ending points

(AASHTO, 2010). The boundary defining points can be intersections, ramps, changes in cross-section, specific length (kilometres) or features such as the number of lanes, access density, traffic volume, functional speed, roadside land use, road functional category and topographic condition. In the sliding window method, a window with a certain length is moved from the beginning to the end of the section. The selected performance indicator is calculated for each window in different situations. Any window that shows the highest potential for reducing the number/severity of crashes in the entire segment is introduced as a candidate for the high-crash segment. After all the parts are ranked based on the selected indicator, the sections with the highest safety improvement potential are selected for further investigation and intervention selection.

Figure 1. Identifying high-crash sections using sliding window method

In this research, Khorasan Razavi 3-year crash data bank (2020-2022), was used as the basis for identifying high-crash sections. Using the HSM method, after controlling the standard deviation, 300-meter segments with a 100-meter increment were confirmed to identify high-crash segments, and the final segment selection criteria was having three fatal crashes or more in 3 years period.

In the iRAP method, the roads are divided into 100-meter sections and each part is risk rated based on factors such as speed, traffic, the presence of pedestrians, the width and type of shoulder, road land use, longitudinal slope, the condition of the side and middle safety barriers, signs and signals, border obstacles, line markings, the driver's visibility, etc. Then each section is assigned a risk score and then safety stars (from one to five). In fact, iRAP targets infrastructure risk factors that, if removed, the probability of crashes will also decrease. For example, assuming other factors are constant, the probability of crashes occurring on horizontal curves, especially when there are no standard horizontal signs, is certainly higher than the probability of its occurrence on straight roads. Therefore, by mitigating or modifying the existing curve, we expect to observe a reduction in frequency of crashes. However, the intervention may not always affect the number of crashes, but instead it may reduce the severity. For instance, if it is not possible to improve a horizontal curve, it is possible to reduce the kinetic energy by installing appropriate safety barriers. Using the iRAP method to assess the safety of the Neshabur-Sabzevar road showed that 27.6 percent of the road length received one and two safety stars, 46 percent of the length of the road received 5-star and 14.7 percent of the length was related to the parts with three safety stars.

Results

Due to the essential difference between active and reactive methods of High-Crash and High-Risk sections identification, it is not anticipated that their results will align perfectly, but in this research, as a new approach, the percentage of overlapping of the identified sections was compared.

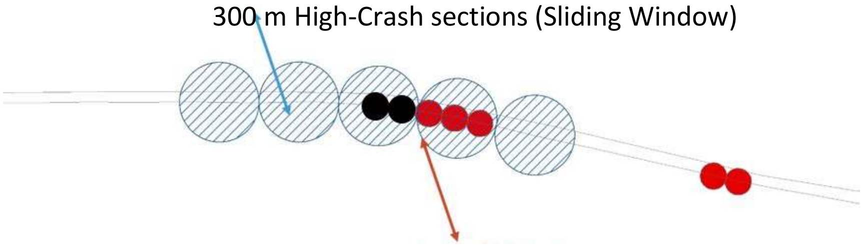

Figure 2. High-Crash and High-Risk sections comparison

After entering the high-crash and high-risk sections coordination in ArcGIS software, the degree of compliance of the 300-meter high-crash sections with the 100-meter high-risk sections (iRAP) was checked. Results showed that 13 out of 21 high-risk sections (62%) corresponded to one-star iRAP sections and 8 sections also matched to 2- and 3-star iRAP sections, which, despite the difference in the identification method, shows the relatively high overlapping ratio and can indicate the acceptable accuracy of the sliding window method in identifying high-crash sections.

Table 1. No of high-crash sections regarding the corresponding iRAP safety stars

No. of identified high-crash sections	1-star	2-star	3-star	4-star	5-star
21	13	4	4	0	0

After prioritizing the sections, strategic planning to improve the selected road safety was started. To achieve the goal of 10 percent reduction in fatalities and serious injuries per year (as defined in the Iran comprehensive development strategic plan), the list of actions based on the dominant crash types (run off the road) was prepared. Then crash modification factors were used to prioritize measures and allocate budgets and a task force formed with all related stakeholders..

