Proceedings of the 2018 Australasian Road Safety Conference

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Preface

We are pleased to welcome you to the fourth annual Australasian Road Safety Conference, an amalgamation of the Road Safety Research, Policing and Education Conference and the Australasian College of Road Safety Conference. The conference provides the unique opportunity for those involved in all aspects of road safety, including researchers, practitioners, policymakers, police, and educators, to meet, present, and discuss their work.

These proceedings describe research, educational and policing program implementation and policy and management strategies related to all aspects of road safety and especially related to the conference theme of 'Towards Zero – Making it Happen!'. Some of the popular topic areas for this year include young and ageing drivers; vulnerable road users; human factors related to distraction, inattention, and fatigue; policing, vehicle safety technology; and road design. The 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. This great set of papers is a wonderful indication of the work being done in Australia, New Zealand and abroad as part of the United Nations Decade of Action for Road Safety.

The Conference Organising Committee allowed two manuscript types for the conference: 'Extended Abstracts' and peer-reviewed 'Full Papers'. Using a similar format to the previous successful conference in 2017, the Conference Scientific sub-Committee initially called for submissions in the form of Extended Abstracts (approx. 1 to 3 pages). Groups of submissions around similar themes were assigned to Conference Handling Editors with senior peer status in the respective field of road safety, who then handled the review process for their assigned submissions. 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. 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 were provided the opportunity to extend their submission into a full paper which subsequently underwent further review by three independent peer reviewers for inclusion into the Journal of the Australasian College of Road Safety. A total of 186 manuscripts were accepted as Extended Abstracts and further 28 submissions were further reviewed as Full Papers.

Putting together such a high-quality program requires a contribution from many people. We would like to thank the Conference Handling Editors for taking the time to handle submissions, allocate appropriate reviewers, and provide useful and constructive feedback to authors. Likewise, we are most grateful for those peers in the road safety field that helped to review a total of 270 submissions. The calibre of the conference proceedings would not be so high without their assistance and we thank them all for giving up their valuable time. We would also like to warmly thank all the keynote speakers, symposium organisers and presenters, the Conference Organising Committee, the Scientific sub-Committee, the International sub-Committee, the Social Activity sub- Committee, conference sponsors, and the session Chairs. The valuable input and enthusiasm from each person and group has helped to ensure the 2018 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 hope that the work described in these proceedings will contribute to the reduction in road trauma in Australia, New Zealand and internationally.

* https://www.education.gov.au/higher-education-research-data-collection

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ARSC2018 Preliminary Conference Program

	Tuesday 2 October 2018 - Conference Pre-Day
12.00pm	**Registration Opens**
1.00pm - 5.00pm	**Pre-Conference Meetings/Events (Invitation Only)** 1. Early Career Professionals Event 2.00pm -5.00pm - Open to all Road Safety Professionals within their first 8 years of professional work (Sponsor: ACT Government) - Room E3.7 2. Senior Policing/Enforcement Meeting - Room E3.2 3. Road Safety Educators Meeting - RSERGA - Room E3.3 4. Austroads Safety Task Force Meeting (9.00am to 5.00pm) - Room E3.4 5. Heads of Workplace Safety Authorities (HWSA) Meeting (1.00pm - 4.00pm) - Room E3.5 6. Australian Naturalistic Driver Study (ANDS) Meeting - Room E3.6 **Technical Tour - CrashLab, Huntingwood (delegates must have pre-registered)**
5.00pm - 6.00pm	**Pre-Conference Networking Function - FOR ALL CONFERENCE DELEGATES - The Gallery**
	Wednesday 3 October 2018
7.30am	**Registration Opens**
7.30am - 8.30am	**Arrival Tea & Coffee & Exhibition Open**
8.30am - 10.30am	***Conference Opening Plenary - Pyrmont Theatre*** ***MC - Dr Marilyn Johnson, co-Vice President ACRS*** Welcome to Country: Aunty Ann Weldon, Metropolitan Local Aboriginal Land Council **Official Opening and Welcome** Mr David McTiernan and A/Prof Teresa Senserrick, Co-Chairs ARSC2018 Mr Lauchlan McIntosh AM, President, Australasian College of Road Safety Mr Nick Koukoulas, Chief Executive Officer, Austroads Mr Kevin Anderson MP, Member for Tamworth & Parliamentary Secretary for Regional Roads, Maritime and Transport Hon. Michelle Roberts MP, WA Minister for Roads Safety & Police (includes links to ARSC2017 outcomes) *Sponsored by Department of Infrastructure, Regional Development and Cities* **Guest Speakers** Hon. Dr. T. Bella Dinh-Zarr, NTSB Mr Llew O'Brien MP, Federal Member for Wide Bay
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays - The Gallery**
11.00am - 12.30pm	***Plenary 2 - Where Does Road Safety Strategy/Planning and Action Need to Go? - Pyrmont Theatre*** ***MC - Mr Lauchlan McIntosh AM, President, Australasian College of Road Safety*** Mr David Bobbermen - NRSS Action Plan 2018-2020 + NRSS Strategy forward planning 2021+ A/Prof Jeremy Woolley, CASR - National Review Mr Bernard Carlon, Transport for NSW - Road Safety Plan 2021 Panel Session: Plenary Speakers & Hon. Dr. T. Bella Dinh-Zarr, NTSB
12.30pm - 1.30pm	**Lunch, Exhibition & Poster Presentation Session - The Gallery**

1.30pm - 3.10pm	**Concurrent Sessions 1 - Wednesday**							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*Jason Thompson*	*David McTiernan & Mick Savage*	*Ioni Lewis*	*Teresa Senserrick*	*Stuart Newstead*	*Matthew Baldock & Sarah Dalton*	*Mark King*	*Darren Neagle*
	SYMPOSIUM 1	**Local Government Road Safety**	**Road Safety Communication**	**SYMPOSIUM 2**	**Emerging Methods for Infrastructure Programming**	**Safe Passing Distance**	**SYMPOSIUM 3**	**WORKSHOP**
1.30pm - 1.50pm	New Research Applications for Tackling Complex Road Safety Issues A Complex Systems Ergonomics Approach to Road Safety: Using STAMP, Cognitive Work Analysis, and Systems Dynamics to Understand and Prevent Road Trauma Paul Salmon *University of the Sunshine Coast* Cognitive Work Analysis to Identify Potential Risks from the Introduction of Advanced Autonomous Vehicles Gemma Read *University of the Sunshine Coast* The Utilisation of Agent-Based Models (ABMs) for Understanding Mechanisms Contributing to Vulnerable Road User Safety Jason Thompson *University of Melbourne* Action Recognition to Prevent Fatigue-Related Road Trauma using Artificial Intelligence Jasper Wijnands *University of Melbourne* Explaining Recent Inflections in the Australian Road Toll Rod McClure *University of New England*	Delivering Safe System Outcomes in Mildura Lisa Steinmetz *ARRB*	Saving Lives on Country Roads Campaign: Helping Achieve the Towards Zero Target in Regional NSW Ruth Graham *Transport for NSW*	Motorcycle Safety Awareness Month LAUNCH – Motorcycle Awareness Month *Steve Pearce on behalf of the Motorcycle Council of NSW* Claire Murdoch *Transport for NSW* Emerging Research Gray Knight *Transport and Road Safety Research Centre, The University of New South Wales* Holger Moeller *The George Institute for Global Health, UNSW Sydney* Liz de Rome *Institute for Frontier Materials, GTP Research, Deakin University* Developing the Motorcycle Clothing Assessment Program David Beck *Transport for NSW*	Automated Safety Evaluation of Intersections using Advanced Video Recognition Technology Md Mazharul Haque *Queensland University of Technology*	Understanding Lane Encroachment using a LIDAR Measurement Device Chris Stokes *University of Adelaide*	Enhancing Enforcement of Road Safety Regulations in Low- and Middle-Income Countries Introduction and Overview of the Dimensions of Enforcement Capacity (Star Rating) Ray Shuey *Strategic Safety Solutions* "No Helmet-No Petrol" - Making Compulsory Wearing of Helmets by Motorcycle Riders Srinivas Puppala *Transport Dept, Hyderabad, Telangana, India* Role of Enforcement Agency in Implementing Helmet Laws in Rajasthan Srinivas Rao *Police Dept, Jaipur, Rajasthan, India* Police Countermeasures in the Enforcement of Alcohol Impaired Driving Visal They *Cambodian National Police, Phnom Penh* Helmet Wearing Awareness and Enforcement Campaign in Lao PDR Sangkhom Phommarath *Vientiane Traffic Police, Lao* Panel Discussion	Road Safety Educators Towards Zero: A Whole of Community Approach to Road Safety Education Darren Neagle *Transport for NSW* Road safety education is a crucial element of the Safe System. Road safety needs to be visible well beyond the curriculum, as children, young people and their families travel on the network everyday. Early childhood services, schools, families and local communities can sustain positive, reciprocal interactions beyond the classroom to support the road safety education of children and young people.
1.50pm - 2.10pm		Road Safety – Is It a Local Government Priority? (What Does the Experience Suggest?) David McTiernan *ARRB*	#BagAPhoneNotABody: A Low Cost and High Reach Social Media Campaign Joel Tucker *RACQ*		Application of Macroscopic Safety Models for Hot Zone Identification Richard Amoh-Gyimah *Main Roads Western Australia*	Regulating Safe Driving Behaviour Passing Stationary Emergency and Enforcement Vehicles with Flashing Warning Lights Christopher Poulter *VicRoads*		
2.10pm - 2.30pm		Crash Data - When it's Wrong, are we Putting More Lives at Risk? Graham Orr *Port Stephens Council*	One-Way to Two-Way: Facilitating Road Safety Conversations on Social Media Dushyant Sharma *Transport for NSW*		Using Lidar Data to Enrich the Diagnosis of Safety Problems and Collision Causes Gerry Shimko *City of Edmonton*	How Well can Drivers Judge the Distance when Passing Bicycles? Narelle Haworth *CARRS-Q*		
2.30pm - 2.50pm		Exploring Local Government Challenges in Effective Road Safety Delivery Paul Durdin *Abley Transportation Consultants*	Exploring the Effectiveness of Different Types of Humour in Road Safety Advertising Campaigns Ioni Lewis *QUT*		Black Spots and Telematics: The Link between Driver Behaviour Data, Road Safety, and the Black Spot Program Jerome Carslake *ARRB*	Findings from the Evaluation of the NSW Minimum Passing Distance Trial Lucy Filardo *Transport for NSW* Narelle Haworth *CARRS-Q*		
2.50pm - 3.10pm		Horns and Hooves on the Highway - A Collaborative Approach to Road Safety Encourages Local and Regional Involvement Greg Hayes *WALGA RoadWise*	Thanks for the Meme-ories. Better Driver Behaviour, One Laugh at a Time Sonia Roberts *NSW Police Force*		Application of Machine Learning to Severe Injury Prediction in Rural Run-off-road Crashes Chris Jurewicz *ARRB*	How Much Space to Vehicles Provide when Passing Cyclists? The Impact of Vehicle Type and Road Infrastructure Ben Beck *Monash University*		
3.10pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays - The Gallery**							

3.30pm - 5.10pm	Concurrent Sessions 2 - Wednesday							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*David McTiernan*	*Rebecca Brookland*	*Marilyn Di Stefano*	*Gray Knight & Duncan Mcrae*	*Kathryn Collier & Peter Palamara*	*Ben Beck*	*Lori Mooren*	*Darren Neagle*
	SYMPOSIUM 4	**Driver Behaviour: New Insights into Fatigue and Distraction**	**Inclusiveness and Driving**	**Motorcycle Safety**	**Novice Drivers: Training Programs**	**Infrastructure Programs and Evaluation**	**Road Safety in LMIC**	**Road Safety Education in Schools**
3.30pm - 3.50pm	Debate: A Systems Approach to Road Safety: A Step Change for Road Safety? Blair Turner *Australian Road Research Board* Paul Roberts *Australian Road Research Board* Brett Hughes *Department of Transport* Johan Strandroth *VicRoads*	Assessing the Combined Effects of Task Factors and Sleep Need on Driving Rainer Zeller *UNSW Sydney*	Exploring User Centred Design Processes to Develop Ideas for Greater Social Responsibility Towards Fitness to Drive Simone Steel *VicRoads*	Further Research on Attachments Mounted on an Approved Motorcycle Helmet: Do they Increase Injury Risk? Dan Leavy *Transport for NSW*	Technology and Driver Education for Indigenous Australians Alana Hawkins *Queensland University of Technology*	Beyond BCR: Ensuring Return on Investment while Strategically Delivering Safe System Outcomes Bruce F Corben *Corben Consulting* Shaun Luzan *VicRoads*	Preparation of a Road Safety Strategy for the City of Addis Ababa Martin Small *Martin Small Consulting*	Bringing the Streets into the Classroom: Using Augmented Reality in Primary Schools to Teach Road Safety Awareness David Gribble *Constable Care Child Safety Foundation*
3.50pm - 4.10pm		Banding Together to Predict Driver Fatigue: A Trial of Wearable Activity Monitoring Devices John P Wall *Transport for NSW*	Vehicle Modification Prescription for Drivers with Disabilities: Development of Consensus Based Prescription Guidelines to Optimise User Interfaces and Safety Marilyn Di Stefano *VicRoads*	RAC Motorcycling Survey 2017 Anna Sawyer *RAC WA*	Psychosocial Factors, Goals for Driver Education and Perceptions of Driver Education Lyndel Bates *Griffith University*	Using ANRAM to Assess the Impacts of Network-Wide Road Safety Interventions: Development and Experience of the SSRIP Planning Tool Anthony Kaissidis *VicRoads* Shaun Luzan *VicRoads*	On-Road Observations to Identify Key Contributors to Road Trauma, and Opportunities for Road Safety Improvements in Lao PDR Chika Sakashita *Global Road Safety Solutions*	Educating Upwards - Empowering Children to be Custodians of their Safety on the Road Venera Owens *NRMA*
4.10pm - 4.30pm		The Efficacy of Driver Performance and Subjective Measures for Investigating Fatigue and Distraction: A Simulator Study Christine Mulvihill *Monash University Accident Research Centre*	Trial of Improved Procedures for Driver Licence Tests Administered by Occupational Therapists John Catchpole *ARRB*	Market Basket Analysis of Powered Two Wheeler Crashes in Metropolitan Roads - A Case Study from Chennai City, India Venkatesh Balasubramanian *IIT Madras*	An Exploratory Study of Professional Driving Instruction and Encouraging the Development of a Self-Regulated Safety Orientation in Novice Drivers Natalie Watson-Brown *University of the Sunshine Coast*	Focusing Investment on Zero - A New Investment Strategy for Victoria's Safe System Road Infrastructure Program (SSRIP) Shaun Luzan *VicRoads*	Child Road Safety in Bangkok: Implementing Local Measures whilst Advancing International Awareness and Collaboration Silvia Shrubsall *Rotary Club Matilda Bay*	Identifying Road Safety Knowledge Gaps in Tasmanian Grade 3 and 4 Students Will Oakley *Royal Automobile Club of Tasmania*
4.30pm - 4.50pm		Mobile Phone Distraction: Understanding the Inconsistencies between Simulator and Naturalistic Driving Study Findings Mitchell Cunningham *ARRB*	Closed Roads to Safe People Pre-Learners, Disabilities and Caravans: Using Closed Roads to Develop Safe Drivers Kathryn Collier *Metropolitan Traffic Education Centre Inc.*	Overcoming Methodological Issues in a Systems Approach to the Analysis of Motorcycle Crash Data Liz de Rome *Deakin University*	The Redevelopment of DriveSmart: A New Life for an Evidence-Based Approach to Online Learner Driver Training Phil Wallace *Learning Systems Analysis*	The Challenges of Implementing Side Traffic Activated Rural Speeds (STARS) Sarah Morris *VicRoads*		Road Safety Education: Improving Outcomes through Community Collaboration Louise Cosgrove *Macquarie University - Kids and Traffic*
4.50pm - 5.10pm		What are Australian Drivers Doing Behind the Wheel? An Overview of Secondary Task Data from the Australian Naturalistic Driving Study Kristie Young *Monash University Accident Research Centre*	Calculating the Personal, Community and Social Impact: A Social Return on Investment Analysis of Vehicle Modifications for People With Disability Angela Berndt *University of South Australia*		An Educated Prevention: The Effectiveness of Police-Led, School-Based Driver Education Programs Levi Anderson *Griffith University*	An Investigation into Potential Migration of Run-of-Road Crashes after Treatments of Sites in Rural Western Australia Kyle Chi Ngok Chow *Curtin University*		Safer Cycling for Women: An Evaluation of a Cycling Skills Training Program Phoebe Dunn & Sarah Dalton *Amy Gillett Foundation*
5.30pm - 7.30pm	**CONFERENCE WELCOME RECEPTION & ACRS 30th ANNIVERSARY CELEBRATION** ***The Gallery***							

	Thursday 4 October 2018							
8.00am	**Registration Opens**							
8.00am - 8.30am	**Arrival Tea and Coffee and Exhibition Open**							
8.30am - 10.30am	***Plenary 3 - Road Safety in the Context of the Vehicle as a Workplace - Pyrmont Theatre*** ***MC: Ms Clare Gardiner-Barnes, Deputy Secretary, Freight, Strategy and Planning - Transport NSW*** Mr Martin Small, Martin Small Consulting Mr Stephen McDonald, Transurban Limited Prof Ann Williamson, TARS Ms Lisa Foley, SafeWork NSW Panel Session: Plenary Speakers & Mr Sal Petroccitto, NHVR, Senator Glenn Sterle, Federal Shadow Assistant Minister for Road Safety & Dr Ian Johnston AM, Independent Consultant							
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays - The Gallery**							
11.00am - 12.40pm	**Concurrent Sessions 3 - Thursday**							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*Julie Brown*	*Jerome Carslake*	*Marilyn Johnson*	*Teresa Senserrick*	*Melvin Eveleigh*	*Lisa Keay & Katherine Brown*	*Paul Graham*	*Phillip Brooks*
	SYMPOSIUM 5	**SYMPOSIUM 6** *Sponsored by State Insurance Regulatory Authority*	**Cyclist Safety: New Research**	**SYMPOSIUM 7**	**Infrastructure Programming**	**Older Drivers**	**Policy: Setting Goals for the Future** *Sponsored by NSW Government*	**WORKSHOP**
11.00am - 11.20am	Advanced Vehicle Technologies and Automation Crash Reduction and Driver Experience with Advanced Vehicle Technologies and Automation: Studies from the Insurance Institute of Highway Safety Jessica Jermakian *Insurance Institute of Highway Safety* Australasian NCAP and Safety Assist Systems Mark Tyrell *ANCAP* Facilitators and Barriers to Implementation of Advanced Technologies and Automation Heelong Wong *Hyundai Motor Company Australia* Safety Benefits of Connected and Automated Driving Technologies in Australia and New Zealand David B. Logan *Monash University* A Safety Assurance System for Automated Vehicles - Addressing Safety Risks Arising Over the Automated Vehicle Lifecycle Helen Tsirlina *National Transport Commission*	The Workplace, why does Road Safety Management Vary so Much? Luke Byrnes *Nestle Australia* Keith Hoskins *APA Group* Sarah Jones *Toll Group* Shane Stockill *Office of Industrial Relations* Ken Leacy *Suez* Mark Stephens *Uniting Care Queensland*	Is There Evidence to Support the Risk Compensation Hypothesis for Bicycle Helmet Use? Jake Olivier *University of New South Wales*	Post-Crash Response - Case Study and Latest Advances Teresa Senserrick *Transport and Road Safety Research, The University of New South Wales* Max Thompson *Stay Upright Rider Training* Ryan Bell *Princess Alexandra Hospital* Ha Nguyen *John Walsh Centre for Rehabilitation Research, The University of Sydney*	Best Practice in Road Safety Infrastructure Programs Paul Durdin *Abley Transportation Consultants*	Determining Fitness to Drive for Drivers with Dementia: A Practitioner's Perspective Joanne Bennett *Australian Catholic University - Strathfield Campus*	Zero 2050 - A Planning Framework to Achieve Zero with a Date Johan Strandroth *VicRoads*	Policy - Heavy Vehicle Safety & Compliance Industry & Engagement Issues Ben Maguire *Australian Trucking Association* Russell White *Australian Road Safety Foundation*
11.20am - 11.40am			Adults' Experience of Safety Issues when Riding with Children Julie Hatfield *University of NSW*		Safe System Assessment: Delivering Safe System Outcomes Kenn Beer *Safe System Solutions Pty Ltd*	Transitioning from Driver to Non-Driver: Be Safe and not a Risk Boon Hong Ang *Monash University - Malaysia Campus*	Development of a New NSW Road Safety Plan and Integration with Transport Planning Outcomes through the Future Transport Strategy Bernard Carlon *Transport for NSW*	
11.40am - 12.00pm			Reckless Cyclists or Impatient Drivers? A Naturalistic Study of Group Riding in Perth, Western Australia Michelle Fraser *Curtin University*		Streamlining Road Safety Risk Mapping and Intervention Programming on Local Networks: The Northland Transportation Alliance Risk Mapping Application Stephen Ford *Abley Transportation Consultants*	Sex Differences Evident in Self-Reported but not Naturalistic Measurement of Driving Patterns of Older Drivers: Implications for Safe Driving Programs Lisa Keay *The George Institute for Global Health*	The Relevance of Australasian Road Safety Strategies in a Future Context Brett Hughes *Curtin University*	
12.00pm - 12.20pm			Evidence for the 'Safety in Density' Effect for Cyclists; Validation of Agent-Based Modelling Results Jason Thompson *University of Melbourne*		Contemporary Guidance on Management of Road Safety Audits Auttapone Karndacharuk *ARRB*	Bouncing Back and Maintaining Mobility: The Relationship between Resilience and Driving in the Ozcandrive Study Renée Marie St. Louis *Monash University Accident Research Centre*	The Power of Partnership: Lessons from Road Safety Week Caroline Perry Brake *The Road Safety Charity*	
12.20pm - 12.40pm			Translating Research into Practice: Insights into Practical Pathways to Apply New Research Findings Marilyn Johnson *Monash University*		Safety Solutions on Mixed Use Urban Arterial Roads Blair Turner *ARRB*	Preparing for Driving Cessation: More Thought than Action Rebecca Brookland *University of Otago Dunedin School of Medicine*	Integrating Safe System Principles Throughout TMR's Business Lachlan Moir *Queensland Department of Transport and Main Roads*	
12.40pm - 1.30pm	**Lunch, Exhibition & Poster Presentation Session - The Gallery**							

1.30pm - 3.10pm	Concurrent Sessions 4 - Thursday							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*John Wall*	*Elizabeth Waller*	*Lyndal Bugeja*	*David Andrews*	*Dimitra Vlahomitros*	*Helen Reddan*	*Clare Anderson*	*Phillip Brooks*
	ITS & AD Estimated Benefits and Trials	**Road Safety in Construction, Workplace and Industrial Zones**	**Driver Behaviour and Road Infrastructure**	**Emergency Response and Rehabilitation**	**Pedestrian**	**Crash Analysis: Cyclists**	**SYMPOSIUM 8** *Sponsored by National Transport Commission*	**Policing: Drink Driving Deterrents**
1.30pm - 1.50pm	Field Operational Test for Cooperative Intelligent Transport Systems (C-ITS) Andry Rakotonirainy *CARRS-Q*	Managing Vulnerable Road User Safety in Urban Environments during Construction of Major Transport Infrastructure Projects Michael William Holmes *Transport for NSW*	Road User Perception of Safety at Safe System Intersections Chris Stokes *University of Adelaide*	Prognostic Capacity of Orebro Musculoskeletal Pain-Short Questionnaire in Predicting Recovery Following Non-Fatal RTIS: Results from an Inception Cohort Study Ha Nguyen *John Walsh Centre for Rehabilitation Research, University of Sydney*	An Evaluation Framework for Pedestrian Safety in Victoria Bruce F Corben *Corben Consulting*	Review of Coroners' Recommendations following Fatal Cyclist Crashes Involving Heavy Vehicles Marilyn Johnson *Monash University*	Reducing Fatigue Related Crashes – Addressing the Gaps for Improved Road Safety Current Gaps in Fatigue and Road Safety Clare Anderson *Monash University and CRC for Alertness, Safety and Productivity* Recent Advances in Fatigue Detection – Developing a Roadside Test for Fatigue Jennifer Cori *Institute of Breathing and Sleep and CRC for Alertness, Safety and Productivity* Distraction or Fatigue? – Allocation of Attention Due to Fatigue Clare Anderson *Monash University and CRC for Alertness, Safety and Productivity* Awareness of Sleepiness – Are Drivers Aware of Fatigue While Driving Mark Howard *Institute of Breathing and Sleep and CRC for Alertness, Safety and Productivity*	Development of a New Drink-Driving Package for Victoria Christopher Freethy *VicRoads*
1.50pm - 2.10pm	Trialing Connected Vehicle Technology in Privately-Owned Light Vehicles: An Australian First Anna Chevalier *Australian Road Research Board*	Are Highway Constructions Associated with Increased Transport Incidents? A Case Study of NSW Pacific Highway Construction Zones 2011-16 Patricia Lemin *Mid North Coast Local Health District*	Effects of Lane Width and Posted Speed Limit on Speed Selection Behaviour of Drivers Jason Deller *Bega Valley Shire Council*	Potentially Preventable Road Trauma Deaths in Victoria *Ben Beck* *Monash University, Australia*	Safe Travel to School - Treatments to Encourage Walking and Cycling to Primary School John Poynton *Safe Systems Solutions Pty Ltd*	Characteristics of Single Cyclist Injury Crashes in South Australia Giulio Ponte *The University of Adelaide*		Evaluation of the Performance of Alcohol and Drug Awareness Courses Currently Provided in the ACT James Thompson *Centre for Automotive Safety Research*
2.10pm - 2.30pm	Road Safety Benefits of Level 3 and Level 4 Automated Vehicles and Fleet Transition David Young *Transport Accident Commission*	Partnership Policing and Road Policing: Is there Value? Lyndel Bates *Griffith Criminology Institute, Griffith University*	3M Connected Roads - Enabling Tomorrow's Technologies Today Konstantinos Karagiannopoulos *3M*	Unfolding the Full Extent of Major Road Trauma Crashes Helen Fagerlind *Neuroscience Research Australia*	Using Evaluation to Drive Program Improvement: Permanent 40 Km/H Speed Limits in High Pedestrian Activity Areas in NSW Rae Fry *Transport for NSW* James Holgate *Martin Small Consulting*	The Role of Kinetic Energy in Bicyclist's Injury Severity at Intersections David Logan *Monash University Accident Research Centre*		Random Breath Testing on our Motorways Greg Donaldson & Adrian Grech *NSW Police Force*
2.30pm - 2.50pm	Where do we go from here? Predictability in Tomorrow's Traffic Andry Rakotonirainy *QUT*	Vehicles as Workplaces - A New Framework for a Critical Road Safety Management Issue Martin Small *Martin Small Consulting*	Australian Naturalistic Driving Study (ANDS): Using 20,000 Trips to Get a Glimpse at Locations and Speeds where Data Was Collected Gregoire Sebastien Larue *CARRS-Q*	Factors Influencing Time To Claim Closure In Older Versus Young Road Traffic Injury Claimants Katherine Brown *George Institute for Global Health*	Investigating Factors Associated with Hit-and-Run Crashes in Indian Metropolitan City Using Association Rules Venkatesh Balasubramanian *IIT Madras*	Identifying and Treating High Risk Locations on High Speed Roads for Cyclist Crashes David Milling *ARRB*		Toward a Performance-Based Approach to the Queensland Alcohol Ignition Interlock Program: The Impact of Performance Record on Risk of Recidivism Vanessa Cattermole-Terzic *Queensland Department of Transport and Main Roads*
2.50pm - 3.10pm	Local and Global Evaluation of Risk, Impact of C-ITS Sebastien Glaser *Queensland University of Technology*	Embedding Road Safety in Businesses Hannah Parnell *Transport for NSW*	Designing Road Tunnels to Optimise User Experience and Safety: A User-Centred Approach Asif Hassan *Australian Road Research Board*	Post-Crash Transport Decisions for Patients with Traumatic Spinal Cord Injury: Does it Differ Between States and Does it Matter? Lisa Nicole Sharwood *University of Sydney*		Injury Characteristics of Cyclist Versus Vehicle Crashes in South Australia Tori Lindsay *University of Adelaide*		Picture This - You're in a Traffic Jam. The Use of Imagery to Influence Road User Behaviour Sonia Roberts *NSW Police Force*
3.10pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays - The Gallery**							

3.30pm - 5.10pm	Concurrent Sessions 5 - Thursday							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*Rae Fry*	*Nicola Fotheringham*	*Kenn Beer*	*John Matta*	*Julie Brown & Bianca Albanese*	*Jake Olivier*	*Dan Leavy*	*Ralston Fernandes*
	ITS & AD Behaviour & Acceptance	**Commercial Vehicles**	**SYMPOSIUM 9**	**SYMPOSIUM 10**	**Occupant Protection**	**Crash Analysis**	**Speed Management in Different Settings**	**Policing: Policing and Enforcement**
3.30pm - 3.50pm	Understanding User Perceptions and Experiences with Cooperative and Automated Vehicles Clare Murray *Queensland Department of Transport and Main Roads*	Workplace Cyclist Safety: A Review of Safety Practices at Deliveroo Marilyn Johnson *Monash University*	Cyclists, Heavy Vehicles and Safety - Amy Gillett Foundation Safe Together Competition 2018	Safe System Road Infrastructure Program Symposium: Practical Plans to Achieve the Objectives of Towards Zero Vision Zero 2050 in Victoria Johan Strandroth *Safe System Lead, SSRIP, VicRoads* Focusing the Investment of Today on the Vision of Zero Shaun Luzan *SSRIP, VicRoads* The Role of Knowledge Management and Evaluation to Achieve Zero Amir Sobhani *SSRIP, VicRoads* Innovative Methods to Develop and Deliver Towards Zero Projects Daniel Mustata *SSRIP, VicRoads* Developing the Community Understanding of Towards Zero Vision Arpad Maksay *SSRIP, VicRoads* Breaking Down Barriers to the Environment – The Challenge of Making Zero Real Joanna Kowalczyk *SSRIP, VicRoads*	Who hasn't it Clicked for? Understanding non-Seat Belt use in Fatal Vehicle Crashes in New Zealand Lily Hirsch *Mackie Research*	Protecting Motorists and Road Works against Wrong Way Drivers Andrew Stevens *Auckland Motorways / Beca*	Recommendations to Reduce Speeding-Related Crashes in the United States Nathan Doble *National Transportation Safety Board*	Characteristics of Offenders Attending a Traffic Offender Intervention Program in New South Wales, Australia Ian Faulks *Queensland University of Technology*
3.50pm - 4.10pm	Validation of a Driving Simulator for Research in Human Factors of Vehicle Automation Nebojsa Tomasevic *Monash University*	Priorities for Improving the Safety of the Victorian Taxi Fleet Stuart Newstead *Monash University Accident Research Centre*			Development of non-Redirective Crash Cushions for Improving the Safety of Occupants Jaehong Park *Korea Institute of Civil Engineering and Building Technology*	The Crash Performance of Seagull Intersections and Intersections with Left Turn Slip Lanes Shane Turner *Stantec NZ*	The Queensland Speed Conversation - Changing the Way Motorists Look at Speed Peter Kolesnik *Queensland Department of Transport and Main Roads*	Self-Reported Response to a Licensing Point System Julie Hatfield *University of NSW*
4.10pm - 4.30pm	Public Awareness, Understanding and Acceptance of Automated Vehicles: An International Survey of Australian and New Zealand Respondents Selena Ledger *ARRB*	Exploring Crash Characteristics and Injury Outcomes among Older Truck Drivers: An Analysis of Truck-Involved Crash Data in the United States Sharon Newnam *Monash University Accident Research Centre*			How Safe are the Cars on our Roads? Data Visualisations to Analyse NSW Light Vehicle Fleet Safety at a Glance Sandra Pangestu *Transport for NSW*	Comparing Crashes: A Safe System Analysis of Serious Injury and Fatal Crashes In New Zealand Dylan Thomsen *NZ Automobile Association*	Implementation Principles for 30 km/h Speed Limits and Zones Auttapone Karndacharuk *ARRB*	Unmanned Aerial Vehicle based Speeding and Tailgating Detection System Sébastien Demmel *Queensland University of Technology*
4.30pm - 4.50pm	Simulation Platform for the Prototyping, Testing, and Validation of Cooperative Intelligent Transportation Systems at Component Level Sebastien Glaser *Queensland University of Technology*	An Evaluation of the Roadworthiness of Victorian Buses Jianrong Qiu *Monash University Accident Research Centre*			Safer Vehicles: Is Our Own House in Order? Michael Timms *NSW Police Force*	Older Drivers may not have a Greater Risk of Intersection Crashes than Drivers in Younger Age Groups Matthew Baldock *Centre for Automotive Safety Research*	Calibrating Infrastructure Risk Rating (IRR) to Inform Speed Management in Queensland Haris Zia *Abley Transportation Consultants*	Road Traffic Infringements and Crash Risk: Is there Evidence of a Deterring Influence? Hayley Maree McDonald *Monash University Accident Research Centre*
4.50pm - 5.10pm	Cutting Through the Hype: Measuring Driver Attention and Actual Driver Take-Over Times in Automated Driving Mike Lenné *Seeing Machines*					Re-investigation of Roadside Risk Factors Associated with Run-off-road Casualty Crashes in Victoria, Australia Farhana Ahmed *ARRB*	A New Proactive Approach to Speed Limit Setting in Queensland Andrew Pine *Department of Transport and Main Roads, Queensland*	Police Pursuits in NSW: Just the Facts…and Figures Kris Cooper *NSW Police Force*
6.30pm - 11.00pm	**CONFERENCE GALA DINNER & AWARDS CEREMONY** ***Doltone House - Jones Bay Wharf*** **Including presentation of the prestigious '3M-ACRS Diamond Australasian Road Safety Awards' & ACRS 2018 Fellowships by the Federal Minister for Infrastructure and Transport & Deputy Prime Minister Hon Michael McCormack MP** **Gala Dinner Sponsor's Address - Mr Scott Charlton, Transurban Limited**							

	Friday 5 October 2018							
8.00am	**Registration Opens**							
8.00am - 8.30am	**Arrival Tea & Coffee & Exhibition Open**							
8.30am - 10.30am	***Plenary 4 - Integrating Road Safety into Road Transport Planning - Pyrmont Theatre*** ***MC: Professor Rebecca Ivers - School of Public Health and Community Medicine, UNSW Sydney*** Ms Clare Gardiner-Barnes, Deputy Secretary, Freight, Strategy and Planning - Transport for NSW Mr Richard de Cani, Arup Mr David Bobbermen, Austroads Safety Program Manager Mr Mick Savage, IPWEA NSW Panel session: Plenary Speakers							
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays - The Gallery**							
11.00am - 12.40pm	**Concurrent Sessions 6 - Friday**							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*Jamie Ross*	*Kate Hunter*	*Joanna Robinson*	*Bridie Scott-Parker*	*Martin Small*	*David Logan*	*Angela Watson*	*David Bobbermen*
	SYMPOSIUM 11	**SYMPOSIUM 12**	**Transport Planning for Mobility and Safety**	**Policy: Novice Driver Safety**	**Heavy Vehicles**	**Roadside Design**	**SYMPOSIUM 13**	**WORKSHOP**
11.00am - 11.20am	Construction Logistics and Community Safety Construction Logistics and Community Safety (CLOCS): Australia's Major Transport Projects Bringing UK's World Best Practice to Australia Jamie Ross *Rail Projects Victoria* Stephen Jones *Sydney Metro* Matthew Bennett & Lydia Foster-Smith *AJM-JV Metro Tunnel Project* *Panel* Jamie Ross Stephen Jones Lora Colussi & Lydia Foster-Smith	Getting the Inside Scoop – The Nexus Between Research, Policy and Practice: Working in Partnership towards Road Safety for Aboriginal and Torres Strait Islander People Implementation Research – Bringing Research to the Practitioner and Policy Space Kate Hunter *The George Institute for Global Health* Setting the Research Scene - Understanding Driver Licensing and Road Safety for Aboriginal and Torres Strait Islander People Rebecca Ivers & Trish Cullen *The George Institute for Global Health* Driver Licensing and Child Car Seat Use (NSW & NT Experience) Bobby Porykali *The George Institute for Global Health* *Representatives from Key Organisations Including Louise Cosgrove, Kids and Traffic Early Childhood Road Safety Program* Current Focus and Initiatives – Working across the Sectors George Shearer *Roads and Maritime Services*	Safely Integrating Public Transport within the Road Environment Melvin Eveleigh *Transport for NSW*	Cycle-Aware: Preparing Novice Drivers to Interact Safely with Cyclists Narelle Haworth *CARRS-Q*	How does Inattentional Deafness and Auditory Exclusion impact on Urgent Duty Driving of Heavy Vehicles in Emergency Services? Peter McMillan *Queensland University of Technology*	Putting Safe System into Practice - Raised Safety Platform Guidelines Sean Yates *VicRoads*	Mini-Symposium: Road Safety Data Linkage Victorian Pilot Data Linkage: Match Rates and Serious Injury Metrics Paulette Ziekemijjer *TAC* Data Linkage and use of Serious Injury Data in NSW Hassan Raisianzadeh *Transport for NSW* Austroads National Data Linkage Project James Harrison Panel Discussion: Road Safety Data Linkage: Challenges and Next Steps **Moderator:** Angela Watson James Harrison Hassan Raisianzadeh Paulette Ziekemijjer Ann Williamson	Local Government I A Comprehensive User Guide for Road System Managers and Local Government This topic will cover a summary of all the best practices through the life cycle of road management and the production of a user guide to assist local government. This will include considerations from planning through to project delivery, to maintenance and operations. There are some options of how this material can be organised and the emphasis placed on the content. Local government input to this is key to a satisfactory output which is practical for use by local government practitioners. A Comprehensive User Guide for Road System Managers and Local Government Speakers TBC
11.20am - 11.40am			"Driving" vs. Road Safety: A Grass Roots Exploration of the Salience of Road Safety Dushyant Sharma *Transport for NSW*	Are Young Adults' Licensing Rates Still Declining? *Lisa Wundersitz* *University of Adelaide*	NSW Police Force Traffic and Highway Patrol. A Response to Road Trauma and Non-Compliance in the Heavy Vehicle Industry Robert Toynton *Traffic and Highway Patrol Command*	Putting Safe System into Practice - Safe System Roadside Design Principles Evan Coulson *VicRoads*		
11.40am - 12.00pm			Practicalities of Integrating Road Safety with Movement and Place Functions: A Case Study of Conflict and Compromise Melvin Eveleigh *Transport for NSW*	Enhancing the NSW Graduated Licensing Scheme Rachel Butterly *Transport for NSW*	Why Bulk Liquid Cargoes Shall Be Secured For The Safe Transportation In Mobile Tanks Erik Eenkhoorn *Accede b.v.*	Deployment of Intelligent Advanced Stop Warning Signs in New Zealand Bridget Southey-Jensen *Abley Transportation Consultants*		
12.00pm - 12.20pm			Can Mobility Management Deliver the Next Step-change Towards Safe System Chris Jurewicz *ARRB*	NSW High Performance Vehicle Scheme for Provisional Drivers *Dan Leavy* Transport for NSW	A Time Series Analysis of Periodic Heavy Vehicle Inspections and Road Safety Outcomes in Queensland Mark Hickman *University of Queensland*	Understanding and Improving the Performance of a Public Domain Guard Fence System *David Williamson* VicRoads		
12.20pm - 12.40pm			Defining Practical "Consistent Look and Feel" for Light Rail Customers and Road Users Airdrie Long *Transport for NSW*	Situation Awareness in Young Novice Ambulance Drivers: So Much More than Driving Bridie Scott-Parker *University of the Sunshine Coast*	On-Road and Driver Fatalities at Toll Group: What the Data Reveals about Risk and Opportunity in Our Pursuit of Zero Sarah Jones *Toll Group*	Implications of Traffic Sign Recognition Systems for Road Operators Mark Rowland & Yasmin Roper *Arup*		
12.40pm - 1.40pm	**Lunch, Exhibition & Poster Presentation Session - The Gallery**							

1.40pm - 3.00pm	Concurrent Sessions 7 - Friday							
Room	**Pyrmont Theatre**	**Room C2.1**	**Room C2.2**	**Room C2.3**	**Room C2.4**	**Room C2.5**	**Room C2.6**	**Room E3.5**
Chair	*Andrew Meier*	*Eric Chalmers*		*Bridie Scott-Parker & Barry Watson*	*Julie Hatfield*		*Marilyn Di Stefano*	*David Bobbermen*
	SYMPOSIUM 14	**Child Restraint** *Sponsored by Transurban Limited*		**SYMPOSIUM 15**	**Driver Distraction**		**Drug Impaired Driving**	**WORKSHOP**
1.40pm - 2.00pm	Current and Emerging Challenges and Opportunities in Level Crossings An Active Look at Level Crossings: Deconstructing their History, Underpinning Theory, and Role Today Anjum Naweed *CQ University Adelaide* Level Crossings from the Regulator's Perspective Peter Doggett *Office of the National Rail Safety Regulator* Practical Considerations in Changes to Level Crossing Warnings from the Road and Rail Perspectives Gemma Read *University of Sunshine Coast* Partnering for Road Safety at Level Crossings: New South Wales Traffic and Highway Patrol Command Mick Timms *NSW Police* Panel Discussion Naomi Frauenfelder *TrackSAFE Foundation* George Rechnitzer *George Rechnitzer & Associates*	A Consumer-Centric Approach to Designing Information Supplied with Child Restraints Reduces Errors in Use: Laboratory Results and Field Study Protocol Jane Elkington *Neuroscience Research Australia*		Road Safety of Young Drivers - A Global Perspective Bridie Scott-Parker & Natalie Watson-Brown *Sunshine Coast Mind and Neuroscience-Thompson Institute, University of the Sunshine Coast* Barry Watson *CARRS-Q, Queensland University of Technology*	Can we Explain Attention-Related Errors While Driving? Xiaomeng Li *Queensland University of Technology*		Roadside Oral Fluid Testing for Illicit Drugs in Western Australia: Trend in Testing and Offences and Characteristics of Offenders, 2008-2015 Peter Gerard Palamara *Curtin University*	Local Government II LAUNCH - Network-wide Design for Improved Road Safety This topic will cover the road safety launch of the world-leading process of defining the standards for each corridor to achieve the best road safety outcome. This will include considerations of safe system, road design dimensional guidance, safety treatments, speed management, and resourcing constraints in an integrated decision-making model. The process is expected to take no longer than one month to complete for an outlook of 10 years and delivers on the commitments made under the National Road Safety Action Plan 2018-2020. The process simply pre-calculates existing model outputs from iRAP and ANRAM and presents this information for typical cross sections and road stereotypes for easy reference and use. While this process will support all road management jurisdictions, the process has been developed specifically to support Local Government as approximately 50% of fatality and serious injury crashes occur on local government roads. Speakers TBC
2.00pm - 2.20pm		Are Type-G Child Restraints (Large Forward-1 Facing Restraints with 2 Inbuilt Harnesses) Safer than Booster Seats? A Preliminary Crash Test Basuki Suratno *Transport for NSW*			Considering Distracted Driving when Developing a Mobile App – the LinktGO Case Study Michael Dalic *Transurban*		Prevalence of Drugged Driving in New Zealand Paul Graham *New Zealand Transport Agency*	
2.20pm - 2.40pm		Frontline Support - Enhancing Child and Family Health Nurses' Knowledge about Child Car Seats Vicki Milne *Kidsafe NSW*		Re:act - Swinburne Students Challenged by Businesses to Create Behavioural Change in their Peers around Truck Safety Jerome Carslake *ARRB*	A Fresh Approach to Distracted Driving: Implications for Policy Stuart Maxwell *Department of Trasport and Main Roads Queensland*		Roadside Random Drug Testing in Victoria 'Making Towards Zero Happen' Tom McGillian *Victoria Police*	
2.40pm - 3.00pm		Who uses Child Restraint Fitting Stations? Results of a Parent Survey Lynne E Bilston *Neura*		PrepL: Redesigning Queensland's Learning and Assessment for Learner Drivers Andrew Mahon *Queensland Department of Transport and Main Roads*	Jaywalking at Signalised Intersections in Melbourne Richard Tay *RMIT University*		Collaborative Development of an Alcohol and Other Drug Risk Management Resource for Trucking Companies Victoria Pyta *VicRoads*	
3.00pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays - The Gallery**							
3.30pm - 5.00pm	***Plenary 5 - Conference Review - Pyrmont Theatre*** ***MC: A/Prof Jeremy Woolley - ACRS Secretary (Overview of Plenary 5)*** Mr Eric Chalmers, 3M Diamond Award Recipient, 2017 A/Prof Jeremy Woolley - Conference Wrap Up A/Prof Teresa Senserrick and Mr David McTiernan, Co-Chairs ARSC2018 - Conference Wrap Up and Award Announcements **Presentation of the Conference Awards for Best Papers/Posters/Presentations** 1. Peter Vulcan Award for Best Research Paper - $1,000 prize plus certificate - Sponsored by Transurban 2. Road Safety Practitioners Award - $1,000 prize plus certificate - Sponsored by Transurban 3. Best Paper by a New Researcher Award (previously John Kirby Award) - $1,000 prize plus certificate - Sponsored by Transurban 4. Road Safety Poster Award - $500 prize plus certificate - Sponsored by Transurban 5. Conference Theme Award - $500 prize plus certificate - Sponsored by Transurban 6. Best Paper by a New Practitioner Award - $1,000 plus certificate - Sponsored by Transurban 7. Best Paper with Implications for Improving Workplace Road Safety - $1,000 plus certificate + NRSPP Thought Leadership Piece & Webinar (Sponsor NRSPP) Invitation to ARSC2019 - Mr Martin Small & A/Prof Jeremy Woolley Thank you and Goodbye - A/Prof Teresa Senserrick and Mr David McTiernan - Peoples Choice Award & Lucky Door Prize(s) Draw							
5.00pm	**Conference Ends**							

Extended Abstract Number	Author(s)	Topics	Title	Abstract
7	Newnam, S. Blower, D. Molnar, L. Eby, D. Koppel, S.	Older Drivers & Road Users Workplace and Work Related Road Safety	Exploring crash characteristics and injury outcomes among older truck drivers: An analysis of truck-involved crash data in the United States	This study explores differences in crash characteristics and injury outcomes in older and middle aged truck driver. Two sets of data in the United States were used to compare truck drivers aged 60 years and older to their younger counterparts (i.e., 27-50 year olds). No differences were identified in crash outcomes and characteristics between older and middle aged truck drivers. Furthermore, older drivers were found to display some safer driver behaviors (i.e., safety belt and alcohol use) compared with middle aged drivers. Recommendations for change in policy and practice are discussed.
8	Harker, D. Richards, B. O'Neil, C.	Distraction & Inattention Signage & Signalisation Crash Data Analysis	Deployment of intelligent advanced stop warning signs in New Zealand	Each year, hundreds of crashes occur where a driver fails to notice a priority-controlled intersection and drives through without stopping. In the Selwyn District of New Zealand, this problem is particularly prevalent due to the flat, straight roads which intersect regularly across the district. To counter this issue, a new intelligent stop sign has been trialed which warns drivers of the approaching intersection via flashing lights as they approach the intersection. The trial was successful, so a nationwide analysis was conducted which identified 50 sites where this technology may prevent crashes and save lives.
17	Sharwood, L.N. Vaikuntam,B. Middleton, J.W.	Policy Development And Implementation Education – general and other Ambulance and Emergency Services Emergency Hospital Trauma	Post-crash transport decisions for patients with traumatic spinal cord injury: does it differ between states and does it matter?	Traumatic spinal cord injury (TSCI) is a devastating injury resulting predominantly from motor vehicle crashes and falls, with significant costs to the healthcare system. Precise post injury management is critical for lessening mortality or complication risk and improving possible functional recovery. Post-crash care including transport decisions can vitally impact patient outcomes. Clinical pathway mapping undertaken on TSCI cases across NSW and Victoria showed 1/3 in NSW were admitted directly to a specialist spinal unit (SCIU); rarely occurring in Victoria. Direct transport to SCIU saw TSCI patients more likely to receive appropriate blood pressure management and timely surgery (< 12 hours).

18	Byrne, M. Dalic, M.	Distraction & Inattention Driver Risk Young Drivers	Engineering Road Safety into Mobile Applications	This year marks 10 years since the iPhone launched and it's hard to think of an aspect of life that it hasn't changed. Smartphones and apps have brought information, convenience and choice to everyday life and are credited with products and services becoming easier to access and increasingly tailored to customers' individual needs. Transurban saw an opportunity to apply the latest smartphone and GPS technology to enhance customers' experience and the way they interact with Transurban. Transurban has launched an innovative new tolling approach using a GPS-enabled app, allowing motorists to drive on any Australian toll road without the need for a tag. Recognising that mobile phones and driving do not mix, Transurban designed LinktGO to ensure user interaction is not required while driving. In addition to safety warnings, LinktGO has built-in safety features that leverage a phone's core motion technology.
19	Filardo, L. El-Hoss, G. Fernandes, R. Noyes, A. Schramm, A. Haworth, N. Legge, M.	Bicyclists Policy Development And Implementation Legislation and Law Crash Data Analysis	Preliminary Findings from the Evaluation of the NSW Minimum Passing Distance Trial	An evaluation of the NSW minimum passing distance (MPD) trial is nearing completion. It assessed practical implementation, impact on road users' behaviours, attitudes and perceptions, and road safety benefits. Draft findings indicate awareness of the MPD rule increased and motorists were generally compliant. Compared to the pre-trial trend, there were 15 fewer casualty crashes indicative of non-rule compliance in the 10 months after the trial began, but the difference was not statistically significant. The draft findings confirm the rule has improved motorist awareness of the need to provide space when passing, and suggest the rule has contributed to cyclists' safety.
22	Wall, J.P. Boland, P. O'Brien, J.	Fatigue Workplace and Work Related Road Safety	Banding Together to Predict Driver Fatigue: A Trial of Wearable Activity Monitoring Devices	Wearable technologies are emerging as innovative tools to help reduce fatigue-related crashes. A wristband product called Readiband monitors the wearer's activity level, and according to the band's manufacturer, can accurately predict when the wearer is likely to be fatigued and more susceptible to a road crash. A study of 25 volunteer drivers from two organisations revealed the devices were generally supported by participants, however their fatigue levels, as calculated by the Readiband, remained static. Furthermore, senior management representatives from both participating organisations did not support the uptake of the devices because of cost, privacy and efficacy concerns.