Conclusion

In this study, we compared the sliding window (reactive) and iRAP (proactive) methods for identifying high-priority road sections for safety improvements. Despite the uncommon nature of this comparison, we aimed to assess the reliability of risk assessment methods like iRAP when precise crash data is unavailable. Our findings indicate that 81 percent of the high-crash sections identified by the sliding window method align with the iRAP one and two-star high-risk sections. This suggests that iRAP can effectively predict high-priority road sections, even in the absence of quality crash data. Overall, our study highlights the value of proactive methods like iRAP in selecting high-crash road sections correctly, demonstrating their potential as a reliable tool for prioritizing safety improvements when precise crash data is lacking.

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Influence of non-driving activities on post-takeover driving performance

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Abstract

In conditionally automated vehicles, drivers are required to respond to takeover requests (TORs) and resume manual driving in circumstances where the automated driving systems are ineffective. Driving performance after the TOR may require time to return to normal. This study investigated the influences of non-driving related tasks (NDRTs) on driving performance after TORs. Main findings include:

1. NRDTs as brief as five minutes can impair driving performance following a takeover.
2. Participation in resting, entertaining or working NRDTs can significantly impair driving performance.
3. Approximately 25% of participants display strongly impaired driving for more than 5 minutes after a manual takeover, and they stray out of the lane for more than 10 seconds per minute.
4. The likelihood of unsafe driving after a TOR can be predicted from normal manual driving performance.
5. Participants are unaware of their degraded driving performance during the takeover period.

Background

Conditional automation requires drivers to occasionally resume manual operation of the vehicle when a situation arises that the advanced driver-assistance system (ADAS) cannot safely handle. Even if drivers can successfully resume manual operation of the vehicle, their driving performance in the period immediately after the TOR transition (post-automation) may require additional time to adjust to driving normally (U.S. Committee on Commerce, 2016; Casner et al., 2016; Lu et al., 2017). The present study has examined the influence of NDRTs of differing mental intensity on simulated highway driving following a TOR.

Method

17 RMIT University students (15 males and 2 females, mean age ± Standard Deviation (SD): 24.8 ± 1.7 years; mean years of holding a driver's license ± SD: 6.2 ± 2.2 years) voluntarily participated in this driving simulator study. The scenario is a two-lane straight highway with only the driver's vehicle driving on it. The NDRTs consist of: i) a working condition; ii) an entertaining condition; and iii) a resting condition. The durations of NDRT engagement are either 5 minutes (short duration) or 30 minutes (long duration). It is assumed that the lane-detection sensors of the driver's vehicle have failed, requiring the driver to resume manual operation of the vehicle. They are given 10 seconds of transition time (TOR lead time) to switch from whatever NDRT they are engaging in, to manually controlling the vehicle using the steering wheel and maintaining the vehicle within the lane at 110 km/h for 5 minutes until the end of the experiment. Two types of data were collected: 1) driving behaviour; 2) subjective assessment of mental demand using the NASA-TLX questionnaire.

Results

Resting negatively affected driving performance more than entertaining, while working had the least effect. Nonetheless, all three conditions were associated with significantly impaired performance, even after just 5 minutes of engagement in these tasks.

Driving performance following a TOR was heterogeneous. Roughly 25 percent of drivers were able to take manual control following a TOR and drive normally from the outset, regardless of the type or duration of the NDRT. A further 50 percent of drivers showed a mild yet significant decrement in driving following a TOR, which persisted for 5 minutes. The remaining 25 percent of drivers displayed severely impaired driving throughout the 5 minutes post-automation.

Participants reported that taking manual control of the vehicle after a period of engagement in a NDRT imposed a substantial mental demand. The 30 minutes working condition was perceived to be the most difficult condition and received the highest scores for mental demand and frustration, and was the only condition where drivers perceived that their driving performance had been affected. Drivers were unaware that their performance had deteriorated following each of the other 5 NDRTs.

Conclusions

The present study found that manual takeovers following a TOR are associated with poorer driving control and an increased risk of straying out of the lane for at least 5 minutes after the takeover. These results have important implications for the design and safety of autonomous vehicles.

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