24	Leavy, D. Beck, D.	Crash Avoidance and Crash Severity Reduction Motorcyclists Policy Development And Implementation Legislation and Law	Further Research on Attachments Mounted on an Approved Motorcycle Helmet: Do they Increase Injury Risk?	There has been growing demand for fitting aftermarket attachments, typically cameras and communication devices, onto motorcycle helmets. Previous research found that in some cases, attaching devices to a helmet caused the helmet to fail one of the tests specified in the two design standards referenced in the NSW Road Rules 2014. A further study was carried out to assess how this relates to an increased risk of injury to the wearer in a crash. The results, which are currently being peer reviewed, indicate that fitting devices to an approved motorcycle helmet is unlikely to pose an additional risk.
25	Pangestu, P. Leavy, D.	Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	How Safe are the Cars on our Roads? Data Visualisations to Analyse NSW Light Vehicle Fleet Safety at a Glance	The NSW Centre for Road Safety (CRS) has developed two vehicle fleet safety visualisation tools to provide insights into the safety of the light vehicle fleet and its relationship to road trauma. The visualisations present a snapshot of the safety specifications of a subset of NSW registered light vehicles, and their involvement rates in crashes. To our knowledge, this is the first application of visualisation tools to match vehicle safety specifications data with crash data. The visualisations assist CRS policy-makers in research and policy analyses by allowing users to filter data and present queries in simple graphical displays.
26	Parnell, H. Graham, R. Wall, J.	Policy Development And Implementation Workplace and Work Related Road Safety	Embedding Road Safety in Businesses	In NSW, one in six workplace fatalities are a result of road crashes at work. All businesses have an obligation under Work Health and Safety law to ensure a safe work environment. This includes when on and around the road. The Centre for Road Safety has developed an easy-to-read guide to help businesses understand the key road safety issues and risks, and ways to help their employees reach their destination safely. It also provides clear steps to help businesses embed road safety within their organisation.
27	Fong, L. Graham, R. Carlon, B. Douglas, N. Dent, S. Gallagher, T.	Fatigue Drink Driving Speed, Speeding & Travel Speeds Driver Risk	Saving Lives on Country Roads Campaign: Helping Achieve the Towards Zero Target in Regional NSW	Country residents make up one-third of the NSW population, yet two-thirds of the state’s road fatalities occur on country roads. The 'Saving Lives on Country Roads' campaign is the first comprehensive education campaign focused on country roads. It aims to raise awareness of the size and nature of the road trauma problem on country roads, and help achieve the State Priority target in regional NSW. The campaign encourages drivers to re-think common excuses used to justify risky driving behavior and to make safer choices. Ultimately, no risk taking on the road is acceptable and can result in serious life-changing consequences.

28	Butterly, R. Thompson, J. Smith, P.L. Noyes, A. Smith, C.	Young Drivers Novice Driver/Rider Licensing	Enhancing the NSW Graduated Licensing Scheme	The NSW Government has enhanced the NSW Graduated Licensing Scheme (GLS) to align more closely with the Australian GLS Exemplar model. The changes, which impacted over 800,000 licence holders, built on a successful existing GLS policy framework. In recognition of the complexity of the changes, a comprehensive media and communications strategy was developed to ensure accurate and consistent messaging, with the social media campaign rated as one of the most engaged-with NSW Government campaigns for 2017. The impacts of the GLS enhancements will be evaluated at a later date.
30	Wilby, L. Warner, W. Holmes, M. Fernandes, R. Eveleigh, M. Carlon, B.	Safer Transport & Mobility	Safely Integrating Public Transport within the Road Environment	With increasing urban congestion there is renewed focus on public transport. Public transport networks may directly integrate with the road environment, such as bus or light rail networks, or may be segregated but provide high-demand interchanges, such as Metro rail. Through good design and practice we can ensure these networks and interchanges provide safe access and thoroughfare for all road users – making sure we proactively create safe places for people that align with our Towards Zero vision. This paper outlines how a collaborative safe system approach has been achieved to ensure safe integration during construction and operation of transport projects.
32	Chow, K.C.N. Meuleners, L. Hobday, M. Argus, F.	Road Environment Road Safety Audit and Road Safety Review Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	An Investigation into Potential Migration of Run-of-road Crashes after Treatments of Sites in Rural Western Australia	Run-off-road crashes are especially problematic in rural Western Australia (WA), with lives lost and trauma that result placing a great burden on community. Factors that lead to these crashes, such as fatigue, are compounded by WA's vast land area and long distances between its towns. Chow et al. (2017) found the State program aimed to reduce such crashes to be successful. However, the question arises, whether the treatments deployed acted to delay the crashes only, and whether the crashes "migrated" to other road sections after the treated sections. This new study aims to answer this question with up-to-date data.

33	Chevalier, A. Vecovski, V. Wright, C. Tyler, P. Wall, J.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	Trialing connected vehicle technology in privately-owned light vehicles: An Australian first	This Field Operational Test (FOT) will introduce up to 55 light vehicles owned by members of the public into Transport for NSW's Cooperative Intelligent Transport Initiative (CITI), the first largescale, long-term connected vehicle initiative in Australia. Within the CITI testbed, there are up to 60 connected trucks, 11 connected public passenger buses, two light fleet vehicles, 1 fleet motorcycle and three connected signalised intersections operating. Findings from the light vehicle study will increase knowledge of the human-machine interface (HMI) and road safety benefits of this technology. The presentation will include an update on study progress and participant recruitment and demographic data.
34	Black, D. Leavy, D.	Young Drivers	NSW High Performance Vehicle Scheme for Provisional Drivers	In the interests of road safety, NSW provisional drivers are prohibited from driving high performance vehicles (HPVs). This restriction has applied since July 2005. In 2014, the definition of a HPV was amended to mean a vehicle greater than a specified power-to-mass ratio (PMR). Although this was intended to apply nationally, NSW added an additional criterion to include vehicles with a lesser PMR but which pose a high risk to novice drivers for other reasons. A new website was developed, which now allows the public to check the status of over 90,000 vehicles available in NSW.
35	Carlon, B. Fernandes, R. Raisianzadeh, H. Fry, R.	Road Safety Strategy Crash Data Analysis Data Linkage Statistical, Epidemiology and Other Road Safety Research Methods	Using high-quality serious injury data to inform development of road safety measures	The Centre for Road Safety (CRS) has established the routine collection and reporting of data on serious injuries from NSW road crashes. This new information shows that the profile of serious injuries and fatalities are different, and highlights the need for practitioners to use serious injury data in setting the road safety agenda and delivering initiatives to reduce serious injuries on roads. This paper outlines how NSW has used serious injury data to date to improve the design and delivery of road safety measures.
36	Carlon, B. Murdoch, C. Cavallo, A. Higgins-Whitton, L. Preece, R. Eveleigh, M. Everingham, S. Raisianzadeh, H. Fernandes, R.	Policy Development And Implementation Road Safety Strategy Safer Transport & Mobility	Development of a New NSW Road Safety Plan and Integration with Transport Planning Outcomes through the Future Transport Strategy	A new Road Safety Plan 2021 (the Plan) has been developed to set new road safety priorities and actions that will help NSW work toward the State Priority target of a 30% reduction in road fatalities by 2021. Development of the Plan relied on detailed understanding of crash trauma, robust evidence gathering, and extensive consultation. The Plan outlines key road safety priority areas and related measures to be implemented. Measures included in the Plan align with the Future Transport Strategy directions and vision of zero trauma for all transport customers and road users.

37	Carlon, B. Fernandes, R. Fry, R. Willey, B.	Speed, Speeding & Travel Speeds Road Environment Road Safety Strategy Land Use & Urban Planning	Practicalities of integrating road safety with Movement and Place functions: A case study of conflict and compromise	The Movement and Place framework is increasingly applied by jurisdictions to guide transport planning, and underpins the NSW approach to long-term transport planning. Embedding safety into Movement and Place considerations will help planners deliver safe road infrastructure. However, conflicts inevitably arise where there are strong demands for both Movement and Place functions. In these cases, compromises must be made to improve safety while balancing different road functions and supporting the needs of different road users. This paper presents a case study outlining how safety principles have been applied to balance Movement and Place functions along the Great Western Highway, NSW.
42	Faulks, I. Siskind, V. Sheehan, M.	Young Drivers Novice Driver/Rider Licensing Education – general and other	Characteristics of offenders attending a Traffic Offender Intervention Program in New South Wales, Australia	In 2008, when the NSW Traffic Offender Intervention Program commenced, seven in ten offenders enrolled in the Blacktown Traffic Offenders Program (Blacktown TOP) were drink drivers. By 2015, this proportion had reduced to five in ten of unrestricted driver offenders, and three in ten novice driver offenders. Five in ten novice driver offenders attending Blacktown TOP in 2015 were appealing a driver licence suspension following speeding offences. Offences for non-compliance with traffic signals/ signs and GDLS restrictions were also frequent. This paper considers the future of the Traffic Offender Intervention Program in light of these changes in the offender population.
43	Clare Murray	Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles Communication and Media	Understanding User Perceptions and Experiences with Cooperative and Automated Vehicles	With the increasing availability of vehicles with various levels of technology, many State transport agencies are investing in pilot programs and trials, designed to prepare for the arrival of cooperative and automated vehicles on their road networks. The Queensland Department of Transport and Main Roads (TMR) sought to understand the perceptions, experiences and understanding of cooperative and automated vehicle technologies through an online survey. This paper discusses the methodology and results of this survey, and implications for the development of public education and participant recruitment materials.

44	McMillan, P. King, M. Watling, C.	Distraction & Inattention Speed, Speeding & Travel Speeds	How does Inattentional Deafness and Auditory Exclusion impact on Urgent Duty Driving of Heavy Vehicles in Emergency Services?	Driving Emergency Response Vehicles under operational conditions can be stressful and particularly so when responding to a time critical emergency situation. Auditory Exclusion (AEX) and Inattentional Deafness (ID) are both characterised by a temporary loss of hearing that occurs when highly stressed or during high levels of cognitive load. Driving an emergency response vehicle under operational conditions could increase the likelihood that AEX and ID could occur which has implications for road safety. The intent of this research is to investigate the phenomena of AEX and ID in emergency services when driving under operational conditions.
45	Anderson, L. Bates, L. Madon, N.S.	Young Drivers Road Safety Programs Education – general and other Statistical, Epidemiology and Other Road Safety Research Methods	An Educated Prevention: the effectiveness of police-led, school-based driver education programs.	This study examines the effectiveness of police-led school-based education programs in reducing the high-risk driving intentions of young people. Road traffic crashes are the second leading cause of death for young people aged between 15 and 24 years of age (Australian Institute of Health and Welfare, 2015). In 2016, 46 young people were killed on Queensland roads (Bureau of Infrastructure Transport and Regional Economics, 2016), this accounts for 18.47% of the road fatalities which is an over representation on the 13.5% that this age group accounts for within the Queensland population. One key countermeasure used to address this over representation is driver education. There are many different types of driver education (Beanland et al., 2013) (Anderson et al., 2018). A qualitative evaluation of a compulsory pre-learner driver education course in the Australia Capital Territory identified that interactive components and a high level of engagement are important factors in a successful course (Lennon and Bates, 2015). Previous research into driver education and training suggests that apart from providing basic vehicle control skills and road law knowledge, previous driver education programs are ineffective at impacting the crash risk and infringement rate of young drivers (RACV, 2001). The Life Awareness Workshop is a program designed by the Road Policing Command of the Queensland Police Service which is both interactive and engaging for grade 12 students it is delivered to. The Life Awareness Workshop is the police-led education program utilized by this study.

46	Ang, B.H. Lee, S.W.H. Chen, W.S. Yap, M.K.K. Song, K.P. Oxley, J.	Driver Risk Driver Psychology Older Drivers & Road Users Hazard Perception	Transitioning from driver to non-driver: Be safe and not a risk	Driving is fundamental for convenience, freedom, and independence, but there is increasing recognition of the need for many older adults to cease driving, due to age-related functional limitations. While much is known about this transition in developed countries, much less is known about driving cessation in developing countries. This study aims to understand the mechanism of driving cessation involving older Malaysian former drivers. Five themes and 16 sub-themes were identified relevant to driving importance, deciding factors, challenges faced, and strategies adopted. Findings suggest that driving cessation is an outcome of a transition process to discover safer mobility opportunities beyond driving.
49	Donaldson, G.	Enforcement Programs	Targeting Drink Drivers on our Motorways	Operation 'NABBED' was developed to target alcohol affected drivers on the M4 Motorway in western Sydney. The operation was developed to overcome the WHS issues surrounding stationary RBT duties in a 110km/h area. The recent restructure of HWP resources in the NSW Police Force allowed for a large scale traffic enforcement along the entire length of the motorway consisting of Stationary RBT on every westbound off ramp from the M4 Motorway.
50	Luzan, S.	Road Environment Road Safety Strategy Safer Mobility Safer Transport & Mobility	Focusing Investment on Zero - A New Investment Strategy for Victoria's Safe System Road Infrastructure Program (SSRIP)	VicRoads and the TAC (Transport Accident Commission) have recently reviewed the Investment Strategy behind Victoria's Safe System Road Infrastructure Program (SSRIP). The fulfilment of the Towards Zero vision has been the underlying focus in the development of this revised strategy. The strategy seeks to make investments that meet the requirements of a future Safe System by taking into consideration the vehicles, users and speeds which will be part of this future system rather than those which are present today. The strategy also defines a leading role for Movement and Place in road safety investment decision making.
52	Berndt, A. Hutchinson, C. Gilbert-Hunt, S. George, S. Ratcliffe, J.	Statistical, Epidemiology and Other Road Safety Research Methods	Calculating the personal, community and social impact: a social return on investment analysis of vehicle modifications for people with disability	With vehicle modifications (VMs), it is possible for many people with acquired disability to return to driving as part of their rehabilitation goals. VMs can range from simple and relatively inexpensive, to highly complex and costly. Though a number of schemes have funded VMs, it is envisaged that NDIS will become a major future funder of VMs for people with disability. Therefore, it is important for funders and other key stakeholders to understand the personal, community and social impact of VMs to justify such investment. We present our recent findings from conducting a social return on investment analysis of VMs.

53	Cooper, K.	General Enforcement	Police Pursuits in NSW: Just the Facts…and figures	Police pursuits are a contentious area of discussion and often lacks a firm understanding of the actual numbers involved. The NSW Police Force for calendar year 2017 engaged in 2543 pursuits. Each one of these pursuits was monitored, managed and recorded. These records and their analysis provide valuable insight as to who is involved in these pursuits, their duration and corresponding resources applied to them. This in turn informs development of policy and procedures for the NSW Police Force and enables a greater focus for training.
55	Beer, K. Moon, W. Strandroth, J.	Road Safety Audit and Road Safety Review Safer Transport & Mobility	Safe System Assessment: delivering Safe System outcomes	Safe System Assessments quantify the alignment of existing roads or proposed designs with Safe System principles. The output is then presented to the project team who are encouraged to improve their alignment with Safe System principles. From the first 50 Safe System Assessments undertaken in Victoria, a number of design choices reoccur on large projects where there is the ability to improve alignment with Safe System principles and reduce fatal and serious injuries.
56	Poynton, J. McIntyre, J.	Crossings (Pedestrian, School, Rail, Rural/Animal) Pedestrians Road Safety Strategy	Safe Travel to School - Treatments to Encourage Walking and Cycling to Primary School	Darebin City Council supports walking and cycling to school. Between 2012 and 2017 Darebin conducted travel audits on many schools and implemented recommended infrastructure treatments. To identify what should be included in future travel strategies, Safe System Solutions Pty Ltd evaluated a sample of the changes as a result of the audits. The present understanding of risk assessment emphasizes that perceived risk is as important as the technically determined actual risk. In an analogous manner, if a treatment that road safety experts consider highly effective (the actual effectiveness), is unpopular with key stakeholders (the perceived effectiveness) then the process of reconciling such disagreement is an important part of determining effective road safety treatments.

57	Bates, L. Larue, G.S. Hawkins, A. Filtness, A.J. Rodwell, D. Watson, B.	Novice Driver/Rider Licensing	Psychosocial factors, goals for driver education and perceptions of driver education	While previous research has identified benefits from certain types of driver education, there has been little research undertaken regarding how psychosocial factors affect this intervention. This research begins to address this gap by examining how four psychosocial characteristics: thrill-seeking, normlessness, attitudes relating to traffic flow and rule obedience as well as attitudes towards speeding, affect perceptions of what should be taught in driver education courses. An online survey was completed by 114 participants aged 17 to 19 years that had completed a driver education course. A series of regression analyses identified that psychosocial factors have an effect.
58	Freethy, C. Wishart, S. Harris, A.	Drink Driving Drug Driving	Development of a new drink-driving package for Victoria	Alcohol interlocks were first introduced in Victoria in 2003, and drink-driving laws have been progressively strengthened since. Victoria also has long-standing mandatory alcohol and drug education and assessment requirements. In December 2017 legislation was passed that further extends these countermeasures. All Victorian drink-drivers at any illegal BAC reading will now have their driver licences cancelled, while first-time drug drivers face longer suspension periods. All impaired drivers must complete a new behaviour change program, and all drink-drivers will be required to use an alcohol interlock. This strong package of measures will assist in further reducing impaired driving in Victoria.
59	Roberts, S.	Road Environment Communication and Media General Enforcement Crash Investigation – including investigation methods & technology	Picture this - You're In A Traffic Jam. The use of imagery to influence road user behaviour	Picture this, you are in a traffic jam and the queues are long – what would make you feel like you had more understanding of the situation? Would seeing livestreaming video or an image from the crash site increase your empathy for the first responders trying to do their job? In 2015, it was identified that one of greatest challenges facing road policing in Australia was the delays caused as an incident is resolved and the roadway is returned. Research examines if the use of imagery would improve road user understanding and attitude and how this may help first responders.
60	Roberts, S.	Communication and Media General Enforcement	Thanks for the memeories. Better driver behavior, one laugh at a time	Images on social media can be likened to theatre's tragedy/comedy masks when applied to road policing and road safety. While there are many factors which influence road user behavior, can any link be established between a popular social media post and their influence on driver behavior?

61	Bates, L. Anderson, L.	General Enforcement	Partnership policing and road policing: Is there value?	Traditionally road policing has relied on deterrence theory to guide its interventions. However, more recently, there has been interest in exploring alternative frameworks. One possible framework that may be worth exploring within a road safety context is partnership policing. This poster will explore the validity of this approach for young drivers. In this area police could partner with parents. Although further research is required, it does appear that road policing policy and practice could be improved by exploring alternative frameworks such as partnership policing.
62	Park, J. Sung, S. Nam, M. Yun, D.	Road Safety Barriers	Development of non-redirective crash cushions for improving the safety of occupants	The fatal accident was occurred when vehicle collision with road facilities. This research was conducted to prevent collision of pole among facilities on the road. The guideline and manual was reviewed to provide performance criteria to ensure occupant safety. This study was conducted 4 types of simulation to assured the performance of pole protection of the occupant safety. This research was conducted THIV, PHD were used to verified a protection of pole which assured the occupant safety. And then this research proceeded to simulation and on-site test. The results of this study are expected to contribute researches for improving traffic safety.
63	Park, P. Yun, D. Sung, J.	Road Environment Road Design	The analysis of the factors affecting the severity of traffic accident	According to the traffic accident statistics in Korea, the number of fatalities and injuries caused by traffic accidents has been decreasing over the last 5-years. However, since traffic accidents are constantly occurring, it is needed to find out the factors affecting the accident. This study was performed to analyze the factors using the Ordered Probit Model and Random Effect Probit Model. The results of both models were compared to the influence and severity for traffic accidents of vehicle accidents. Independent variables concerning road cross sectional factor and severity of traffic accident were used and the severity of accidents were dependent variables. The results of this study are expected to improve the traffic safety.

64 (also Full Paper)	Karndacharuk, A. Hillier, P.	Road Safety Audit and Road Safety Review Policy Development And Implementation	Contemporary Guidance in Procuring and Managing Road Safety Audits See also: https://doi.org/10.33492/JACRS-D-18-00064	Although there is good awareness of road safety auditing (RSA) as a proactive technique for identifying and mitigating road safety related risks throughout Australasia and internationally, local practices in procuring, managing and conducting audits can vary between jurisdictions. The benefits of more effectively guiding practitioners towards good practice are obvious, as well as the need to better integrate current Safe System thinking into the RSA process. To this end, ARRB was engaged by Austroads in 2017 to manage a revision to the current Guide to Road Safety Part 6: Road Safety Audit (Austroads 2009). This paper presents the scope, method and key outcomes of the revision of the existing guide.
65 (also Full Paper)	Karndacharuk, A. McTiernan, D.	Pedestrians Policy Development And Implementation Speed, Speeding & Travel Speeds	Implementation Principles for 30 km/h Speed Limits and Zones See also: https://doi.org/10.33492/JACRS-D-18-00065	In the context of the Safe System and harm minimisation approach where fatal and serious injuries are not accepted as inevitable costs of mobility in any transport system, there is an increasing need to consider implementing speed limits within the tolerance of road users, especially in urban areas with high pedestrian activity. Through a literature review, stakeholder consultation with Australia and New Zealand road transport agencies and a Safe System analysis, this paper presents the development of potential high-level principles and implementation criteria for 30 km/h speed limits and zones.
67 (also Full Paper)	Tomasevic, N. Horberry, T. Young, K. Fildes, B.	Driver Psychology Autonomous Vehicles	Validation of a driving simulator for research in human factors of vehicle automation See also: https://doi.org/10.33492/JACRS-D-18-00279	This study evaluated the behavioural validity of the Monash University Accident Research Centre driving simulator for research in human factors of automated driving. The study involved both onroad and simulator driving. Twenty participants gave ratings of their willingness to resume control of an automated vehicle and perception of safety for a variety of situations along the drives. Each situation was individually categorised and ratings were processed. Statistical analysis of the ratings confirmed the behavioural validity of the simulator, in terms of the similarity of the on-road and simulator data.

68	Bilston, L.E. Fong, C.K. Brown, J.	Child Restraints Early Childhood Road Safety	Who uses child restraint fitting stations? Results of a parent survey	The use of a child restraint fitting stations has been shown to increase the odds of correct use of child restraints, but their use is not universal. This study aimed to characterize the differences between parents who use child restraint fitting services and those who do not, using an online survey of 470 child restraint users. Of survey respondents, approximately a third had used a fitting station. Fitting stations users had higher levels of education, tended to be more likely to think installation was difficult, and to have purchased their restraint from a specialist baby store.
70	Tucker, J.	Distraction & Inattention Advocacy Communication and Media	#BagAPhoneNotABody: A low cost and high reach social media campaign	Distraction is one of the ‘Fatal Five’ in Queensland, and causes many road crashes and deaths each year. Recognising this deadly problem, RACQ decided to launch a thought-provoking campaign to encourage real change to motorists’ driving habits. RACQ used a collaborative staff workshop to develop the tagline and narrative for the campaign, observational studies to provide data on behaviour and evaluated the campaign using before and after surveys. The campaign proved to be a low-cost and high-reach initiative, with a total spend of less than $5,000 and a total audience of over 4.5 million people.
71	Deller, J. Haque, M. King, M.	Speed, Speeding & Travel Speeds Road Environment Road Design Signage & Signalisation	Effects of lane width and posted speed limit on speed selection behaviour of drivers	Driving speed is a critical factor in road traffic crashes. Empirical evidence suggests that narrow roads and narrow lanes on roads lead to drivers selecting slower speeds. A program of study has been designed to examine the relationship between roadway design parameters and speed selection among drivers using both a driving simulator experiment in the QUT CARRS-Q advanced driving simulator and an observational study. The key research aim is to examine speed selection behavior of drivers in response to geometric feature changes.
73	Eenkhoorn, E.	Crash Avoidance and Crash Severity Reduction	Why Bulk Liquid Cargoes Shall Be Secured For The Safe Transportation In Mobile Tanks	Bulk liquid cargoes have not been secured in mobile tanks primarily because the significance of improving the safety of liquids transportation using means to secure liquid cargoes which include the elimination of any dynamic behaviour of liquids during transportation, had never been established nor fully been realised. Secondly, no bulk liquid load securing means were developed nor become available to bulk liquid transportation companies. Research, recently concluded at the University of Twente, the Netherlands, not only provides for bulk liquid slosh mitigating and securing means but also has demonstrated the need for applying such means.

76	Li, X. Oviedo-Trespalacios, O.	Distraction & Inattention	Can we explain attention-related errors while driving?	Driver inattention is one of the main causes of road crashes. Factors that result in drivers' attentionrelated errors, especially from the perspective of driver characteristics, have not been systematically investigated. This study conducted a questionnaire survey and investigated the inter-relationship between driver characteristics and their attention-related errors. Results indicated that (1) driving experience decreases attention-related errors while driving; (2) a higher frequency of driving violations, high disinhibition, and high susceptibility to involuntary distraction are associated with frequent attention-related errors. The findings shed light on the direction of countermeasures to reduce distracted driving and attention-related errors.
77	Knight, M. Carslake, J. Peppard, F.	Policy Development And Implementation Road Safety Strategy Data Linkage Statistical, Epidemiology and Other Road Safety Research Methods	Black Spots and Telematics: the link between driver behaviour data, road safety, and the Black Spot program	The emergence of vehicle telematics data (location, speed, acceleration etc) for insurance purposes has opened the possibility of using this data to improve road safety. Treatments to Black Spot intersections were used to analyse correlation between telematics data, and the effect of changes to road infrastructure on driver behaviour. Telematics measurements, including harsh braking, were used to compare driver behaviour before and after road safety treatments at three known, high-risk intersections, with a view to identifying the traits of the driver behaviour that change with the inferred improvement of safety that comes with treatments applied at the intersection. Data analysis at the three sites showed negligible change in behaviour, or even a slight increase in harsh braking, though this was not statistically significant. Consequently, no identifiable characteristics of safe or risky driving behaviour could be determined by comparing behaviour before and after a treatment.
78	Jones, S.	Road Safety Strategy Workplace and Work Related Road Safety	On-road and driver fatalities at Toll Group: what the data reveals about risk and opportunity in our pursuit of zero	On-road and driver fatalities at Toll Group: what the data reveals about risk and opportunity in our pursuit of zero. Toll Group is the Asia-Pacific region's largest provider of transport and logistics services, operating across 1,200 locations in more than 50 countries. In 2017 Toll undertook an analysis of all 'on-road and driver fatalities' that occurred in its operations between 1 July 2007 and 31 December 2016. This paper represents the first in-depth public articulation of Toll's research. Our results suggest that key opportunities to influence the road toll are being missed by industry, community and government.

80	Larue, G.S. Rodwell, D. Bates, L. Hawkins, A. Haworth, N.	Young Drivers Hazard Perception Novice Driver/Rider Licensing Driver/Rider Training	Enhancing driver education with driving simulators: what do novice drivers perceive as effective?	Technology developments, and particularly driving simulators, provide an opportunity to bridge the gap between research and practice in driver training. However, few studies investigate how young people are likely to engage with technologically-augmented driver education using driving simulators. This study surveyed novice drivers aged 18 to 20 with provisional driving licenses (N=273) and investigated their perceptions of what medium and high fidelity simulators could be effective at if included in a driver education course. We found that, despite a large focus on procedural skills, novice drivers thought that simulators could be used also for higher level skills, and that it aligned with their expectations about driver education, which suggests that enhancing this countermeasure with driving simulators would be accepted by novice drivers.
81	Shiwakoti, N. Tay, R. Stasinopoulos, P.	Distraction & Inattention	Jaywalking at Signalised Intersections in Melbourne	Vehicle-pedestrian collisions are a major road safety concern because of the relatively smaller mass and lack of protection for the pedestrian. Moreover, the risk of fatality or serious injury resulting from crashes involving jaywalking and distracted walking have been increasing over the last two decades. The objective of this study is to explore the prevalence and contributing factors of pedestrian jaywalking behaviours using video data collected at three locations in Melbourne, Australia. A binary logistic regression model will be applied to examine the influence of gender, apparent age, herding or group behaviour, and use of mobile devices on jaywalking. It will provide useful information to develop suitable engineering, education or enforcement measures to reduce jaywalking behaviour at the intersections.
82	Poulter, C. Freethy, C. Wishart, S.	Speed, Speeding & Travel Speeds Hazard Perception Policy Development And Implementation Workplace and Work Related Road Safety	Regulating safe driving behaviour passing stationary emergency and enforcement vehicles with flashing warning lights	Emergency and enforcement workers perform diverse and time-critical tasks on the road and in roadrelated environments, placing them at risk of being struck by passing vehicles. In response to ongoing concerns from emergency providers and other agencies, VicRoads undertook a collaborative process to investigate the nature of roadside incidents involving emergency or enforcement workers and the feasibility of regulating driver behavior. Informed by research and consultation, a new road rule was introduced requiring drivers and riders to safely slow to 40 km/h when passing stationary or slowmoving emergency and enforcement vehicles with red, blue or magenta flashing warning lights.

85 (also Full Paper)	Young, K. Osborne, R. Koppel, S. Charlton, J. Grzebieta, R. Willamson, A.	Distraction & Inattention Driver Risk Driver Psychology	What are Australian drivers doing behind the wheel? An overview of secondary task data from the Australian Naturalistic Driving Study See also: https://doi.org/10.33492/JACRS-D-18-00085	Using data from the Australian Naturalistic Driving Study (ANDS), this study examined patterns of secondary task engagement (e.g., mobile phone use, manipulating centre stack controls) during everyday driving trips to determine the type and duration of secondary task engaged in. Safety-related incidents associated with secondary task engagement were also examined. Results revealed that driver engagement in secondary tasks was frequent, with drivers engaging in one or more secondary tasks every 96 seconds, on average. However, drivers were more likely to initiate engagement in secondary tasks when the vehicle was stationary, suggesting that drivers do self-regulate the timing of task engagement to a certain degree. There was also evidence that drivers modified their engagement in a way suggestive of limiting their exposure to risk by engaging in some secondary tasks for shorter periods when the vehicle was moving compared to when it was stationary. Despite this, almost six percent of secondary tasks events were associated with a safety-related incident. The findings will be useful in targeting distraction countermeasures and policies and determining the effectiveness of these in managing driver distraction.
86	Gruyer, D. Chapoul, J. Glaser, S.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure Autonomous Vehicles Computer Simulations - Restraints, Human Body, Vehicle (ITS - vehicles) Intelligent Transport Systems in Vehicles	Simulation Platform for the Prototyping, Testing, and Validation of Cooperative Intelligent Transportation Systems at Component Level	Cooperative Intelligent Transport Systems (C-ITS) are widely considered as the next major step in the development of driving assistance systems (ADAS), and Autonomous Vehicle (AV), aiming at increasing robustness of information for algorithms thus, increasing services, safety and comfort aspects for drivers. Infrastructure managers also benefit from C-ITS data as up-to-date and detailed information about road uses. Simulation platforms that allow prototyping and evaluating of such applications, are crucial. We propose a virtual cooperative simulation platform which integrates models and tools for road environments modelling, embedded virtual sensors and communication devices, which are all consistent with the laws of physics.

87	Milne, V.	Community Programs Road Safety Programs Advocacy Education – general and other	Frontline Support - Enhancing Child and Family Health Nurses' Knowledge about Child Car Seats	In NSW, a significant burden of injury and death of children is road related, including children as passengers in vehicles. Child and Family Health Nurses (CFHN) are uniquely positioned to reach families, especially in regional, rural and remote areas. Kidsafe NSWlaunched a four-staged project, funded by Transport for NSW, to increase awareness and understanding of road rules and child car seat use. Evaluation of the project showed that the CFHN participants gained knowledge and passed this information to parents and carers of young children. The project reached 537 CFHN, which carries a potential reach of 7500 families per week.
88	Haythorpe, B. Rasch, A.	Young Drivers Novice Driver/Rider Licensing Driver/Rider Training	Keys2drive: the evolution continues	Keys2drive, Australia's largest-ever learner-driver education program, recently celebrated two milestones – its eighth birthday and its 500,000th participant. Keys2drive is aimed at arresting the overrepresentation of novice drivers in road trauma across Australia. Citizens aged 17-25 comprise only 13% of the Australian population, but more than 20% of the annual road toll (Senserrick, 2015). In 2009, when Keys2drive lessons began, there were 291 road crash fatalities among drivers and passengers aged 17-25, which equates to 28% of the total number of fatalities. In 2016, that number dropped to 192 (BITRE, 2016), or 23% of the total. Although not solely responsible, Keys2drive has helped shape this outcome by boosting the skills, confidence and risk management of novice drivers and their supervisors.
89	Sarrami, P. Hall, B. Lemin, P. Dinh, M. Lassen, C. Balogh, Z. McDougall, D. Wullschleger, M. Dale, K.	Temporary Road Works	Are highway constructions associated with increased transport incidents? A case study of NSW Pacific Highway construction zones 2011-16	Construction zones are associated with higher rates of transport incident. While these incidents are preventable, there is limited data in Australia on the effects of high way construction zones on the rate of transport incidents. This is a retrospective study focused on the construction zones and periods along the NSW Pacific Highway and aims to investigate if the number of people who have major trauma as a result of a transport incidents in construction zones is higher than the number of people with incidences in highways out of construction zones.

90	Glaser,S. Gruyer, D. Orfila, O.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Local and global evaluation of risk, impact of C-ITS	Nowadays, an increasing number of assistances is available to help the driver: they are growing toward automated functionalities. Given the sensing capacities, it now becomes possible to have a local view of the surrounding and, with existing communication capacities, this view can be shared. Standardization activities show even that future messages exchanges between vehicles and with the infrastructure will provide an in-depth knowledge of surrounding vehicles dynamic states and position. We propose to provide a broader and more accurate understanding of the traffic situation, at the vehicle level and infrastructure manager level using high level indicator as risk definition. At the vehicle level, it allows a faster evaluation of the surrounding, simplifying decision process. At the infrastructure level it enables a fine description of the road usage.
91	Long, A. Hughes, G.	Road Environment Pedestrians Policy Development And Implementation Safer Transport & Mobility	Defining Practical "Consistent Look and Feel" for Light Rail Customers and Road Users	With the move towards integrated public transport systems, providing a consistent look and feel for both customer service and marketing purposes has become more important than ever. The Human Factors profession recognises that consistency in the system can reduce injuries and errors, increasing safety. However, consistency in look and feel is not well defined. This paper describes how a transport agency defined what is meant be consistent look and feel so that the benefits of consistency could be gained without providing unnecessary constraints on the systems designers. The result is a publically available guideline for suppliers of light rail to NSW.
92 (also Full Paper)	Thompson, J. Wundersitz, L. Raftery, S.	Drink Driving Drug Driving Driver Psychology Road Safety Programs	Evaluation of the performance of Alcohol and Drug Awareness Courses currently provided in the ACT See also: https://doi.org/10.33492/JRS-D-18-00277	This study evaluates the performance of Alcohol and Drug Awareness Courses (ADAC) provided in the Australian Capital Territory. The following were examined: key performance indicators on the provision of ADACs, their efficacy in changing the attitudes and knowledge of attendees, and their effect on drink driving rates in the ACT. Completion rates for individuals enrolled in the courses have been increasing. Surveys of attendees suggested that the courses improved their attitudes towards drink driving. Also, ADACs may have contributed to reductions in drink driving detections. Based on these findings, the ADAC program has been performing well since its inception.

93	Wundersitz, L. Bailey, T. Thompson, J.	Novice Driver/Rider Licensing Young Drivers	Are young adults' licensing rates still declining?	Declines in young adult driver licensing have been reported in several countries. This study provides an important update of such trends in Victoria and includes new data by gender and location. Across 2001-2016, there was an 18% decrease in young adults aged 18-24 holding a driver licence with over a third not holding a licence in 2016. Females were less likely than males to be licensed at all ages. Those living in the Greater Melbourne area or regional centres were less likely to be licensed than those dwelling in the remainder of Victoria. The findings have implications for road safety.
94	Shalkamy, A. El-Basyouny, K. Gargoum, S.	Road Safety Audit and Road Safety Review Road Safety Strategy	Using LIDAR Data to Enrich the Diagnosis of Safety Pproblems and Collision Causes	The current practices of diagnosing safety problems are associated with many challenges such as the reliance on manual observations, intra- and inter-observer variability, time consumption, and the great effort required to conduct a large-scale diagnosis of an entire road network. This research advocates using LiDAR data to create an accurate 3D model of crash-prone locations which would help identify potential safety problems in a robust and efficient manner. To diagnosis safety issues, different algorithms are used to extract and evaluate roadway features such as available sight distance, horizontal and vertical curves characteristics, cross-section elements, and lateral placement of roadway signs.
95	Sawyer, A. Catan, N. Still, A. Young, G.	Motorcyclists	RAC Motorcycling Survey 2017	The rate at which motorcyclists are being killed or seriously injured on Western Australian roads is growing. To better understand how the safety of motorcyclists can be supported, RAC conducted a survey of Western Australian drivers and motorcyclists, which was exploratory in nature with the overall aim of understanding usage, riding behavior, attitude and perceptions of road users about motorcycling behavior and challenges. As well as showing that there are differences related to rider age, type of vehicle and usage, the survey results identified a number of initiatives which could improve the safety of motorcyclists.
96	Coulson, E. Cassar, D.	Road Design Road Environment Road Furniture (Poles, Signs, Etc) Road Safety Barriers	Putting Safe System into Practice - Safe System Roadside Design Principles	To support the rollout of Victoria’s Towards Zero Strategy which looks to address lane departure accidents on 20 of its highest risk roads, VicRoads Network Design Services – Safe System Design Team, developed a design guideline for practitioners on the application of continuous barrier treatments based on existing hazard treatment principles with a number of evolutionally learnings along the way. Practitioner/Policy Focused.

97	Coulson, E. Cassar, D.	Crossings (Pedestrian, School, Rail, Rural/Animal) Intersections and Roundabouts Signage & Signalisation	Putting Safe System into Practice - Raised Safety Platform Guidelines	To support the rollout of Victoria's Towards Zero Strategy which looks to address intersection and midblock crashes, VicRoads – Network Design Services – Safe System Design team developed a technical guideline for design practitioners on the application of these treatments. We took learnings from sites both within Australia and abroad and considered the limited research available to formulate criteria and design guidance and considerations for practitioners around various aspects of the treatments. The plan is to take the audience via presentation through the development experience and evolution of the guideline document as well as some of the learnings and amendments currently underway to improve it. Practitioner/Policy Focused.
98	Coulson, E. Cassar, D.	Road Safety Barriers	Understanding and Improving the Performance of a Public Domain Guard Fence System	For over 30 years Australian State Road Authorities have been using public domain guard fence systems as the primary roadside barrier on their networks. As crash testing standards have evolved and improved over time very little has been done to understand the performance of these systems and to look for improvements, particularly as we all have 1000s of kms already installed on our network and as better systems have been developed by industry. This abstract proposes to take those interested through the journey VicRoads has taken to understand the performance of its public domain guard fence system and look to improve it. Research Focused.
99	Shrubsall, S. McMillion, M. Natário, I.	Road Safety in a Global Perspective Road Safety Strategy Road User Training – General (Bicyclists, Workplace, OHS, Etc.) Statistical, Epidemiology and Other Road Safety Research Methods	Child Road Safety in Bangkok: implementing local measures whilst advancing international awareness and collaboration	If child road accidents are to be eliminated, opportunities for collective local actions need to be greatly increased. This paper reports on the preparation and development of the first Road Safety project benefiting from a Rotary Global Grant. Data for the exercise was collected in-situ and analyses were carried out to assess the impact of the measures. The study aimed at providing helmets for children in two schools in Bangkok and contributing to reshaping road users' behaviours. Furthermore, this (mostly) Australasian multi-partner collaboration changed policies at international level which have the potential to improve Road Safety worldwide.

101 (also Full Paper)	Hughes, B. Falkmer, T. Anund, A.	Policy Development And Implementation Road Safety Strategy	The Relevance of Australasian Road Safety Strategies in a Future Context See also: https://doi.org/10.33492/JACRS-D-18-00101	The improvements to road safety since the 1970's are becoming increasingly difficult to sustain in many developed countries. This paper analyses ten Australasian Government road safety strategies against three key criteria: 1. a comprehensive framework for road safety, 2. anticipated changes to transport and the economy, and 3. the changing and variable nature of future transport and its context. The analysis concludes that current Australasian road safety strategies are weak in some areas of content and do not address future challenges. Improvements are suggested to the strategies' thoroughness and robustness.
102 (also Full Paper)	Chan, H. Chiang, T. Yip, R. Shih, Y. Ho, V. Brar, R. Brubacher, J.	Driver Risk Older Drivers & Road Users	Driving Ability and Transportation Needs of Elderly Drivers: A Prospective from Emergency Department Elderly Patients See also: https://journalofroadsafety.org/article/32146-driving-ability-andtransportation-needs-of-older-driverstreated-in-an-emergency-department	The number of Canadians over 65 is growing faster than anticipated. Since older adults live independently longer and stay more active, many will continue to depend on driving to meet their transportation needs. Older drivers are mostly safe drivers; however, with advancing age, many older adults develop medical conditions that affect their driving ability and often lead to driving cessation. Often these medical conditions are first recognized in emergency department (ED) when patients present with an acute illness or injury. We proposed to interview elderly drivers who attend the ED to examine their driving ability and transportation needs.
103	Ziekemijjer, P.E. McIntyre, A.	Crash Data Analysis Data Linkage Policy Development And Implementation Road Safety Strategy	Victorian Pilot Data Linkage: Match Rates and Serious Injury Metrics Sustained in On Road Transport Crashes	A Victorian pilot project merging hospital, police and TAC data for one year was established. The dataset includes 68,639 cases of transport/road-related injury; 62% of which were from an on-road crash. Dataset linkage rates of cases showed 33% were police-reported crashes with no hospital data link; 10% were police-reported with a hospital admission; 10% were police-reported linked to an emergency only presentation and 45% had hospital data with no link to a police report. 14% of cases had MAIS2+ injury levels accounting for more than 81% of the total burden of injury.

105	Bonham, J. Johnson, M. Haworth, N.	Bicyclists Novice Driver/Rider Licensing	Cycle-Aware: Preparing novice drivers to interact safely with cyclists	Improving infrastructure and educating drivers and cyclists are two responses to cyclist safety. This paper reports on stage one of Cycle-Aware, a three year study targeting novice driver education and training. The content analysis of education and training materials revealed limited and inconsistent advice on interacting with cyclists who are represented in neutral or negative terms while drivers are represented in positive terms. Many stakeholders interviewed were unsure of what advice to offer novice drivers beyond ‘sharing the road’. Some recommended education on cyclist vulnerability, the rationale for cyclist-related road rules, contextualizing cyclist behaviours, and specific guidance on common interactions.
106	Tsirlina, H. Hall, B.	Autonomous Vehicles Policy Development And Implementation	A safety assurance system for automated vehicles - addressing safety risks arising over the automated vehicle lifecycle	The presentation describes the National Transport Commission’s (NTC) development of a safety assurance system for automated vehicles to ensure the road safety benefits of these vehicles are realised. The NTC is focusing on achieving policy reform to support the safe, commercial deployment and operation of automated vehicles in Australia. The presentation focuses on policy options to address safety risks associated with deploying automated vehicles, including an early indication of the optimal option based on cost benefit analysis. The presentation also considers how safety risks under illustrative scenarios arising over the automated vehicle’s lifecycle may be addressed under each option.
107	Hassan, A. Regan, M.A. Casey, N.	Road User Behaviour and Human Factors Road Environment Road Design Motorcyclists	Designing Road Tunnels to Optimise User Experience and Safety: A User-Centred Approach	User-centred design puts user needs and requirements at the center of product design and development. This paper outlines an approach used to define road user needs to optimise the customer experience and safety in Sydney road tunnels. This involved a literature review, focus groups and a self-reported online survey to obtain information regarding what drivers/riders do and do not like about driving in tunnels, and what they perceive they need and would like to see in future tunnels. Six focus group discussions, and three separate interviews, were conducted with Sydney tunnel users. Five hundred respondents completed the survey. This paper describes the study aims, methods and findings.

108 (also Full Paper)	Durdin, P. Clark, K. Draper, J.	Policy Development And Implementation Road Safety Strategy Financing Road Safety Road Safety Programs	Exploring Local Government Challenges in Effective Road Safety Delivery See also: https://doi.org/10.33492/JACRS-D-18-00108	Half of all vehicle kilometres travelled and 62% of all deaths and serious injuries in New Zealand occur on local government roads. The upward trend in road trauma has revealed a growing disparity in safety performance between locally and centrally managed roads. The increasing gap, which is mirrored by differing levels of investment, was the stimulus behind a national project to understand the dynamics of local government road safety delivery and investment. Engagement workshops with local councils throughout New Zealand uncovered an array of common challenges – some of which were not anticipated when the project commenced.
109	Qiu, J. Logan, D.B. Oxley, J. Lowe, C.	Heavy Vehicles - Trucks, Buses, Hazardous Materials	An evaluation of the roadworthiness of Victorian buses	As part of a project investigating the relationship between bus roadworthiness and safety outcomes, this study examined annual inspection results to identify the incidence and characteristics of mechanical failures. The findings showed that about one in five buses had issues that may have compromised safety, with Body & Chassis and Steering & Suspension comprising the highest incidence of defects. Registered buses were much less roadworthy than accredited ones. Vehicle age was found to be an important influential factor, with the effect varying across operation type. The implications of the findings in enhancing bus roadworthiness and safety were discussed.
110	Strandroth, J. Moon, W. Corben, B.	Policy Development And Implementation Road Safety Strategy	Zero 2050 in Victoria	Several countries and overseas jurisdictions have formulated ambitious road safety targets by setting a date for achieving Vision Zero. By targeting zero with a date for Victoria, much can be done in the next few years to prepare for the major challenges faced in moving close to zero. The aim of this paper is to map a road trauma elimination agenda to 2050 by outlining step changes and requirements of roads, vehicles and road users. A plausible zero scenario can be developed, but it will bring some major challenges including a clearer safety philosophy than what exists today.

111 (also Full Paper)	Turner, S. Tate, F. Wood, G.	Road Design Intersections and Roundabouts Crash Data Analysis	The crash performance of seagull intersections and intersections with left turn slip lanes See also: https://doi.org/10.33492/JACRS-D-18-00111	Alternative intersection layouts may reduce traffic delays and/or improve road safety. Two alternatives are reviewed in this research: 'priority controlled Seagull intersections' and ‘intersections with a Left Turn Slip Lane’. Seagull intersections are used on roads to reduce traffic delays. However, some do experience high crash rates. Left Turn Slip Lanes allow turning traffic to move clear of the through traffic before decelerating thereby reducing the risk for rear end crashes. Although there is debate about the safety problems that occur at Seagull intersections and Left Turn Slip Lanes there has been very little research to quantify the safety impact of different layouts. In this study, crash prediction models have been developed to quantify the effect of various Seagull intersection and Left Turn Slip Lane designs on the key crash types that occur at priority intersections. In this study, crash prediction models have been developed to quantify the effect of various Seagull Intersection and Left Turn Slip lane designs on the key crash types at priority intersections.
112	Beck, B. Chong, D. Cameron, P. Johnson, M.	Bicyclists	How much space to vehicles provide when passing cyclists? The impact of vehicle type and road infrastructure	To reduce cyclist crashes and related injury, and improve the infrastructure provided to cyclists, there is a need to greater understand the distance vehicles provide when passing cyclists. To address this, we conducted an on-road observational study using a purpose-built device mounted on participants’ bicycles. Sixty-three participants recorded 18,246 passing events, of which 6% were closer than one metre. Compared to roads with no marked bicycle lane and no parked cars, passing events in which the cyclist was riding in a marked bicycle lane next to parked cars resulted in passing distances that were 0.41m closer.
113	Beck, B. Smith, K. Mercier, E. Cameron, P.	Ambulance and Emergency Services	Potentially preventable road trauma deaths in Victoria	The majority of road trauma deaths will occur in the prehospital setting. However, these deaths have not been subject to the same scrutiny as in-hospital deaths. This study aimed to provide an overview of road trauma deaths and identify situations in which these deaths may have been prevented. Between 2008 and 2014, there were 1,374 deaths resulting from road traffic events in Victoria. Of the deaths that had a full autopsy and had attempted resuscitation from paramedics, 55 had ‘potentially survivable’ injuries. Of these, 45 were considered not preventable and 10 considered potentially preventable or preventable road trauma deaths.

114	Hirsch, L. Mackie, H. Scott, R. de Pont, J. Douglas, S. Thomsen, D.	Driver Risk Driver Psychology Crash Data Analysis	For whom didn’t it click? A study of the non-use of seat belts in motor vehicle fatalities in New Zealand	The aim of this research was to determine profiles of a representative sample of seat belt non-users who were killed in motor vehicle crashes in New Zealand between 2011-2015. A Safe System analysis of 186 vehicle occupant fatality reports (n=200 fatalities) was conducted and 63 variables were coded for each case. A Multiple Correspondence Analysis explored relationships between the variables and identified five clusters of individuals with similar characteristics. The profiles were: ‘young and risky’; ‘driving for work’; ‘elderly and retired’; ‘passengers from overseas’; and ‘people driving in rural settings’. Initiatives to reduce seat belt non-use road deaths should consider what will most likely influence these various groups, acknowledging that each profile may need to be targeted with a different approach.
115	Mackie, H. Scott, R. Hirsch, L. de Pont, J. Douglas, S. Thomsen, D.	Speed, Speeding & Travel Speeds Driver Risk Road Environment Crash Data Analysis	Comparing crashes: A Safe System analysis of serious injury and fatal crashes in New Zealand	Serious injuries account for the greatest proportion of the social costs of New Zealand’s road trauma, yet there is limited understanding of the differences in system failures between fatal crashes and those that result in serious injuries. Using a Safe System analysis framework, this research compared the circumstances of 200 serious injury crashes and 100 fatal crashes involving light vehicle occupants. This framework included criteria for ‘triggering’ each system pillar. The research shows that serious injury crashes are less likely than fatal crashes to involve complete system failure and that all pillars of the Safe System require attention if tangible road safety improvements are to be expected.
116	Oakley, W.	Road Safety Programs School Safety Education – general and other	Identifying road safety knowledge gaps in Tasmanian Grade 3 and 4 students	Due to a gap in coordinated, innovative road safety education tools in Tasmania, RACT RoadSafe was developed and launched in 2017 and piloted in five Tasmanian primary schools in Term 4. The resource is designed for students to better explore road safety independently, in small groups and/or in a classroom. Students have access to videos, games, activities and a comprehensive quiz set which all explore pedestrian safety, passenger safety, safety on wheels and basic street sign knowledge. Importantly, student performance in the quiz component generates background data to identify gaps in road safety knowledge.

117	Newstead, S. Mulvihill, C. Bud, L.	Crash Avoidance and Crash Severity Reduction Policy Development And Implementation Fleet Safety	Priorities for improving the safety of the Victorian taxi fleet	This study aimed to assess the relative merits of age based limits as a tool for governing taxi safety in comparison to other potential policy options including mandating minimum vehicle secondary safety performance, mandating various crash avoidance technologies and behavioural measures to reduce crash risk such as driver training and monitoring. Results showed that age limit restrictions were a weak mechanism by which to govern taxi safety with other options such as improved secondary safety standards, mandating vehicle crash avoidance technologies and introducing effective driver focused measures such as training, licensing and behavioural monitoring, predicted to have much greater safety benefits.
118	Thompson, J. Wijnands, J. Mavoa, S. Scully, K. Stevenson, M.	Driver Psychology Bicyclists Road Safety Strategy Statistical, Epidemiology and Other Road Safety Research Methods	Evidence for the 'safety in density' effect for cyclists; validation of agent-based modelling results	Time-gap analysis of cyclists passing through an intersection was conducted using five hours of video-observation of a single intersection in Melbourne, Australia, where motorists were required to ‘yield’ to oncoming cyclists. Results demonstrated that potential collisions between motor-vehicles and cyclists reduced with increasing cyclists per minute in a manner analogous to the SiN effect. These results successfully validate ‘synthetic’ data gathered using agent-based models, supporting evidence of a proposed causal mechanism related to safety in density (SiD) rather than safety in numbers, per se. Results suggest that increased cyclist safety may be achieved through creating highdensity strategic cycling corridors.
119	Doble, N. Cheung, I.	Speed, Speeding & Travel Speeds	Recommendations to Reduce Speeding-Related Crashes in the United States	The National Transportation Safety Board (NTSB) is a United States government agency charged with investigating transportation accidents, studying transportation safety issues, and issuing recommendations to prevent future accidents. The NTSB recently completed a study of countermeasures to reduce speeding-related crashes, focusing on five areas: (1) speed limits, (2) datadriven enforcement, (3) automated speed enforcement (ASE), (4) intelligent speed adaptation (ISA), and (5) national leadership. This paper summarizes the study findings, details how the NTSB leveraged research and countermeasures from the Australasian region to develop safety recommendations, and highlights differences in speed management approaches between the United States and other countries.

120	Perry, C.	Community Programs Advocacy	The power of partnership: lessons from Road Safety Week	Partnering with other organisations can help to develop effective, successful road safety initiatives. This presentation will explore how initiatives such as Road Safety Week can be used to engage communities and organisations at a grassroots level, whilst also raising awareness of key messages on a larger, national scale. It will discuss how partnerships between statutory agencies and NGOs can benefit such initiatives, and how giving ownership of activities to communities can empower them to start campaigns that run beyond the week and engender tangible change to road safety in their area. Case studies will be presented from New Zealand and the UK, along with key points for organizing a successful week and developing effective partnerships in your organisation, region or country.
121	Gribble, D.	Bicyclists Pedestrians School Safety Early Childhood Road Safety	Bringing the streets into the classroom: Using Augmented Reality in primary schools to teach road safety awareness	Constable Care Child Safety Foundation, in partnership with augmented reality design company DSBS, have developed a world-first road safety learning application for primary schools. The curriculum-linked app lets teachers run engaging augmented reality road safety lessons in the classroom on their school tablets, delivering real-time pre-post measurement and post analysis of students change in knowledge in pedestrian, cyclist and public transport learning areas. Students engage in interactive decision-making in relation to portrayed risks such as road crossing, school zones, bus stops etc. A gamification reward approach motivates students to correctly identify answers. Two separate experiences tailored to younger (4-7 years) and older (8-11 years) children have been developed, providing different age-appropriate experiences. Teachers control the experience in class, starting it and stopping it through a master app, seeing student progress in the learning scenarios in real time, and accessing additional road safety teaching material to further enhance their experience.
122	Smith, S. McCarthy, T. Dalton, S. Johnson, M	Bicyclists Community Programs Driver/Rider Training Road User Training – General (Bicyclists, Workplace, OHS, Etc.)	Safer cycling for women: an evaluation of a cycling skills training program	In Australia, the most frequently reported barriers to cycling for females are safety concerns and lack of knowledge. In this initiative, a cycling skills training program was made available to women aged 50 years and older who are not regular cyclists. Comparison of cycling behaviour pre-and-post program show that skills training, supported rides and an environment to discuss safe cycling practices to increased cycling among the women. Importantly, participants report increased feelings of safety when riding.

123	Toynton, R.	General Enforcement Enforcement Programs	NSW Police Force - Traffic and Highway Patrol. A response to serious road trauma and non-compliance in the Heavy Vehicle Industry	The Traffic Taskforce (Formally known as the Joint Traffic Taskforce) was formed in 2014 after a string of Heavy Vehicle incidents on the NSW road network. The Taskforce's main role is to provide the NSW Police Force an ability to rapidly respond to high risk incidents/non compliance involving Heavy Vehicles and investigate these incidents against the requirements of Heavy Vehicle legislation. In the past four years the Taskforce has conducted numerous reactive and pro active interactions with Operators within industry, with very positive outcomes.
124	Cosgrove, L.	Indigenous Road Safety Community Programs Advocacy Early Childhood Road Safety	Road safety education: improving outcomes through community collaboration	Transport-related injuries are a leading cause of death in children under 14 in Australia. The NSW Road Safety Plan 2021 commits to ongoing road safety education from early childhood through schooling. An enduring partnership with Transport for NSW (TfNSW) enables Kids and Traffic to work with early childhood organisations to support children, families and communities to improve safety outcomes. An online resource, Safe Journeys Safe Communities, showcases Kids and Traffic community-focused road safety collaborations. Kids and Traffic resources and professional learning workshops inspire early childhood organisations to address local road safety issues to reduce road trauma.
125	Logan, D.B. Allen, T. Young, K. Jones, C. Ballingall, S.	Crash Avoidance and Crash Severity Reduction Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Safety benefits of connected and automated driving technologies in Australia and New Zealand	Two rapidly developing technology areas, Cooperative Intelligent Transport Systems (C-ITS) and Automated Driving (AD) applications, are likely to have a substantial impact on road trauma through assisting drivers with the driving task and providing enhanced crash avoidance capabilities. This study aimed to identify emerging C-ITS and AD applications and assess their potential safety benefits for Australia and New Zealand. Using an analysis of a sample of Australian serious injury real-world crashes, expert estimates were made of the potential effectiveness of several light passenger vehicle applications in preventing each crash. Following this, the outcomes from the crash sample were scaled using aggregate serious injury crash data to project annual savings across Australia and New Zealand.

126	Esmaeilikia, M. Radun, I. Grzebieta, R. Olivier, J.	Bicyclists Driver Psychology Personal Protection – Helmets, Clothing, etc. Statistical, Epidemiology and Other Road Safety Research Methods	Is There Evidence to Support the Risk Compensation Hypothesis for Bicycle Helmet Use?	A long-standing argument against bicycle helmet use is the risk compensation hypothesis. Multiple studies have examined the effect of bicycle helmet use on risky behaviour showing mixed findings. There have been no systematic reviews on bicycle helmet use and risky compensation to date. The current systematic review includes peer-reviewed literature studies conducted across eight countries. The findings of this study shed light on the potential association between bicycle helmet wearing and risky behaviour.
127	Starkey, N.J. Charlton, S.G. Graham, P.	Drug Driving	Prevalence of drugged driving in New Zealand	In 2014 the New Zealand Transport Agency commissioned a research project designed, in part, to establish a quantitative picture of the type and the extent of drugged driving in New Zealand, by both legal and illegal drugs. A stratified telephone survey (n=2000) and internet survey (n=546) were conducted to explore the extent of drugged driving. Other than alcohol, the drugs most commonly taken prior to driving were strong opioid-based painkillers, antidepressant medication, anti-nausea medication, cannabis and anti-anxiety medication. A large proportion of drivers also reported taking combinations of different drugs prior to driving.
128	Corben, B.F. Fildes, B. Sohbani, A.	Crossings (Pedestrian, School, Rail, Rural/Animal) Intersections and Roundabouts Pedestrians Statistical, Epidemiology and Other Road Safety Research Methods	An Evaluation Framework for Pedestrian Safety in Victoria	Walking is undergoing a marked revival; urban living, health considerations and the need for sustainable transport are key reasons. However, more walking can mean increases in severe trauma. This paper describes a practical, scientifically-based evaluation framework to assess a program of thirty projects designed for Safe System performance. Victoria's Safe System Road Infrastructure Program includes $100 million for a variety of pedestrian (and cyclist) safety measures, only some of which have been reliably evaluated. Given the program's financial and geographic scale, early, comprehensive indications of effectiveness of individual treatments and of combinations of treatments will enhance future targeting of investment.

129	Harris, D. Le, J. Bobbermen, D. Durdin, P. Smith, D.	Road Design Road Safety Audit and Road Safety Review Policy Development And Implementation Road Safety Strategy	Best Practice in Road Safety Infrastructure Programs	Traditionally, investment in road safety infrastructure in Australia and New Zealand has taken a bottom-up approach by targeting locations with an established safety problem. While this approach has served both countries well, it does not fully embrace the Safe System philosophy on which each country's road safety strategies are based. This paper presents the results of an Austroads research project which identifies best practice recommendations for Road Safety Infrastructure Programs that align with the Safe System approach. When implemented, this best practice approach will effectively contribute towards a safer transport system with fewer fatalities and serious injuries.
130	Baldock, M. Dutschke, J. Thompson, J.	Driver Risk Older Drivers & Road Users Road Design	Older drivers may not have a greater risk of intersection crashes than drivers in younger age groups	Crash patterns for older drivers/riders were examined using ten years of crash data from New Zealand and every jurisdiction in Australia. Consistent with the literature, older drivers/riders had a higher proportional rate of intersection-type crashes. However, once population numbers and numbers of licensed drivers were controlled for, older drivers/riders were not found to have a higher rate of intersection crashes than those in younger age groups. Intersections do not pose any greater risk of a crash to older adults. Nonetheless, given their frailty, intersection safety measures are still needed to improve safety for older drivers/riders.
131	Orr, G. Lovegrove, L. Mackenzie, R.	Crash Data Collection Crash Data Analysis Data Linkage	Crash data - when it's wrong, are we putting more lives at risk?	Port Stephens Council in NSW, is proactive in road safety and is evident by Council's award winning educational programs & civil projects. Local Government relies on accurate data to review and design treatments that aid in the reduction of casualty crashes on local roads. Council is increasingly concerned over misreporting of crash locations within our LGA in official records and is questioning how widespread the issue is? Misreported crashes, unless corrected, can be a domino effect of treatments in the wrong location to treat nonexistent crashes and at worst, misappropriation of Government funding in this critical area of national focus.

132	Hatfield, J. Senserrick, T. Boufous, B. Williamson, A. Mooren, L. Sakashita, S. Job, J.	Driver Risk Driver Psychology Penalty Systems	Self-reported response to a licensing point system	An online survey of New Zealand car license holders was conducted to advance understanding of how individuals respond to licensing points. Results suggest that there are that the majority of drivers aim to drive in a manner that avoids demerit points. The smaller group of drivers who drive more carefully when they have a few points, are perhaps the primary target of licensing point systems, and may be responsive to system refinements such as increasing the number of points that apply to particular offenses and increasing the points lifetime). A small minority of drivers report that they are not influenced by demerit points, at least in part because they are prepared to drive with a suspended license.
133	Timms, M.	Hazard Perception Crossings (Pedestrian, School, Rail, Rural/Animal) Education – general and other Enforcement Programs	Partnering for Road Safety at Level Crossings: New South Wales Traffic and Highway Patrol Command	Between April 2012 and January 2018, three vehicle occupants died in crashes with trains at level crossings (LX's) in NSW. Some 2,000 lives were lost in all road crashes over the same period. LX crashes may be low likelihood, but the consequences are extreme. On 4 January 2018, 19 people were killed when a truck ploughed into a passenger train in South Africa. How then can authorities apply safe systems thinking to drive behavioural change? Working with an expanding range of partners, NSW Police Traffic and Highway Patrol Command leads LX programs and initiatives that go well beyond enforcement.
134	Hatfield, J. Poulos, R. Murphy, S. Rissel, C.	Bicyclists	Adults' experience of safety issues when riding with children	Supporting children to develop a habit of bicycle riding helps to protect them against a range of diseases associated with inactivity. An online survey of adult bicycle riders was conducted to advance understanding about safety issues of riding with children. A large majority of respondents who reported riding with children specified risks particular to riding carrying, or riding with, children. Many respondents highlighted risks associated with riding on footpaths but reported that they avoid riding on roads with children. Among crashes with a child on the bicycle, most were falls, and "tagalong" carriers appeared to be overrepresented. Findings suggest the importance of communicating with parents about safety issues that they may encounter when riding with children, and highlight the importance of providing environments which can safely accommodate the characteristics of bicycles carrying children (in terms of stability and handling) and bicycles ridden by children (with their developing capacities).

136	Young, D. Nieuwesteeg, M. Ziekemjjer, P. Strandroth, J. Logan, D.	Crash Avoidance and Crash Severity Reduction Autonomous Vehicles Crash Data Analysis	Road Safety Benefits of Level 3 and Level 4 Connected and Automated Vehicles and Fleet Transition	The road safety benefits of Connected and Automated Vehicles (CAVs) will likely be significant. However, there is much debate around the risk of trauma during the transition to this future. A topic that is the subject of the most divided opinion is if there is a need to transition through all the levels of automation. Some experts suggest that there is a need to 'skip' some levels (Noy, Shinar, & Horrey, 2018) while others have suggested all levels are required for the best outcome (Ma & Kaber, 2005). This research examines these two views using real world data.
137	McDonald, H.M. Berecki-Gisolf, J. Stephan, K. Newstead, S.	Driver Risk General Enforcement Enforcement Programs Penalty Systems	Road traffic infringements and crash risk: Is there evidence of a deterring influence?	This paper presents the results of a case-case-time-control study that aimed to determine whether infringements for traffic offences have a deterring influence on driver behaviour, measured by crash involvement. Licensing, infringements and crash data from Victorian drivers aged 40+ was used. The risk of receiving an infringement in the period prior to a crash was higher than in a comparable period. Infringements may not be effectively changing driver behaviour, and thus reducing the risk of crash involvement. Other approaches to changing driver behaviour may be necessary in order to enhance safety on the roads.
138	Lewis, I. Watson, B. White, K.M.	Driver Psychology Communication and Media Education – general and other	Exploring the effectiveness of different types of humour in road safety advertising campaigns	Recently, in Australia, road safety advertising campaigns reflect an increased reliance upon messages that incorporate positive emotions including humour. Evidence, however, is lacking regarding the extent to which different types of humour are associated with persuasive (or dissuasive) effects. This study, based on an in-depth qualitative investigation with N = 18 licensed drivers, addressed this gap by exploring the effectiveness of different types of humour. The findings revealed that humour that was clever, incorporated something unexpected and contrasting with the everyday, was a preferred and relevant approach, thus aligning with humour types, such as comic wit and satire.

140	Beck, D. Leavy, D.	NCAP And Consumer Test Ratings Biomechanics Motorcyclists Personal Protection – Helmets, Clothing, etc.	Developing the Motorcycle Clothing Assessment Program	The Motorcycle Clothing Assessment Program (MotoCAP) has been established as an Australian/New Zealand program to provide motorcycle riders with an independent assessment of the relative performance of their garments for thermal comfort and protection. The protection rating is based on the garment's abrasion resistance, impact protection and burst strength. The program will enable consumers to select clothing based on performance, which is expected to drive demand for better-performing garments and result in increased supply and use of such garments on the road, thereby reducing trauma to motorcyclists.
141	Suratno, B. Leavy, D. Sherry, D. Lai, A.	NCAP And Consumer Test Ratings Restraints Child Restraints Crash Testing	Are Type-G Child Restraints (Large Forward-1 Facing Restraints with 2 Inbuilt Harnesses) Safer than Booster Seats? A Preliminary Crash Test	Type-G restraints are a new type of child restraint designed for children from six months to approximately eight years of age. These restraints are perceived to be safer than booster seats because they are fitted with six-point harnesses. This paper presents the results of a single preliminary crash test comparing a Type-G restraint and a booster seat. The dummy seated in the Type-G restraint experienced greater forward head excursion, increasing the risk of possible contact between the occupant's head and the front seat or the centre console. Further tests are needed to validate the findings.
142	Fry, R. Holgate, J. Small, M. Wilkinson, R. Webster, K. Eveleigh, M. Le, J. Kloeden, C. Dutschke, J.	Speed, Speeding & Travel Speeds Road Environment Pedestrians Policy Development And Implementation	Using evaluation to drive program improvement: Permanent 40 km/h speed limits in high pedestrian activity areas in NSW	An evaluation of permanent 40 km/h speed limits in NSW aimed to determine their effectiveness in preventing crashes and to guide future program implementation. Close collaboration between independent evaluators, commissioning staff and program managers helped focus the evaluation on important questions for program management, maximising the usefulness of evaluation results. A clear safety benefit was found, along with broad support from the community, practitioners and stakeholders. The evaluation recommended expanding the program to generate further safety benefits and improve urban amenity. Increased implementation of permanent 40 km/h speed limits will be considered in light of the findings.

143	Sharma, D. Gallagher, T. Graham, R. Everingham, S. Carlon, B.	Distraction & Inattention Driver Psychology Communication and Media Education – general and other	"Driving" vs. Road Safety: A Grass Roots Exploration of the Salience of Road Safety	Road user behaviour and communications research typically interrogates micro-elements of road user attitudes and behaviour, often limited to a specific behavioural issue. Transport for NSW recently undertook research with a more “macro” perspective: a people-centric qualitative study to explore motorists’ relationship with driving and how it fits into their lives. Automatic behaviours, mood and other everyday factors were found to influence the salience of road safety on a given journey, while situational factors acted as triggers for more conscious driving behaviours. Ultimately, road safety was not regarded as a “top-of-mind” concern in the complexity of modern life.
144	Sharma, D. Hedges, T. Gallagher, T. Graham, R. Carlon, B. Everingham, S.	Communication and Media Education – general and other	One-Way to Two-Way: Facilitating Road Safety Conversations on Social Media	Road safety communications have traditionally relied on one-way advertising campaigns to facilitate social changes. However, the emergence of user-centric digital platforms whereby road users can directly engage with Government has transformed communications from one-way into two-way conversations. The NSW Road Safety Facebook community provides a case study in developing a feedback loop for continuous learning for road safety agencies to communicate with their audiences. Balanced analysis of reach, engagement and sentiment data has led to greater consideration of content-crafting, influencers and community management. The ongoing use of “test and learn” approaches presents an opportunity to evolve road safety conversations.
145	Milling, D. Young, B.	Road Design Road Safety Audit and Road Safety Review Bicyclists	Identifying and treating high risk locations on high speed roads for cyclist crashes	The number of cyclist fatalities on high speed roads low compared to lower speed urban environments, however due to the more simplex nature of traffic movements there may be an opportunity to address the contributing factors to these crashes. A methodology to establish cyclist risk on a route using established crash risk factors (AusRAP) and then through a conceptual cyclist crash likelihood matrix developed to identify locations with a high likelihood of a cyclist being struck by a vehicle and identify suitable treatments to treat these often-isolated locations. The cyclist crash likelihood matrix is based on road design principles and identifies the locations that present a higher likelihood of a cyclist being struck from behind, side-swiped, or at an angle in an intersection or interchange due to restricted stopping sight distance, safe intersection stopping sight distance and cyclist clearance times through intersections and interchanges.

149	Hirpa, J. Zegeye, S. Small, M. Addo-Ashong, T.	Road Safety Strategy Road Safety in a Global Perspective Road Safety in Developing Countries Safer Transport & Mobility	Preparation of a Road Safety Strategy for the City of Addis Ababa	Many low and middle-income countries do not have strong crash and injury data systems. The experience of Addis Ababa is that the available data can be used, and augmented, to identify critical road traffic crash patterns and support good practice road safety management. The preparation of a road safety strategy in the city highlights the need to ensure high quality analysis of safety issues is integrated with straightforward participatory processes, and the importance of institutional arrangements to ensure plans are able to be followed through and resources effectively allocated to the issues that matter most. This paper reports on a critical diagnosis of road safety issues in a major African city, and the preparation of a good practice road safety strategy.
150	Nguyen, H. Rebbeck, T. Cameron, I.	Statistical, Epidemiology and Other Road Safety Research Methods Post Crash Rehabilitation	Prognostic capacity of Orebro Musculoskeletal Pain-Short Questionnaire in predicting recovery following non-fatal RTIs: results from an inception cohort study	Poor prognosis following non-fatal road traffic injuries (RTIs) contributes to unnecessary health care utilisation and high costs. We aimed to assess prognostic capacity of the Orebro Musculoskeletal Pain – Short Questionnaire (OMPSQ) in predicting recovery following non-fatal RTIs. Using data from an inception cohort study of non-fatal RTIs in NSW, we found statistically significantly higher proportions of fully recovered (GPE >4) 6 months after the injury in the low (OMPSQ score <50) than the high (OMPSQ score ≥50) risk groups. OMPSQ would have a potential to be used as a stratification tool for non-fatal RTIs into groups with distinct recovery.
151	Bahrololoom, S. Young, W. Logan, D.	Intersections and Roundabouts Bicyclists Statistical, Epidemiology and Other Road Safety Research Methods	The Role of Kinetic Energy in Bicyclist's Injury Severity at Intersections	Kinetic energy management has considerable potential to achieve the objectives of the Safe System. A literature review of bicycle crash studies revealed that there is a big gap in knowledge in understanding the relationship of bicycle crash severity and kinetic energy of these crashes. This study investigated the trends of bicycle crash severity for the kinetic energy related factors. Based on an analysis of police-reported bicycle crashes in Victoria, the results revealed that, in general, similar trends between vehicle to bicycle and vehicle-to-vehicle crashes were identified; however, a number of significant differences were also highlighted.

152	Larue, G.S. Demmel, S. Dehkordi, S. Rakotonirainy, A. Grzebieta, R. Williamson, A. Charlton, J. Haworth, N. WooleyJ. Senserrick, T. Young, K.	Speed, Speeding & Travel Speeds Speed Cameras Statistical, Epidemiology and Other Road Safety Research Methods	Australian Naturalistic Driving Study (ANDS): Using 20,000 trips to get a glimpse at locations and speeds where data was collected	The Australian Naturalistic Driving Study provides immense opportunities for further understanding driver behaviour. Data collection being now completed, and a large subset of the data becoming available to researchers, it becomes important to look at what is available in the data. This paper presents a first attempt to develop a scalable approach for analysing data, by looking at the particular case of vehicle speed and driving location. A preliminary spatial database was created using ~20,000 New South Wales trips, and GPS points were map matched to Australian roads. This approach provides opportunities for studying locations where NSWdrivers over-speed.
155	Brown, K. Cameron, I.D. Keay, L. Rogers, K. Nguyen, H. Ivers, R.Q.	Older Drivers & Road Users Insurance Emergency Hospital Trauma Post Crash Rehabilitation	Factors influencing time to claim closure in older versus young road traffic injury claimants	Prolonged claim closure following road traffic injury is associated with adverse outcomes [1], yet has not been investigated in older people, despite Australia's ageing population and increasing life expectancy. NSW compensation data was analysed using logistic regression to identify predictors of late claim closure (>24 months) in older (≥65 years) versus younger (17-64 years) people. Legal representation was the dominant predictor for both age groups after adjusting for other variables, although the odds were higher for younger people. Qualitative studies are recommended to identify older people's underlying reasons for earlier closure, the influence of legal representation and impact on recovery.
156	Porter, A. Bates, L. Irvine, C.	Young Drivers Policy Development And Implementation General Enforcement Statistical, Epidemiology and Other Road Safety Research Methods	Exploring novice driver offences within Queensland: Pre and post the 2007 GDL changes	Existing research and evaluation of the current Queensland Graduated Driver Licensing system indicates the number of crashes and crash related injuries of novice drivers is reducing. However, to date there has been minimal research into the locations of specific novice driver non-compliance and the rates at which offences occur. This research fills the gap by highlighting areas of compliance and non-compliance across Queensland. Through applied analysis, focusing on offences recorded between 1997 - 2017, this study highlights different aspects of driver compliance and serves as a tool for future policy considerations.

157	Scott-Parker, B. Attwater, S. Birch-Chapman, S.	Driver Psychology Young Drivers Driver/Rider Training Education – general and other	Young passengers becoming young co-drivers to improve road safety: SAFER-Passengers	The pervasive problem of young driver road safety has led to a plethora of interventions targeting the driver, some of which are designed to build the situation awareness skills (SAS) – including hazard perception, comprehension, and projection skills – of these inexperienced drivers (e.g., SAFER, Scott-Parker, 2017). Crash data reveals however that adolescent passengers can increase crash risk, and that adolescent passengers are fatally-injured in young driver crashes. SAFERPassengers broadly addresses adolescent road safety by developing SAS in the young 'co-driver' (not 'passive passenger'), and building the self-efficacy of the adolescent. Results of the SAFERPassengers randomised controlled trial will be presented.
158	Keay, L. Coxon, K. Chevalier, A. Brown, J. Rogers, K. Clarke, E. Ivers, R.	Older Drivers & Road Users Education – general and other Statistical, Epidemiology and Other Road Safety Research Methods	Sex differences evident in self-reported but not naturalistic measurement of driving patterns of older drivers: implications for safe driving programs	It has been consistently reported that women self-regulate their driving more than men. Volunteer drivers aged 75 years and older from the suburban outskirts of Sydney, Australia joined a longitudinal study in 2012-2014. GPS in-vehicle monitoring was used to objectively measure driving and surveys of driving patterns. The study included 343 drivers (203/343, 59% men) with an average age of 80 years. Our results revealed that men were 3.85 times more likely to report driving beyond their local shire during the past year (95% CI 2.03-5.72) and 1.81 times more likely to report that they do not avoid night driving (95% CI 1.21-3.22). In contrast sex was not predictive of any objective measure of driving during a one-week period of monitoring. These findings suggest that men and women report different self-regulation practices but that actual driving exposure is quite similar. These findings can inform strategies to promote safe mobility.
160	Palamara, P.G.	Drug Driving Drug Testing	Roadside oral fluid testing for illicit drugs in Western Australia: Trend in testing and offences and characteristics of offenders, 2008-2015	This research sought to describe the trend in roadside oral fluid testing in Western Australia and associated offences and characteristics of offenders during the period 2008-2015. The rate of testing per licensed driver fluctuated over the period but showed signs of increasing in the latter years of the period, as did the rate of offending. Males and drivers aged 25-39 years were the most frequent offenders; repeat offenders were most likely to be female, aged < 40 years and to have first offended in regional WA. The results are discussed in relation to testing and enforcement practices.

162	Steel, S. Fayle, K.	Distraction & Inattention Driver Risk Older Drivers & Road Users Young Drivers	Exploring user centred design processes to develop ideas for greater social responsibility towards fitness to drive	Ensuring that members of society are fit to drive is a cornerstone of the driver licensing system in Australian jurisdictions. Anecdotally it is known that licensed drivers are not clear on what impacts fitness to drive, or at least which medical conditions need monitoring to make sure they do not become an unacceptable risk to themselves and others on the road. However the assessment and monitoring process is not well understood, which requires a cooperative approach from doctors and patients, as well as careful management by the regulator. VicRoads established a Design Lab to review and redesign policies and services in the registration and licensing domain. Its approach is user-centered service design – focusing on the user's experience in their engagement with VicRoads.
163	Schroeter, R. Maruhn, P. Schneider, S. Rakotonirainy, A. Bengler, K.	Driver Psychology Hazard Perception Autonomous Vehicles Pedestrians	Where do we go from here? Predictability in tomorrow's traffic.	This extended abstract explores the various aspects contributing to predictability in a traffic environment, and how these aspects drastically change through the introduction of automated driving systems. Such automated systems will need to share the environment with humans, raising questions about how predictability can be achieved in such a way that automated systems can predict human behaviour and humans can predict the behaviour of automated systems. The talk presents an overview, research questions and a preliminary framework as a basis for discussion.
165	de Rome, L.	Motorcyclists Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Overcoming methodological issues in a systems approach to the analysis of motorcycle crash data	Motorcyclists represent an increasing proportion of road casualties however, while the risk factors associated with crashes can be established, less is known about the precipitating factors that directly result in a crash. Analysis of crash data based on crash type and key vehicle identifies distinct differences in the patterns of error by riders in single-vehicle motorcycle crashes, and by riders compared to drivers in multi-vehicle crashes. These patterns also vary by rider age group and provide potentially valuable information that may be obscured when the data is aggregated. Crash risk rates are also calculated using registration data as a proxy for the active riding population. This is proposed as an alternative framework for the analysis of motorcycle crashes to inform a systems approach to targeted countermeasures.

166	Lenné, M. Yang, S. Kuo, J.	Distraction & Inattention Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Cutting through the hype: Measuring driver attention and actual driver take-over times in automated driving	The transition between manual and automated modes is one of the primary safety concerns in semiautomated driving. This project directly addresses this concern by taking in-depth measurements from drivers operating a Tesla vehicle and responding to take-over requests in on-road driving conditions. The data collected via our driver monitoring system and other sensing technologies is being used to measure driver engagement during semi-automated driving and support a transition based on the engagement measure. These data will feed directly into the development of our next generation driver monitoring systems to improve the driver experience and safety in automated vehicles.
167	Johnson, M. Smith, S. Dunn, P. Jess, P. Wells, M. Dalton, S. McCarthy, T.	Bicyclists Workplace and Work Related Road Safety	Workplace cyclist safety: a review of safety practices at Deliveroo	Food delivery by bicycle is a growing service industry that has increased the number of bicycle couriers nationally. In 2017, the Amy Gillett Foundation undertook a review of the safety practices of one of Australia's leading food delivery services, Deliveroo. The review included initial contact (e.g. online approach, telephone and online screening), onboarding procedures (e.g. documentation, training, equipment) and broad systems (e.g. payment model, communications). While Deliveroo is to be commended for its existing safety measures and proactiveness in seeking to further improve its safe cycling practices, however, the review included 39 recommendations for action to improve safety of Deliveroo cyclists.
168	Johnson, M. Oxley, J. Rose, G.	Road Environment Road Design Bicyclists	Translating research into practice: insights into practical pathways to apply new research findings	Too often, there is a gap between research and action. For researchers, peer-reviewed scientific evidence is the benchmark of success, while for policy makers and practitioners, success is being able to apply findings in the 'real world'. In this presentation, we will unpack the practical process used to translate the research to practice taken in a major research project that aims to improve cyclist safety. We will discuss the approach used to bring together leading Australian and international road safety experts, practitioners and policy makers to build the pathway from research to practice and increased safety.

169	Morris, S. Bond, J.	Intersections and Roundabouts	The Challenges of Implementing Side Traffic Activated Rural Speeds (STARS)	One of the highest risk areas on rural roads is intersections, particularly where smaller side roads intersect with main roads. To find a low cost, effective treatment for high speed intersections Safe System Road Infrastructure Program is piloting Side Traffic Activated Rural Speeds (STARS) which is based on the Rural Intersection Activated Warning Signs (RIAWS) program that operates in New Zealand. Three intersections at Wahring, Yalca and Barnawatha have been selected for the Victorianfirst trial and were switched on in December 2017. This article outlines the challenges that were identified and the practical solutions developed to overcome these challenges.
170	Johnson, M. Bugeja, L.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Bicyclists	Review of coroners' recommendations following fatal cyclist crashes involving heavy vehicles	Heavy vehicles are overrepresented in cyclist fatality crashes. This study is a review of coroners’ findings and recommendations for all cyclist fatality crashes involving a heavy vehicle. Nationally from 2000 to 2016, there were 141 cyclist deaths involving a heavy vehicle, coroners made recommendations in 17 cases with 51 individual recommendations. The recommendations were examined through the lens of the Safe System. Most recommendations focused on Safe People followed by Safe Roads and Safe Vehicles. Despite the range of recommendations from coroners nationally, little direct action has been identified in response to the recommendations to improve cyclist safety.
173	Steinmetz, L. Jurewicz, C. Davis, C. Beer, K. Hall, C.	Speed, Speeding & Travel Speeds Road Safety Audit and Road Safety Review IRAP, AusRAP, etc. Safer Mobility	Delivering Safe System outcomes in Mildura	Mildura Rural City Council’s Road Safety Strategic Plan embraces a Safe System approach to support a safe community. In delivering the Strategic Plan, a municipal speed limit review was undertaken and speed management plan developed. Revised speed limits, reflecting road environment rather than default limit, were proposed. The expected reduction in fatal and serious injury crashes associated with the proposed new speed limits were evaluated. Findings of the speed limit review, as well as expected fatal and serious injury crash savings are presented. The paper will also consider community response and acceptance of the proposed measures.

174	Zia, H. Atabak, S.	Speed, Speeding & Travel Speeds Road Environment IRAP, AusRAP, etc. Crash Data Analysis	Calibrating Infrastructure Risk Rating (IRR) to Inform Speed Management in Queensland	Infrastructure Risk Rating (IRR) is a road assessment methodology designed to assess road safety risk, primarily as an input to the speed management process. It is one of the attributes underpinning the framework in NZ Transport Agency's Speed Management Guide and has been applied nationwide in New Zealand. As part of reviewing their speed management guidelines, the Department of Transport and Main Roads were keen to test IRR on Queensland roads. This paper presents the results of applying IRR on various road environments in Queensland with the aim of developing a single IRR model that is calibrated for all roads.
175	Zeller, R. Friswell, R. Williamson, A.	Fatigue	Assessing the combined effects of task factors and sleep need on driving	Driver fatigue has been attributed to both sleep need and to task-related factors, including time-ontask. The current simulator study examined the sleep-task interaction to determine their relative contributions to fatigue. Sixty participants were randomly assigned to two sleep conditions (shorter vs. longer) before a 2-hour drive. In addition to time-on-task, cognitive task load (higher vs. lower) was also manipulated as a task-related factor. Significant effects of sleep restriction and time-on-task were observed on performance (lane position variability - SDLP) and subjective ratings (sleepiness, alertness, effort). The implications for understanding driver fatigue are discussed.
176	St. Louis, R.M. Koppel, S. Molnar, L. Hua, P. Di Stefano, M. Darzins, P. Odell, M. Bédard, M. Mullen, N. Tuokko, H. Myers, A. Marshall, S. Charlton, J.	Driver Psychology Older Drivers & Road Users	Bouncing back and maintaining mobility: the relationship between resilience and driving in the Ozcandrive study	This study explored the concept of resilience as it relates to driving-related abilities, perceptions and practices in drivers aged 75 years and older (Male: 69.9%; Mean age = 81.74 years, SD = 3.38, Range = 76.00-90.00) in the Ozcandrive cohort study. Participants completed a range of functional/health assessments and self-reported driving questionnaires. Data for a subset of 166 Ozcandrive participants from Melbourne, Australia were analysed. Results show that higher resilience scores were correlated with higher levels of driving comfort, positive perceptions of driving abilities and more frequent driving during challenging situations.

177	Ponte, G. Lindsay, T.	Bicyclists	Characteristics of Single Cyclist Injury Crashes in South Australia	One of the targets in the South Australian Government's State Strategic Plan is to double cycling participation by 2020 from the 2011 baseline of 299,000 residents riding a bike in a typical week. A potential consequence of increasing cyclist participation is an increased number of cyclist crashes. To address the safety of cyclists on public roadways a number of strategies to reduce vehicle and cyclist conflicts have been implemented. These include minimum passing distance laws (when overtaking cyclists) as well as segregated or dedicated cycling infrastructure. However, risk remains even in the absence of vehicles, with single cyclist crashes representing approximately half of all cyclist casualty crashes. This paper explores some of the characteristics of single cyclist injury crashes occurring on public roadways in South Australia.
178	Stokes, C. Raftery, S. Woolley, J.	Hazard Perception Road Design Intersections and Roundabouts	Road user perception of safety at Safe System intersections	This study examined driver perceptions of safety at metro and regional intersections with different types of control. Data was collected using an on-line survey with 696 participants drawn from the Royal Automobile Association of South Australia's Member Panel. Results demonstrate a greater perception of safety associated with the use of roundabouts, yet a reduced perception of safety associated with a lesser known Safe System design of raised plateaus. Additionally, the results suggest that there is some confusion about the need to give way to other traffic at traditional controlled and uncontrolled intersections, further supporting the need for Safe System intersection designs.
179	Elkington, J. Hall, A. Ho, C. Albanese, B. Keay, L. Hunter, K. Charlton, J. Koppel, S. Hayen, A. Bilston, L. Brown, J.	Child Restraints Road Safety Strategy Education – general and other	A consumer-centric approach to designing information supplied with child restraints reduces errors in use: Laboratory results and field study protocol	The greatest challenge to optimal crash protection of children in cars is the long standing problem of errors in use of child restraints (CRS).We have worked with industry to address this problem through better design of information supplied with CRS. This paper presents results from a controlled laboratory-based trial evaluating these materials. Of those exposed to existing materials, 5% used the CRS without error, however of those exposed to the new materials, 28% achieved 100% correct use ($p<0.001$). To evaluate the effectiveness under real-world conditions, we are now conducting a fieldbased cluster randomised controlled trial (cRCT).

181	Hayes, G.	Road Environment Community Programs Advocacy Communication and Media	Horns and Hooves on the Highway - A Collaborative approach to road safety encourages local and regional involvement.	In the Kimberley region of Western Australia, what started as a discussion about issues associated with stray cattle on roads has grown into an innovative whole-of-region road safety campaign which has been embraced by state and local agencies, communities and special interest groups, members of the community and tourists alike. Launched in February 2016, Horns and Hooves on the Highway is not just a catchy slogan, it is a call to action to raise awareness about one of the biggest road safety concerns in WA's north - the risks associated with straying cattle on the roads. While it is acknowledged that Main Roads WA and the pastoral industry play key roles, local road safety committees believe their role is to raise awareness of the risks and provide advocacy in bringing stakeholders together to discuss a way forward on the issue.
182	Rakotonirainy, A. Bond, A. Blogg, M. Mosley, K. Schroeter, R. Larue, G. Demmel, S. Lewis, I. Haworth, N. Miska, M.	(ITS - vehicles) Intelligent Transport Systems in Vehicles	Field Operational Test for Cooperative Intelligent Transport Systems (C-ITS)	This paper reports on the progress of a large on-road field operational test (FOT) of eight Cooperative Intelligent Transport Systems (C-ITS) safety applications on about 500 public and fleet vehicles, and road infrastructure, in the City of Ipswich, Queensland, Australia. The FOT is conducted by the Queensland Department of Transport and Main Roads (TMR), Queensland University of Technology (QUT) and is financially supported by the iMOVE Cooperative Research Centre (CRC). It adheres to the European standard FESTA methodology. This paper describes progress related to the study design covering use case description, research questions, hypotheses formulation and identification of surrogate safety measures.
183	Mulvihill, C. Horberry, T. Fitzharris, M. Lenne, M. Kuo, J. Riquelme, N. Wood, D. Peden, M.	Fatigue Distraction & Inattention	The efficacy of driver performance and subjective measures for investigating fatigue and distraction: A simulator study	Driver fatigue and distraction contribute to a significant proportion of traffic fatalities and injuries worldwide. This paper presents a sub-set of results from an ongoing collaborative research program to develop and evaluate driver state monitoring technology to reduce road trauma. Seventy participants completed simulated drives and a secondary task distraction protocol under both drowsy and alert conditions. Preliminary results show that under the drowsy and distracted conditions, drivers experienced a higher proportion of lane exceedances and crashes than when they were alert and nondistracted, and were more likely to self-report higher levels of subjective sleepiness when drowsy.

184	Lindsay, T. Ponte, G.	Bicyclists	Injury characteristics of cyclist versus vehicle crashes in South Australia	For the 2012 to 2016 period, 21 cyclists were killed on South Australian roads, a further 331 seriously injured and almost 2,500 received minor injuries. Little information is available on the types of crashes that lead to cyclist injuries and the types of injuries incurred. Deeper understanding of the circumstances leading to crash involvement for cyclists is likely to result in more targeted countermeasures. This paper explores the circumstances that lead to injuries for a group of 207 cyclists injured in crashes with another vehicle on public roadways in South Australia. The injury characteristics by the different crash mechanisms are also explored.
186	Stevens, A. Baisyet, R.	Driver Risk Signage & Signalisation (ITS - roads) Intelligent Transport Systems in Road Infrastructure Safer Transport & Mobility	Protecting Motorists and Road Works against Wrong Way Drivers	Wrong Way Driving (WWD) occurs when a driver either inadvertently or deliberately drives against the traffic flow. On a divided road, particularly motorways and expressways, WWD results in a serious safety risk due to the high speeds that tend to be involved when a collision occurs. Despite being a serious international phenomenon, it has typically been viewed as being in the too difficult basket to try and resolve and hence appears to have been largely left unaddressed. The Auckland Motorway Alliance (AMA) started from first principles to bring together a multi-Agency and multidisciplinary team to develop tools and systems to target this issue.
188 (also Full Paper)	Bennett, J. Chekaluk, Eu Batchelor, J.	Older Drivers & Road Users Policy Development And Implementation	Determining Fitness to Drive for Drivers with Dementia: A Practitioner's Perspective See also: https://doi.org/10.33492/JACRS-D-18-00276	Currently in Australia medical fitness to drive decisions for individuals with dementia are largely conducted by front line practitioners. Given recent changes to the fitness to drive guidelines, little is known about the processes that these practitioners use to make these decisions, and how the guidelines might assist them in making determinations about driving capacity. In order to investigate this a short survey has to date been completed by 42 practitioners. Practitioners reported that the current guidelines do not provide adequate information to enable an informed decision, with calls for a more objective assessment tool. Given the road safety implications of these decisions it is prudent to investigate this further.

189	Haque, M. Washington, S. Arun, A. Bunker, J. Sayed, T. Debnath, A.	Road Environment Road Design Intersections and Roundabouts	Automated Safety Evaluation of Intersections using Advanced Video Recognition Technology	The present study aims to assess the utility of advanced video recognition technology in assessing road safety at intersections. In particular, this study assessed safety performance of three complex intersections in Brisbane by using safety surrogates automatically measured by an advanced video recognition technology. Traffic movement data on typical weekdays at the chosen intersections were video recorded. Conflict analysis was then performed by analyzing traffic interactions among vehicles, pedestrians and cyclists. In particular, Time-To-Collision (TTC) and Post Encroachment Time (PET) were used to identify frequency, severity and locations of the conflicts at each intersection. Subsequently, suitable countermeasures were identified to reduce these conflicts and improve safety at these intersections.
190	Amoh-Gyimah, R. Saberi, M.	Policy Development And Implementation Road Safety Strategy Land Use & Urban Planning Crash Data Analysis	Application of Macroscopic Safety Models for Hot Zone Identification	Macroscopic safety research provides important insight into dealing proactively with road safety problems in the transport network. This research explores the need to develop and use macroscopic safety models in Australia, especially for network screening. Using road crash data from Melbourne, Australia (2010-2012), safety performance functions (SPFs) are developed for total, serious injury and minor injury crashes. Potential for Safety Improvement (PSI) is adopted as the measure of the crash risk. The developed PSI's are used to identify the various hot zones (high-risk crash zones) in the Melbourne transport network.
191 (also Full Paper)	McTiernan, D.	Policy Development And Implementation Road Safety Strategy Land Use & Urban Planning Safer Transport & Mobility	Road Safety - Is It a Local Government Priority? (What does the Evidence Suggest?) See also: https://doi.org/10.33492/JACRS-D-18-00285	Almost 70% of the 392 fatalities on NSW roads in 2017 occurred on country roads (Transport for NSW, 2018). Each year, upwards of half the State's road fatalities occur on local roads, roads that are the sole responsibility of local government. As THE road authority, local councils have the legislated responsibility to manage their road infrastructure; fundamentally this includes ensuring the safety of road users on their networks. Councils and the State Government can no longer plead ignorance to the contribution local roads make to the tragedy and trauma occurring across NSW. Unfortunately, the current situation sees a myriad of systemic hurdles that result in local government not making road safety a priority? What is required to change this? What is required to change this?

192	McGillian, T.	Drink Driving Drug Driving Driver Psychology Drug Testing	Roadside Random Drug Testing in Victoria 'Making Towards Zero Happen'	In December 2004, Victoria Police became the world's first jurisdiction to implement roadside illicit drug testing (RDT). Initial implementation was a restricted centrally managed program, with limited numbers of tests conducted each year. The RDT program is strongly supported by a range of agencies and road safety partners that provide services to ensure the program is robust, credible and achieves contemporary road safety objectives. The legitimacy of RDT in Victoria provides community confidence that has enabled the program to expand significantly to become a state-wide enforcement program. The RDT program provides a valuable contribution to making towards zero happen.
194	Fraser, M. Meuleners, L. Chow, K.	Bicyclists Road Environment	Reckless cyclists or impatient drivers? A naturalistic study of group riding in Perth, Western Australia	This study aimed to describe the unsafe events and road rule violations observed among groups of riders in Perth, WA using naturalistic video and GPS data. A total of 72.5 hours of eligible naturalistic group riding video footage recorded from cameras mounted on bicycles were analysed. Common violations were stop sign violations and riding more than two abreast. For unsafe events, 65% of the events involved an interaction with a motor vehicle, with over half of these involving unsafe overtaking manoeuvres (58%). Recommendations include motorist education as well as considering the safety needs of group riders in road infrastructure design.
196	Carslake, J. Hardwick, A.	Young Drivers Heavy Vehicles - Trucks, Buses, Hazardous Materials Safer Mobility Education – general and other	Re:act - Swinburne students challenged by businesses to create behavioural change in their peers around truck safety	Re:act is an annual behavioural change project that aims to make 18-25 year olds consider their actions by increasing awareness of the dangers they may face on the roads. This year’s Re:act project challenges final year Swinburne University Communication Design students to create a campaign to change behaviour in their peers around safe interactions of young road users with trucks. The winning campaign is chosen by Re:act partners and rolled out on Swinburne campus during ’O-Week’. This paper explores the Re:act process, results and the types of messaging students identify to achieve cut-through with their peers.

197	Sakashita, C.	Restraints Motorcyclists Pedestrians Road Safety in Developing Countries	On-road observations to identify key contributors to road trauma, and opportunities for road safety improvements in Lao PDR	Road safety in Lao PDR is following the trend of increasing trauma with increasing population and motorised vehicle use. On-road observations of road user behaviours and road infrastructure were conducted to assess potential contributors to road crash deaths and injuries in Lao PDR. Lack of helmet and seat belt wearing, high travel speeds, lack of safe pedestrian amenity, limited road and roadside infrastructure, and use of intrinsically unsafe vehicles were identified as key contributors. These risk factors suggest that Lao PDR's road crash deaths and injuries can be greatly reduced by stronger enforcement, more comprehensive laws, and Safe System infrastructure.
199	Beaumont, S. Brookland, R. Connor, J. Samaranayaka, A.	Older Drivers & Road Users	Preparing for driving cessation: More thought than action	Driving cessation is a difficult topic that many older drivers avoid, however being prepared for transport dependence may mitigate the negative outcomes associated with driving cessation. In a population based survey 1181 older drivers reported their level of contemplation and planning for driving cessation. Socio-demographic, health characteristics, and transport use were compared between those who had given driving cessation no thought (pre-contemplators), thought about it (contemplators) and made plans (active planners). Active planners were a small minority, were older, and reported poorer health than the other groups. 46% had not thought about driving cessation at all.
200	Chapman, S. Wallace, P.	Young Drivers Road Safety Programs Driver/Rider Training	The redevelopment of DriveSmart: a new life for an evidence-based approach to online learner driver training	It is well known that novice drivers are consistently overrepresented in road trauma. In order to improve learner drivers' hazard perception, safe response and attentional control skills, the DriveSmart program was originally developed and tested with two main aspects: scenario videobased exercises and attentional control training. While the original learning framework is still considered to be valid, key issues relating to the age of the program prompted a need for substantial redevelopment. Scripting, filming and post production of new video-based scenarios was completed in 2017 with the redeveloped DriveSmart website expected for public launch in June 2018.

202	Di Stefano, M. Stuckey, R.	Older Drivers & Road Users Policy Development And Implementation Post Crash Rehabilitation Safer Mobility	Vehicle modification prescription for drivers with disabilities: development of consensus based prescription guidelines to optimise user interfaces and safety	Vehicle modifications (VMs) may be essential to ensure drivers with disabilities can access and drive motor vehicles independently and safely: safer driver-vehicle interfaces are an imporant contributor to meeting the goals of "Toward Zero" for this driver group. Occupational therapy driver assessors (OTDAs) routinely prescribe vehicle modifications based on individualised assessments. Following stakeholder consultation, safe systems and human factors analysis and a literature review, we identified resource gaps in information to support a licensing authority approved, and evidence based, VMs prescription process. Using an action research approach, we established content validity for items and developed consensus-based draft VMs prescription guidelines ready for trialling by OTDAs.
206	Fagerlind, H. Harvey, L. Davidsson, J. Brown, J.	Crash Data Analysis Data Linkage Ambulance and Emergency Services	Unfolding the full extent of major road trauma crashes	Major trauma (MT) is a term used for pre-hospital patients that have sustained life-threatening injury. Trauma patients from the same road traffic crash are seldom matched in hospital data and therefore the individuals in need of medical care from MT crashes are likely underestimated. Using a hospital and police matched road crash database, additional individuals from MT crashes were retrieved. The sample of individuals increased from 2,542 MT patients to a total of 4,937 individuals. Emergency department presentations increased by 39.8% and ambulance transportation by 34.8%. Ninety-five additional fatalities were not accounted for in the original MT sample.
209	Smith, T.	Speed, Speeding & Travel Speeds Road Safety Programs Communication and Media Education – general and other	The Queensland Speed Conversation - Changing the way motorists look at speed	In May 2016 the Queensland Department of Transport and Main Roads (TMR) released the Queensland Speed Conversation (the Conversation) which sets the long term vision for changing Queensland motorists' attitudes and behaviours around speed through education and empowerment of individual responsibility. TMR has engaged with various motorist groups through a range of communication methods to commence delivery of this vision. Consequently, there have been significant learnings around readiness of motorists to receive speed education and creating positive engagement between motorists and speed messaging. These learnings are continually fed back into activities to continually improve the efficacy and relevance of speed safety messaging delivered to Queensland motorists.

211	Jones, C. Zhou, R. Roper, Y. Rowland, M.	Signage & Signalisation NCAP And Consumer Test Ratings Crash Avoidance and Crash Severity Reduction Autonomous Vehicles	Implications of Traffic Sign Recognition Systems for Road Operators	Achieving a zero fatality vision will require innovative new approaches such as adoption of vehicle systems that warn, aid and ultimately replace the driver. Vehicles are now available with machinevision based systems which can read and interpret traffic signs. However, machine-vision systems require ‘readable’ infrastructure. Austroads engaged ARUP to consider the implications of traffic sign recognition systems on road operations, including their design, maintenance and configuration at the road side. Based on literature reviews, on-road and off-road evaluations and stakeholder interviews, we have determined that road side infrastructure changes will be required to make Australia’s signs more readable.
212	Collier, K. Callanan, J.	Older Drivers & Road Users Young Drivers Driver/Rider Training Education – general and other	Closed roads to Safe People Pre-learners,disabilities and caravans: using closed roads to develop safe drivers	Safe people is arguably the most difficult component of the Safe System to create positive change, yet safe people are critical to maximise safety on our roads. This presentation will provide an overview of the programs delivered at the METEC Driver Training Centre to three key groups: 1) pre-learner drivers, 2) people living with a disability and 3) drivers towing (e.g. caravan, boat). Insights will include experiences from all three driving groups and the instructors who teach the courses and recommendations to creating safe drivers and safe roads for all road users.
213	Jurewicz, C. Ahmed, F.	Road Furniture (Poles, Signs, Etc) Road Design Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Application of Machine Learning to Severe Injury Prediction in Rural Run-off-road Crashes	This paper describes how Machine Learning (ML) techniques were used gain a deeper insight into the factors leading to rural run-off-road casualty crashes being severe. The ML findings were compared with a conventional binary logistic modelling approach. The findings showed that roadside objects hit, road curvature, vehicle type and age, and the number of persons in vehicle were strong predictors of run-off-road crash severity. More importantly, ML highlighted specific combinations of risk factors which were linked to high risk of severe injury in a run-off-road casualty crash. ML may enable a more synergistic approach to risk and Safe System assessment.

214	Jurewicz, C. Troung, L. Ahmed, F. Espada, I.	Policy Development And Implementation Road Safety Strategy Safer Mobility Safer Transport & Mobility	Can Mobility Management Deliver the Next Step-change Towards Safe System	Progression towards Safe System goals of zero death and serious injury has stalled in Australia. Historical downward step-changes in road toll were associated with systemic and cultural shifts driven by government regulation (e.g. drink driving, seat belts). The goals of the current National Road Safety Strategy (NRSS) are not likely to be met by 2020, but significant opportunities lay beyond if more systemic approach to road safety strategies can be adopted. This paper discusses potential strategic contributions of Mobility Management (travel demand management, road pricing, urban planning, Mobility as a Service) to the next NRSS goals and points out the evidence necessary for detailed estimation of the next step-change in road toll.
215	Kim, C.W. Jung, H.J. Lee, J.	Autonomous Vehicles Computer Simulations - Restraints, Human Body, Vehicle	A SysML-Based Modeling and Verification Method for Vehicle Safety	Vehicle safety is becoming a critical issue in developing autonomous driving technology. For example, failure propagation due to sensor failures on road obstacles will have significant impact on safe operation. Previous studies in safety design used different modeling languages in creating, analyzing, and simulating failure models. In this study, we used the system modeling language (SysML), which is widely accepted language for systems modeling, consistently in modeling component failures and analyzing them to identify failure propagation paths. Among the identified failure paths, critical ones were used to derive safety measures. SysML simulation was also used to verify the safety measures.
218	Ford, S. Durdin, P. Harris, D.	Speed, Speeding & Travel Speeds IRAP, AusRAP, etc. Road Safety Programs Crash Data Analysis	Streamlining road safety risk mapping and intervention programming on local networks: The Northland Transportation Alliance Risk Mapping Application	Crash risk is only one of the necessary metrics that local authorities require to analyze road safety risk and to plan and prioritize intervention programmes on their networks. Outputs of such analysis is often aggregated and not stored alongside the outputs of other important metrics and frameworks. Abley Transportation Consultants have developed an interactive application for the Northland Transportation Alliance that combines various risk analyses and metrics. Interactive analysis tools and the ability to overlay different metrics allows for an increased understanding of crash risk and aid efficient and robust planning for intervention programmes.

219	Sivasankaran, S.K. Balasubramanian, V.	Policy Development And Implementation Road Safety in Developing Countries	Investigating Factors Associated with Hit-and-run crashes in Indian Metropolitan City Using Association rules	Hit-and-run crashes are a serious road safety problem threatening the world especially in developing economies like India. It is considered as crime worldwide and stringent laws prevail to punish the offending drivers. In spite of these, rate of hit-and-run crashes in India is higher compared to developed nations and states such as Singapore (1.83%), California (8.1%), Guangdong (7.7%) and shanghai (4.45%) in china. The recent figures according to the Ministry of Road Transport and Highways (MoRTH), government of India shows that hit-and-run crashes accounts for 11.6% (55,942) of all crashes and number of people died due to hit-and-run crashes was 15.2% (22,962) of total persons killed in the country during 2016.
220	Sathish Kumar Sivasankaran; Venkatesh Balasubramanian, PhD	Motorcyclists Road Safety in Developing Countries Road Safety Across Cultures	Market Basket Analysis of Powered Two Wheeler Crashes in Metropolitan Roads - A case Study from Chennai City, India.	Powered two wheelers (PTW) provide a flexible, faster mode of transport in congested traffic such as cities and other urban areas. These are particularly a growing mode of transportation systems in most of the middle income countries ,such as India, both for its ease of mobility and the price for acquisition. According to the latest annual report by Ministry of Road Transport and Highways (MoRTH) 2015, the number of registered PTW increased by 178% in the past decade, i.e., from 58 Million in 2005 to 154 Million in 2013. Safety is of major concern in PTW usage. Crash reports show that PTWs contribute to about 34% of total accidents reported (MoRTH,2016).In this paper, we propose a method to analyze the characteristics and contributory factors of PTW accidents based on association rules. Crash data obtained from Government of Tamilnadu's RADMS database for the Chennai Urban. A total of 3002 PTW accidents were reported for a two year period between 2015 and 2016.
221	Faulks, I.	Young Drivers Education – general and other	A web-based program to target novice driver traffic offenders under the Traffic Offender Intervention Program in New South Wales, Australia	TOP ONLINE is a web-based traffic offender intervention developed for desktop, tablet and smartphone applications. Here, it is shown that online learning can be used to deliver specific messaging for a common category of offenders – novice drivers. The TOP ONLINE: Novice Driver Traffic Offender Unit provides a targeted, high fidelity program allowing revision of graduated driver licensing concepts and specific restrictions applicable in NSW as well as more general road safety messaging. Offenders enjoy the online content and the flexibility of self-paced learning. However, only half of novice driver traffic offenders are willing to undertake a web-based learning unit.

222	Ahmed, F.	Driver Risk Driver Psychology Young Drivers	Modal shift amongst young adults and the potential safety benefits: A synthesis of evidence	Young adults in Australia are driving less now than young adults did twenty years ago. Victoria and New South Wales, (as opposed to other states), have shown the fastest changes, with the percentage of young adults with a driving license declining around 1% per year. This trend indicates a possible modal shift frompassenger car to other alternative modes, including public transport and other active transports amongst young adults. Again, young drivers in Australia are one of the most vulnerable groups when it comes to safety. Around 25% of the drivers who lost their lives in road collisions in Victoria, Australia over the past 10 years, belong to the 18-25 age group. This paper discusses potential safety benefits as a result of this modal shift amongst young adults. Also, the paper proposes that an enhanced understanding of a young adult's decision-making process when choosing a travel mode is required, to ensure the vision of 'Towards Zero' is achieved.
223	Ahmed, F. Jurewicz, C.	Road Safety Barriers Road Furniture (Poles, Signs, Etc) Road Design IRAP, AusRAP, etc.	Re-investigation of Roadside Risk Factors Associated with Run-off-road Casualty Crashes in Victoria, Australia	This paper examines the road side design features related with run-off-road collisions on rural undivided roads in Victoria, Australia. Run-off-road casualty crashes comprise around fifty percent of all single vehicle crashes that take place in rural roads with a speed limit 80km/h or above in Victoria. Five-year crash and road design inventory data from Victoria were analysed. A poisson regression modelling approach was adopted to estimate run-off-road crash frequency. Modelling results indicated that narrower hazard offset (clear zone) increased the likelihood of run-off-road casualty crashes. Tight road curvature was a strong and consistent predictor of run-off-road casualty crashes. Findings from the study can lead to more effective safety countermeasures that can substantially reduce the injuries and fatalities associated with run-off-road collisions.
224	Cunningham, M. Regan, M.A. Wijayaratnac, K. Dixit, V. Jianc, S. Hassan, A. Chand, S.	Distraction & Inattention Driver Risk Driver Psychology	Mobile Phone Distraction: Understanding the Inconsistencies between Simulator and Naturalistic Driving Study Findings	A major current controversy within the driver distraction community is the apparent mismatch between findings on the safety impact of mobile phone conversation found in driving simulators versus real-world naturalistic driving studies (NDS). To this end, the aim of this study was to undertake a critical appraisal of relevant literature and conduct targeted consultations with distraction experts to identify possible reasons for this apparent inconsistency in findings. The methods, results, findings from the study, and their theoretical and practical implications, are discussed.

227	Pyta, V. Blythe, R.	Drug Driving Policy Development And Implementation Workplace and Work Related Road Safety Education – general and other	Collaborative Development of an Alcohol and Other Drug Risk Management Resource for Trucking Companies	Heavy vehicles are involved in 18% of road deaths in Victoria, and alcohol and other drugs (AOD) are a preventable risk factor in heavy vehicle crashes. The majority of drivers do the right thing, but a small group who take AOD and drive cause a disproportionate amount of harm. This extended abstract describes the development of a resource kit to support organisations that employ truck drivers to manage the risk of AOD use in their business. A key factor in the project's success was broad consultation across Government, subject matter experts and industry representatives.
228	O'Sullivan, S. Haworth, N. Legge, M.	Bicyclists	How well can drivers judge the distance when passing bicycles? A controlled photographic study	The evaluation of the Minimum Passing Distance Road Rule Trial in Queensland and earlier psychophysical research questions the ability of drivers to accurately judge the distance to cyclists they are passing. In an online survey, 196 Queensland drivers judged the passing distance in 36 photographs taken from the driver's perspective. Participants were more accurate when the portrayed distance diverged from one metre to a greater extent, when the vehicle was large and when the cyclist portrayed was a male wearing lycra. Accuracy was not influenced by age, gender, whether the participants were cyclists, or reported frequency of passing cyclists.
230	Scott-Parker, B. Fitz-Walter, Z. Ti, J.	Young Drivers Road Environment Novice Driver/Rider Licensing Driver/Rider Training	The driving exposure of learner drivers in New South Wales: Insight from a smartphone app	Young drivers persist as a major public health problem due to their over-involvement in road crashes in which they and other road users are injured. In New South Wales (NSW), young drivers progress through graduated driver licensing (GDL), logging a supervised practice minimum of 120 hours in the learner phase. While logbooks record some information regarding the Learner's driving exposure, such as distance driven, much remains unknown regarding their driving exposure during this period. A smartphone app is currently being used by a group of learner drivers in NSW, providing unique insight into the nature of the young driver's exposure during this learning phase.

231	Scott-Parker, B. Huckstepp, T. Huang, B.	Distraction & Inattention Driver Risk Young Drivers Hazard Perception	"a maccas on the left… something on the right": The influence of emotions and passengers upon young driver situation awareness	A breadth of driving experience-related factors (eg., situation awareness skills, SAS), driving exposure-related factors (eg., friends as passengers) and age-related factors (eg., strong emotions) have been found to increase the crash risk of young drivers. The influence of passengers and emotions upon the SAS of 73 drivers aged 17-24 years with a Provisional 1 licence was explored in a cave simulator. Passengers and emotions negatively impacted upon SAS through operationalisation of a surface understanding of the driving environment, rather than a deeper understanding of the nature and mechanisms of driving hazards evident when driving alone and without experiencing strong emotions.
232	Scott-Parker, B. Curran, M. Rune, K. Lord, W. Salmon, P.	Driver Risk Young Drivers Hazard Perception Ambulance and Emergency Services	Situation awareness in young novice ambulance drivers: So much more than driving	The wicked problem of young novice driver road crashes, and the critical role of emergency responders in attending crashes, is well-recognised. What is less well-recognised is that emergency responders may be young novice drivers and young novice ambulance drivers. This project explored the situation awareness (SA) demands upon young novice ambulance drivers in Queensland through a synthesis of relevant literature, hierarchical task analysis (HTA) to explicate the complex emergency dispatch/response system, and perceptual exploration of drivers' SA. The findings reveal a plethora of opportunities for inadequate SA to negatively impact the road safety of drivers, patients, and other road users.
233	Watson-Brown, N. Scott-Parker, B. Senserrick, T.	Driver Risk Driver Psychology Young Drivers Driver/Rider Training	An exploratory study of professional driving instruction and encouraging the development of a self-regulated safety orientation in novice drivers	Novice drivers' greatest crash risk occurs in the months immediately following the supervised learner period. This research aimed to explore whether elements of professional driving instruction have potential to reduce this risk. Five hundred and forty-four eligible Queensland learner drivers aged 16-19 years completed a voluntary, on-line survey regarding their professional instruction experience, driving behaviour and a motivation inventory framed by self-determination theory. Analyses found professional higher-order instruction predicted selfregulated safety orientations which negatively predicted engagement in risky driving behaviours. Professional higher-order instruction, with strategies encouraging a self-regulated safety orientation, has potential to reduce young novice drivers' risky driving.

234	Assemi, B. Hickman, M.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Policy Development And Implementation Road Safety Programs Crash Data Analysis	A Time Series Analysis of Periodic Heavy Vehicle Inspections and Road Safety Outcomes in Queensland	Heavy vehicle crashes cause significant economic and social costs. Although most crashes are considered to be related to driver errors, the impact of vehicle defects is evident in many crashes (Blower et al., 2010). Hence, different vehicle inspection schemes, including Queensland's certificate of inspection (COI), have been implemented around the world to more effectively manage the safety of heavy vehicles (Keall and Newstead, 2013). This study investigates the trends in and potential impact of COI on heavy vehicle crashes, relying on longitudinal data provided by Queensland's Department of Transport and Main Roads for the period of 2009-2014.
235	Catchpole, J. Di Stefano, M. Mestroni, K.	Older Drivers & Road Users	Trial of improved procedures for driver licence tests administered by occupational therapists	VicRoads, ARRB and Occupational Therapy Australia–Victoria Division are supporting the implementation of improved testing procedures for use by occupational therapists trained in driver assessment (OTs) who conduct driver licence tests for people with medical/disability issues. A trial was conducted in 2016–17 to establish the feasibility and OT acceptance of the improved test. Twenty OTs participated in three trial phases using iterative processes to develop 15 compliant routes and test 156 clients, completing feedback forms after each test. Based on the trial outcomes, further improvements were made to test procedures, assessment criteria, route requirements and associated documentation.
237	Small, M. Holgate, J. Bobbermen, D. Masterman, A.	Fleet Safety Policy Development And Implementation Road Safety Strategy Workplace and Work Related Road Safety	Vehicles as workplaces - a new framework for a critical road safety management issue	The paper outlines the similarities in policy and differences in application between the management of road traffic safety (RTS) and of work health and safety (WHS). The application of WHS principles to RTS is discussed and used to develop a new framework for considering road traffic system risks and countermeasures. The development of WHS guidance regarding the use of vehicles in road traffic, based on this framework, is described.
239	Luzan, S. Corben, B.	Policy Development And Implementation Road Safety Strategy	Beyond BCR: Ensuring Return on Investment while Strategically Delivering Safe System Outcomes	The Safe System philosophy demands that risks be dealt with systematically. The Towards Zero Strategy attempts to introduce a systematic and proactive approach to dealing with risk on the road network. Enabling this approach has required changes to the role of Benefit-Cost Ratio (BCR) in project selection, prioritisation and approval. Historically projects have been required to meet minimum BCRs which are calculated using recent crash history. A new approach has been devised to enable Victoria's Safe System Road Infrastructure Program (SSRIP) to deal proactively and systematically with safety risks.

240	Hawkins, A. Belsham, D. Bates, L. Filtness, A. Larue, G.S. Rodwell, D. Makin, S.	Young Drivers Hazard Perception Indigenous Road Safety Driver/Rider Training	Technology and driver education for Indigenous Australians	Multiple barriers have been identified that prevent some Indigenous Australians from obtaining a licence. A scoping review of the literature was conducted to identify interventions that are used to address these barriers. Limited research was identified, none of which assessed the suitability of technological interventions such as PC-based training or driving simulators. Following this, Indigenous community members in regional Queensland were consulted to gain insight into the appropriateness and perceived usefulness of a PC-based hazard perception training intervention. Diverse experiences of drivers and differing preferences to delivery mode and content highlight the importance of driver education interventions to be flexible.
241	Demmel, S. Khakzar, M. Larue, G.S.	Speed, Speeding & Travel Speeds (ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	Unmanned Aerial Vehicle based Speeding and Tailgating Detection System	Unmanned Aerial Vehicles (UAVs) offer a considerable potential for road safety stakeholders; they have been already used for tasks such as assisting first responders. This paper reports on a small-scale prototyping effort to use UAVs to measure speeding and tailgating on major urban roads. One hour of UAV footage was acquired and a custom vehicle detection system was programmed. From this, we developed methods to extract vehicles' speed and headways. Validation information was extracted from TMR induction loop present near the testing site.
243	Turner, B. Partridge, R. Turner, S. Corben, B. Woolley, J. Stokes, C. Oxley, J. Stephan, K. Steinmetz, L.	Land Use & Urban Planning Road Design Road Environment Safer Transport & Mobility	Safety solutions on mixed use urban arterial roads	Urban arterials and intersections account for a large proportion of high severity crashes in Australia and New Zealand, particularly involving vulnerable road users. Safety gains appear to be slower in these 'mixed use' environments than in other areas. Austroads commissioned research to help identify solutions that might be applied on mixed use arterial roads to improve safety through the provision of Safe System infrastructure. The project involved assessment of six case studies around Australia and New Zealand. Concept designs were developed for each of the routes based on analysis of safety issues and the likely safety benefits were assessed. This paper presents information on the safety solutions identified, as well as the broader implications from the use of these interventions, including impact on traffic.

244	Ledger, S. Cunningham, M.L. Regan, M.A.	Autonomous Vehicles Driver Psychology Older Drivers & Road Users Young Drivers	Public Awareness, Understanding and Acceptance of Automated Vehicles: An International Survey of Australian and New Zealand Respondents	This paper reports the findings of a large-scale online survey, undertaken under the auspices of the Australian Driverless Vehicle Initiative (ADVI), to gauge Australian and New zealand public awareness, understanding, and likely acceptance of automated and driverless vehicles. The 90-item survey, developed by the ADVI Survey Working Group, was administered to 5,102 Australian and 1,049 New Zealand respondents. The items sought community feedback on a number of issues including public concerns with AVs and perceptions towards automated and connected-automated public transport. This paper presents the aims, methods and findings from the survey and the implications of the findings for policy development.
245	Owens, V. McKenna, C. Makari, D.	Community Programs Road Safety Programs School Safety	Educating upwards - empowering children to be custodians of their safety on the road	The Towards Zero goal highlights safe attitudes and behaviours. As these are formed in childhood, school programs can play a role in reducing road trauma. The NRMA Science & Road Safety program, launched in 2014 has educated 213,206 children across 523 primary schools. The program which was completed in schools typically over eight weeks was evidence-based, curriculum linked and designed by educators and road safety experts. Education resources were provided to students and teachers, an interactive road safety show was used to deliver memorable learning to students, parents and teachers. Parents were included in the program to deliver whole of school learning.
246	Holmes, M.W. Ross, J. Porter, A. Jones, S.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Pedestrians Road Safety Programs Workplace and Work Related Road Safety	Managing Vulnerable Road User Safety in Urban Environments during Construction of Major Transport Infrastructure Projects	Australia is experiencing an unprecedented infrastructure boom in its largest capital cities through the construction of major transport infrastructure projects. Delivering these projects involves a significant logistics task of transporting millions of tonnes of excavated spoil and construction materials throughout urban road environments using heavy vehicles. Introducing heavy vehicle traffic to road environments shared by popular urban modes of transport such as cycling and walking has the potential to increase road safety risks. This paper provides an overview of the safe systems approach developed on two major transport infrastructure projects to manage road safety during construction.

247	Stokes, C. Mackenzie, J.	Bicyclists Road Environment Statistical, Epidemiology and Other Road Safety Research Methods	Understanding lane encroachment using a LIDAR measurement device	This study described the development of a device for measuring the lateral passing distance to vehicles. The device was evaluated in both laboratory and field settings. In the lab, the device was shown to consistently and accurately determine the distance to static objects and a moving vehicle. In the field, the device was deployed onto the side of an urban road to detect the number of vehicles which encroach into a bicycle lane. Comparisons to a video recording at the same location showed that the device was able to determine the number of passing vehicles encroachments into the bicycle lane.
248	Timms, M.	Fleet Safety Vehicle Crashworthiness Workplace and Work Related Road Safety	Safer Vehicles: Is our own house in order?	Traffic and Highway Patrol Command (THPC) is responsibile for road policing in New South Wales. There are some 1,400 people in the command and vehicles owned by THPC workers represent a private vehicle fleet of well over 2,000 vehicles. This project represents a health check on the safety of vehicles owned and driven by those civillian and police employees and their families, as well as their awareness of the safer vehicles pillar.
251	Luzan, S. Kaissidis, A.	IRAP, AusRAP, etc. Road Safety Strategy Crash Data Analysis	Using ANRAM to Assess the Impacts of Network-Wide Road Safety Interventions: Development and Experience of the SSRIP Planning Tool	VicRoads has developed a program planning tool (the SSRIP Planning Tool) utilising the Australian National Risk Assessment Model (ANRAM). This tool allows planning teams to quickly and easily predict the benefits of broad programs of safety treatments across the State’s entire arterial road network. The tool is being used by the Safe System Road Infrastructure Program (SSRIP) to inform the future direction of the program. A number of scenarios have been run to demonstrate the value of the tool.
254	Karagiannopoulos, K.	Road Environment Signage & Signalisation (ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	Connected Roads - Enabling tomorrow's technologies today	The typical road infrastructure consists of visual cues, as human drivers predominately use their vision to navigate around and drive their vehicles on the road. In a similar manner, most advanced vehicles today -as well as the ones currently designed for the future- also rely on cameras and sensors that help the vehicle ‘see’ the world around it. Human drivers will most likely co-exist with Connected Autonomous Vehicles on the roads for many years to come, possibly decades. This paper will look at the importance of designing road markings today for both types of drivers of tomorrow.

268	Higgins, A. Dumont, N. Smyth, T. Mahon, A.	Young Drivers Novice Driver/Rider Licensing Education – general and other	PrepL: Redesigning Queensland's learning and assessment for learner drivers	A new, online learning and assessment program, PrepL, has been developed to replace the existing learning and assessment requirements for persons commencing Queensland's Graduated Licensing System. In this program, road rules and safety content is delivered through modules in an interactive learning experience which prioritises customer learning and road safety benefits. PrepL is anticipated to deliver enhanced learning outcomes and process efficiencies for Queensland's new drivers.
269	Bailey, S. Soole, D. Cattermole-Terzic, V. Osmond, S.	Drink Driving Enforcement Programs Enforcement Technologies Penalty Systems	Toward a performance-based approach to the Queensland Alcohol Ignition Interlock Program: the impact of performance record on risk of recidivism	Drink driving is a significant contributing factor to road trauma. The Queensland Alcohol Ignition Interlock Program (AIIP) aims to reduce drink driving recidivism among problematic offenders and has been evaluated to measure its effectiveness. Results of this evaluation revealed a significant reduction in drink driving recidivism associated with interlock fitment, but an increased risk from 55 days after removal, compared with those still suspended from driving. In addition, poor interlock use performance data was found to be predictive of a greater risk of future reoffending. These findings will inform future policy development to optimise the effectiveness of the AIIP in Queensland.
270	Pine, P. Atabak, S. Harrison, S. Maclean, E.	Speed, Speeding & Travel Speeds Road Safety Audit and Road Safety Review Safer Mobility Safer Transport & Mobility	A new proactive approach to speed limit setting in Queensland	The Speed Limit Review process in Queensland is conducted according to the Department of Transport and Main Roads' Manual of Traffic Control Devices, Part 4: Speed Controls. The current process is mainly reactive and uses a complex methodology, comparing the crash rate of the road section to the 'critical crash rate'. It is also heavily reliant on the experience of practitioners to judge the level of road risk. The new SLR process combines proactive road infrastructure risk assessments with refined crash risk assessments to provide more tangible guidance to practitioners and recommend safer speed limits on high risk road sections.

271	Peterson, P. Harrison, S.	Policy Development And Implementation Road Safety Strategy	Integrating safe system principles throughout TMR's business	Queensland Department of Transport and Main Roads (TMR) has developed a Road Safety Management Plan (RSMP) to embed safe system principles and culture throughout the organisation. The Road Safety Management Plan is designed to put road safety at the forefront and will result in road safety-focused decision making and network level thinking. The RSMP will facilitate the implementation, within TMR, of a Safe System approach to managing road safety. Senior leadership commitment and the supportive framework provided by the National Road Safety Strategy, the Queensland Road Safety Strategy and Action Plan are necessary to its success.
272	Downing, N. Maxwell, S.	Distraction & Inattention	A fresh approach to distracted driving: implications for policy	Distracted driving due to mobile device use is an increasing contributing factor in road crashes globally. In Queensland, a high proportion of drivers report using their phone illegally in the car, despite being aware of the risk for driving. A ‘design-thinking approach’ was applied to gain further understanding and develop policy options on this issue. A complex ecosystem of driver behaviour influence, and five driver profiles with differing device interactions and propensities for risk were identified. This new information regarding influences on driver behaviour will guide engagement to inform development of new safety solutions for driver distraction due to mobile device use.

Exploring crash characteristics and injury outcomes among older truck drivers: An analysis of truck-involved crash data in the United States

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Abstract

This study explores differences in crash characteristics and injury outcomes in older and middle aged truck driver. Two sets of data in the United States were used to compare truck drivers aged 60 years and older to their younger counterparts (i.e., 27-50 year olds). No differences were identified in crash outcomes and characteristics between older and middle aged truck drivers. Furthermore, older drivers were found to display some safer driver behaviors (i.e., safety belt and alcohol use) compared with middle aged drivers. Recommendations for change in policy and practice are discussed.

Background

Road freight transportation represents a long-standing public health and transportation safety problem in the United States (U.S.). One group of truck drivers found to be over-represented in fatal crashes is comprised of drivers aged 60 years and older (Duke et al., 2010). This trend is unlikely to change given the proportion of truck drivers aged 65 years and over almost doubled from 2.8% in 2003 to 5.4% in 2008.

There is little information about the unique safety issues faced by older truck drivers and existing preventive strategies to address these issues, or how to inform the development of new evidence-based preventive strategies. This study represents the starting point for addressing this issue by describing trends in truck crash data to identify risk factors that contribute to crashes among older truck drivers. Crash data from the U.S were analysed to identify differences in crash outcomes and characteristics in middle and older aged truck drivers.

Method

Data were combined from two crash databases maintained by NHTSA: 1) the Fatality Analysis Reporting System (FARS) (NHTSA, 2016a); and, 2) the National Automotive Sampling System General Estimates System (GES) (NHTSA, 2016b). FARS data are compiled by analysts in each state from state records, and investigators at the crash scene. The database includes information at the crash, vehicle, and person levels. GES is a nationally-representative probability sample of all police-reported crashes. FARS was used to obtain fatal crash data and GES was used to obtain non-fatal crashes. Combined in this way, FARS and GES provide the best estimate of the U.S. national crash experience. SAS was used to compute chi-square statistics on a combined datasets. Based on a recent review (Koppel et al., 2018), this study defines older age drivers are defined as 60 years and older.

Results and Conclusions

Inconsistent with research conducted in the general older driver population (Langford and Koppel, 2006, Koppel et al., 2011), this study found no statistically significant differences in crash outcomes (i.e., fatal crashes, injury severity) between older and middle aged truck drivers. This study also found no statistically significant differences in crash characteristics (i.e., crash type, rollover, environmental conditions) across these groups, which is also inconsistent with the study conducted by Duke et al. (2010). A possible explanation for these findings is self-regulation, or the modification of driving in circumstances considered challenging. Future research could explore this issue through investigating if older truck drivers are engaging in self-regulation and, if they are, the tools they adopt.

There were some indications in the results as well as existing literature (Pickrell et al., 2016; National Center for Statistics and Analysis, 2016) that older aged drivers tend to be more risk-adverse (i.e., less likely to drive under the influence of alcohol) and have a more positive attitude towards safety (i.e., more likely to wear safety belts). These findings suggest that older drivers could play a key role in creating a culture of safety in the workplace, particularly through mentoring programs for younger truck drivers.

The findings of this study are important as they provide unique insight into the development of targeted intervention efforts to improve safety in the transportation industry.

This paper has recently been published in the journal, Safety Science: https://www.sciencedirect.com/science/article/pii/S0925753517307658. Please contact the lead author for a copy of this publication.

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Deployment of intelligent advanced stop warning signs in New Zealand

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Abstract

Each year, hundreds of crashes occur where a driver fails to notice a priority-controlled intersection and drives through without stopping. In the Selwyn District of New Zealand, this problem is particularly prevalent due to the flat, straight roads which intersect regularly across the district. To counter this issue, a new intelligent stop sign has been trialed which warns drivers of the approaching intersection via flashing lights as they approach the intersection. The trial was successful, so a nationwide analysis was conducted which identified 50 sites where this technology may prevent crashes and save lives.

Background

Between 2011 and 2015, New Zealand Police in the Selwyn District recorded 47 crashes in the New Zealand Transport Agency’s Crash Analysis System (CAS) specifically attributed to drivers who did not stop at a priority-controlled intersection. This resulted in 3 fatalities, 4 serious injuries and 27 minor injuries. One particular issue noted by local police were drivers failing to notice an approaching priority-controlled intersection and driving through the intersection at the open road speed limit.

To counter this problem, a trial of solar-powered Advanced Stop Warning Signs (ASWSs) in the Selwyn District was mooted. ASWSs are activated by radar when a vehicle approaches the sign. The signs (shown in **Figure 1**) replace the existing static pre-warning sign 200m prior to the intersection. The signs are activated 150 to 200m before the sign and the high intensity LEDs have a strobe type pulse that alternates between two lights. The cost of each sign is between $4,000 and $5,000 NZD excluding installation costs. Installation is simple, and no more time consuming than installing a static sign.

Trials of similar systems conducted in Sweden and the UK decreased crash levels by 30-40% (Lind, 2009).

Figure 1. Activated Stop Warning Signs

Trial of ASWSs in the Selwyn District

During the trial, the signs were 100% operationally reliable even though one sign was located beside a hedge which shaded it for most of the day. The system survived without any backup power, in some cases with approximately one hour of sunlight per day.

The signs were deployed at three intersections in the district where crash records confirmed that drivers were failing to notice the intersection. In the two years since the trial began, no crashes have been recorded at these intersections involving a driver who failed to stop.

Nationwide Analysis to Identify Further Sites

Because crashes where drivers fail to notice the intersection are not identifiable through coded crash data alone, hand-written Traffic Crash Reports (TCRs) had to be analysed individually to confirm whether a crash may have been preventable using an ASWS. To reduce the number of TCRs which needed to be analysed individually, an automated filtering system was calibrated using confirmed 'fail-to-stop' crashes. When applied to the Selwyn District, the automated filtering system correctly identified all intersections which had at least two crashes that may have been preventable using an ASWS.

In total, 50 intersections were confirmed as potential candidates using a threshold of at least two crashes where drivers failed to notice the intersection. Between 2007 and 2016, 200 such crashes occurred at these 50 intersections. Of these crashes, 80 caused injury and 45 caused fatalities or serious injuries. The threshold was set low due to the low cost to install an ASWS and the comparatively high social cost of even one preventable crash.

An extended trial is now planned which will involve formal before-and-after analysis and assessment of the effectiveness of ASWSs in various conditions and locations. This will enable the development of best practice guidelines and statistically significant results.

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Post-crash transport decisions for patients with traumatic spinal cord injury: does it differ between states and does it matter?

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Abstract

Traumatic spinal cord injury (TSCI) is a devastating injury resulting predominantly from motor vehicle crashes and falls, with significant costs to the healthcare system. Precise post injury management is critical for lessening mortality or complication risk and improving possible functional recovery. Post-crash care including transport decisions can vitally impact patient outcomes. Clinical pathway mapping undertaken on TSCI cases across NSW and Victoria showed 1/3 in NSW were admitted directly to a specialist spinal unit (SCIU); rarely occurring in Victoria. Direct transport to SCIU saw TSCI patients more likely to receive appropriate blood pressure management and timely surgery (≤ 12 hours).

Background

Traumatic spinal cord injury (TSCI) is a devastating, costly condition impacting adversely health and quality of life. From 2008-2013 over 1200 people aged ≥15 years sustained TSCI in Australia, admitted to a SCIU; 43% as a result of a motor vehicle crash. Age at injury averaged 41 years, 80% males and 96% were discharged with persisting neurological deficit (AIHW & Harrison, 2018).

It has been previously demonstrated that not all patients with acute TSCI achieve timely admission to a SCIU (Sharwood, Boufous, Muecke, & Middleton, 2016). Expert consensus recommends expeditious transfer (<24 hours of injury) to a SCIU (Consortium for Spinal Cord Medicine, 2008), equipped to provide the comprehensive care necessary for TSCI. Delayed transfer to SCIU has been shown to increase the risk of secondary complications by at least 2.5 times (Middleton et al., 2012). This study aimed to examine clinical pathways for patients with acute TSCI across NSW and Victoria, associations with patient outcomes and costs.

Method

Prospective observational study of 267 cases with an acute TSCI were recruited in NSW and Victoria between June 2013 and January 2016. Early care pathways from the scene of injury to definitive treatment in a SCIU were examined, including transfer decisions, care protocols, timely access to surgery and health outcomes at follow up to two years post injury.

Results

We undertook clinical pathway mapping for 267 TSCI cases across NSW and Victoria revealed significant differences between states; one-third of NSW TSCI cases were admitted directly to SCIU however this rarely occurred in Victoria. Admissions to SCIU as a secondary inter-hospital transfer from a Major Trauma Service (MTS), Rural Trauma Service or other hospital occurred in over 90% in NSW, compared to less than 60% in Victoria. Transport mode (air vs road) had no effect on getting to a SCIU. Long delays in time to SCIU admission occurred in Victoria (median time 52 hours versus 3 hours in NSW) associated with increased number of inter-hospital transfers. Seventy-two percent of patients in NSW were admitted to SCIU within 24 hours of injury, compared to 21% in Victoria, reflecting some differences in injury severity, however predominantly due to the configuration of trauma services and SCIU hospitals. In NSW, the acute SCIU is collocated with a MTS; this is not the case in Victoria. Patients were 2-4 times more likely to receive appropriate treatment to maintain blood pressure (for cord perfusion) if taken directly to a SCIU than elsewhere. Early surgical decompression (≤ 12 post injury) was strongly associated with direct admission to SCIU.

Conclusions

Injuries resulting in permanent disability demand our best efforts to mitigate the extent of their severity. Importantly, victims of TSCI are often young at the time of injury and as such impose substantial and lengthy cost burdens on the health system and their families. Timely access to best practice medical and surgical care depends on an effective, coordinated health care system. Post-crash care policy and clinician action plays a key role in the long term disability of this critical injury.

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Engineering Road Safety into Mobile Applications

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Abstract

This year marks 10 years since the iPhone launched and it's hard to think of an aspect of life that it hasn't changed. Smartphones and apps have brought information, convenience and choice to everyday life and are credited with products and services becoming easier to access and increasingly tailored to customers' individual needs. Transurban saw an opportunity to apply the latest smartphone and GPS technology to enhance customers' experience and the way they interact with Transurban. Transurban has launched an innovative new tolling approach using a GPS-enabled app, allowing motorists to drive on any Australian toll road without the need for a tag. Recognising that mobile phones and driving do not mix, Transurban designed LinktGO to ensure user interaction is not required while driving. In addition to safety warnings, LinktGO has built-in safety features that leverage a phone's core motion technology.

LinktGo puts flexibility and control into the hands of Transurban’s customers

Since the opening of CityLink in 1999, e-Tags have worked well for regular users. However, recent customer research indicated that 50 per cent of Transurban customers are occasional toll road users, meaning they typically use Transurban’s roads less than four times a year. The research also indicated that these customers want flexibility, control and easier ways to manage their toll road travel, with many just wanting to pay for their toll road use without committing to an account. While occasional toll road users may not to have an e-Tag in their car, most have a smartphone in their pocket. To reach these customers and improve their experience Transurban focused on the driver, rather than the vehicle, and created a new way to pay for tolls.

LinktGO is a GPS-enabled mobile app that allows drivers to see their toll travel in real time and pay trip-by-trip using their smartphones, with no ongoing commitment. Customers can start driving just by registering their vehicle and a credit card to the app – no paperwork, no start-up costs and no tag needed. Using LinktGO, customers pay trip-by-trip, with trip details and associated costs displayed in real-time and prompts to indicate when payment is due. Trips are recorded even if the phone battery dies or data connection is lost.

Recognising that mobile phones and driving do not mix, Transurban designed LinktGO to ensure user interaction with the app is not required while driving. LinktGO has built-in safety features that leverage a phone’s core motion technology, suppressing notifications until the phone senses that the customer is no longer moving at speed. If the customer tried to access the app while driving they would find it temporarily disabled.

LinktGO has been developed in collaboration with award-winning app developer Outware and Bluedot who provide expertise in precision location technology. By incorporating lean start-up and design-thinking methodologies into the development process, the team released the app on Android and iOS in under 12 months.

Initial feedback has been positive, and Transurban will continue to listen to customers to find ways of improving their LinktGO and toll road experience.

Preliminary Findings from the Evaluation of the NSW Minimum Passing Distance Trial

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Abstract

An evaluation of the NSW minimum passing distance (MPD) trial is nearing completion. It assessed practical implementation, impact on road users' behaviours, attitudes and perceptions, and road safety benefits. Draft findings indicate awareness of the MPD rule increased and motorists were generally compliant. Compared to the pre-trial trend, there were 15 fewer casualty crashes indicative of non-rule compliance in the 10 months after the trial began, but the difference was not statistically significant. The draft findings confirm the rule has improved motorist awareness of the need to provide space when passing, and suggest the rule has contributed to cyclists' safety.

Context

In March 2016, NSW commenced a two-year trial of minimum passing distance rules. The rules require drivers passing a cyclist to leave at least 1 metre when the speed limit is 60 km/h or below, and 1.5 metres if above 60 km/h. The MPD rules aimed to influence safe passing behaviour by removing ambiguity about the expectations for leaving space when passing a cyclist and providing a clear measure for NSW Police to enforce unsafe overtaking manoeuvres. Compliance is facilitated by providing exemptions to existing road rules so motorists can pass cyclists in safe circumstances.

The Centre for Road Safety commissioned the Centre for Accident Research and Road Safety – Queensland to evaluate the practical implementation of the rule, its impact on road users' attitudes and perceptions, and road safety effects. The evaluation is nearing completion, with a final report expected to be completed during the first half of 2018.

Methodology

Evaluation methods included: pre (n=1,755) and post-rule (n=1,812) surveys with cyclists and motorists; pre and post-rule observations of passing events at 12 low and high-speed sites across metro and regional NSW (with 3,329 passing events measured in the pre-rule period and 2,650 in the post); interviews and focus groups with 18 stakeholders; and infringement and crash data analysis using an interrupted time series analysis.

Preliminary Findings

Post-rule survey results showed most cyclists (80%) and drivers (69%) supported or strongly supported the rule. All stakeholders generally considered the MPD and the speed limit ranges to which they applied were appropriate. All stakeholders thought the rule improved driver awareness of the need to provide space when passing, and validated cyclists' right to cycle on roads. While Police were supportive of the rule they had concerns about enforcing it. In practice, 45 infringement notices related to MPD rules were issued between March 2016 and May 2017.

Most drivers (69%) and cyclists (81%) surveyed thought the rule had improved safety. Awareness of the rule increased from about half of the drivers and cyclists in the pre-rule survey to about two-thirds in the post.

The median passing distances across low-speed sites were observed to range between 1.2 and 1.8 metres, and between 1.7 and 2.8 metres across high-speed sites, suggesting a general level of compliance with the rule.

Crash data analysis comparing five-year trends before the introduction of the MPD rule with the 10 months post found a 14% reduction in the number of casualty crashes per month involving a bicycle and a motor vehicle in the post period.

There were also 15 fewer casualty crashes indicative of non-rule compliance involving cyclists and motor vehicles in the post period, although the change was not statistically significant.

Conclusion

Overall, draft findings indicate the MPD rule is mostly supported. Awareness of the rule increased after the trial began, and motorists were generally compliant. Compared to the pre-rule trend, there were fewer casualty crashes involving bicycles and motor vehicles after introduction of the rule. When finalised, evaluation findings will inform further decisions regarding future implementation.

References

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Banding Together to Predict Driver Fatigue: A Trial of Wearable Activity Monitoring Devices

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Centre for Road Safety, Transport for NSW

Abstract

Wearable technologies are emerging as innovative tools to help reduce fatigue-related crashes. A wristband product called Readiband monitors the wearer's activity level, and according to the band's manufacturer, can accurately predict when the wearer is likely to be fatigued and more susceptible to a road crash. A study of 25 volunteer drivers from two organisations revealed the devices were generally supported by participants, however their fatigue levels, as calculated by the Readiband, remained static. Furthermore, senior management representatives from both participating organisations did not support the uptake of the devices because of cost, privacy and efficacy concerns.

Objective

The objective of the study was to assess the potential road safety benefits of a commercially available wearable technology called Readiband, manufactured by a Canadian firm called Fatigue Science. The product is worn around the driver's wrist, and the device's algorithm uses the wearer's activity levels to calculate the wearer's current and predicted (for the following 18 hours) levels of fatigue. The wearer can monitor their risk level in real time via the product's smartphone app, and this information is also available to the wearer's employer. Unlike other fatigue detection technologies, the Readiband does not emit audible or visual warnings to the wearer, as the data is primarily intended to be monitored by the wearer's supervisor. The efficacy of the algorithm used by the Readiband, which converts bodily activity levels to sleep, was not tested during the trial.

Method

Twenty-five volunteer drivers were recruited from the NSW State Emergency Service and a Wollongong bus company. The participants' SAFTE™ Average Alertness Scores were calculated by the band across the 52-day assessment period. According to the device's manufacturer, the SAFET™ score, which ranges from zero to 100, is a scientific measure of the effects of a lack of good and consistent sleep. Participants also completed an online post-trial survey, which included questions relating to the technology's ease of use, perceived value, reliability, and the extent of any changes in the participants' sleeping behaviour. The participants' senior management provided face-to-face verbal feedback, which included their willingness to adopt the technology within their organisations.

Results

The online surveys revealed that the participants generally found the bands to be comfortable and user-friendly, and felt the data accurately reflected their sleeping behaviour. They believed the band could help reduce driver fatigue in principle, and were willing to wear the band during and outside working hours if asked by their employer. The majority of participants, however, felt the bands did not improve their sleeping patterns.

The bands' activity data revealed that the average daily hours of sleep was marginally below the manufacturer's claimed optimum of seven to nine hours. The Average Alertness Score for the entire group was within the ‘Optimal’ range, and it remained generally static across the assessment period, reflecting no general change in participant sleep behaviour.

Senior managers from both organisations did not support the adoption of the technology in their workplaces, for reasons related to cost, employee privacy, the lack of a perceived need for the technology and the efficacy of the device’s algorithm to convert activity data to sleep data.

Conclusions

The bands were generally accepted by the participants. However, no improvement in participants’ sleep patterns was detected. Furthermore, the participants’ senior management did not support the implementation of the technology because of concerns related to high cost, employee privacy, the lack of a perceived need for the technology and the efficacy of the device’s algorithm to convert activity data to sleep data. The technology may deliver road safety benefits in the future if these significant challenges can be addressed.

Further Research on Attachments Mounted on an Approved Motorcycle Helmet: Do they Increase Injury Risk?

Dan Leavy, David Beck

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Abstract

There has been growing demand for fitting aftermarket attachments, typically cameras and communication devices, onto motorcycle helmets. Previous research found that in some cases, attaching devices to a helmet caused the helmet to fail one of the tests specified in the two design standards referenced in the NSW Road Rules 2014. A further study was carried out to assess how this relates to an increased risk of injury to the wearer in a crash. The results, which are currently being peer reviewed, indicate that fitting devices to an approved motorcycle helmet is unlikely to pose an additional risk.

Background

The NSW Road Rules 2014 require motorcyclists to wear a helmet that complies with Australian Standard 1698 or UNECE Regulation 22.05. Both standards have conditions for fitting attachments and have a test to check that projections incorporated into a helmet detach easily in a crash. In 2015, the Centre for Road Safety (CRS) carried out a series of tests on helmets fitted with various attachments; these found that some attachments caused the helmet to fail the projection tests (Suratno & Leavy, 2017). In 2017, CRS carried out further tests using more recent technologies and a new methodology to determine the injury risk that helmet attachments may pose in a crash.

Method

The recent research involved two sets of tests. All tests used an instrumented biofidelic Hybrid III headform rather than the standard headform specified in the standards' tests, as this provided a more realistic response to the forces imposed on a person in a crash. Phase 1 applied the tests and associated injury assessment criteria specified in the standards. Phase 2 involved a world-first test protocol using a rig developed specially for the Consumer Rating and Assessment of Safety Helmets test program to assess the level of trauma sustained to the head and neck by a person wearing a helmet in a crash. This test involved dropping a helmeted Hybrid III head and neck assembly onto a moving striker plate, which applies radial and tangential loads to the helmet and attachments (Figure 1). Control tests were carried out on helmets without any devices attached to them. Data recorded by the Hybrid III headform were used to assess the likely injury outcomes.

This research also investigated if the material used to attach a device to a helmet affects the injury outcome, and whether an adhesive could be used that would allow the helmet to pass the standards' tests regardless of the type of device attached to it.

Overall, 72 tests were carried out on seven types of helmets using three different cameras and two different communications devices.

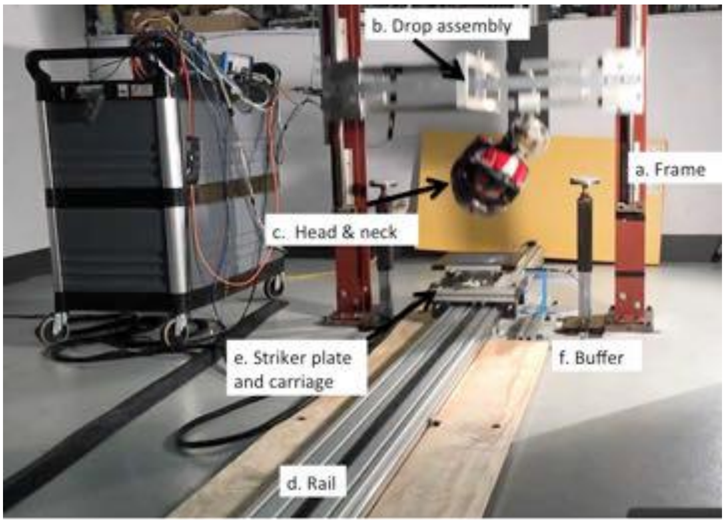

Figure 1. Rig used in Phase 2 tests

Results

Failures were recorded in 14 of the 32 Phase 1 tests but the Hybrid III headform showed that in all but one case, the risk of skull and brain injuries was very low. In the other case, the results were within acceptable limits when the test was repeated using a different adhesive material.

The forces recorded in the 40 Phase 2 tests were below the levels associated with brain or skull injuries, and most were less than those recorded in the control tests; this is probably due to the device absorbing some of the force in the crash that had previously been transmitted straight to the helmet.

Conclusions

The research program indicated that fitting devices to an approved motorcycle helmet is unlikely to pose an additional risk to the wearer in a crash. Independent peer reviews recommended additional tests be carried out to ensure the veracity of the results and conclusions , and these are currently being undertaken. The final findings will be provided to key stakeholders, including helmet manufacturers and applicable standards committees, for their consideration, and it is hoped they will inform amendments to the two design standards and the Road Rules.

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How Safe are the Cars on our Roads? Data Visualisations to Analyse NSW Light Vehicle Fleet Safety at a Glance

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Abstract

The NSW Centre for Road Safety (CRS) has developed two vehicle fleet safety visualisation tools to provide insights into the safety of the light vehicle fleet and its relationship to road trauma. The visualisations present a snapshot of the safety specifications of a subset of NSW registered light vehicles, and their involvement rates in crashes. To our knowledge, this is the first application of visualisation tools to match vehicle safety specifications data with crash data. The visualisations assist CRS policy-makers in research and policy analyses by allowing users to filter data and present queries in simple graphical displays.

Background

Improvements in the safety of the vehicle fleet have the potential to drive major reductions in road trauma. Detailed vehicle fleet safety specifications data, however, are typically difficult and labour-intensive to obtain and compile.

CRS has developed two vehicle visualisations to make NSW vehicle fleet safety specifications data routinely available to policy-makers in a user-friendly way. The first contains a snapshot of the NSW registered light vehicle fleet. The second contains a snapshot of NSW-registered and written-off light vehicles that were involved in a crash.

Both visualisations are designed using the readily available software ‘Tableau Desktop’, which easily allows customisation of data queries. The visualisations aim to refine analyses and assist informed decision-making on policies and strategies to promote the purchase of safer vehicles.

Visualisation 1: NSW Vehicle Fleet Safety Specifications

This visualisation currently has data for more than 4.5 million NSW registered motorised light vehicles (excluding plant vehicles and motorcycles) with compliance plate years 2000−2016. The information is derived from registration data maintained by NSW Roads and Maritime Services, matched to vehicle manufacturer data through a Vehicle Identification Number (VIN) decoding process. The database is updated annually and the decoding process is performed annually. Quarterly data update is currently being considered.

The vehicle data includes age, ANCAP rating, market class, segment, make, model, vehicle type, colour, garaging location, and safety features fitted. For example, Figure 1a displays a query for ANCAP ratings and electronic stability control (ESC) install rates for light pick-up or cab chassis commercial vehicles. It shows that 99.9% of 5-star ANCAP-rated vehicles in this category had ESC installed, compared to 34% overall. The visualisation is able to show ESC install rates for each vehicle compliance year. Should uptake be slow, this information would inform programs to encourage faster uptake of commercial vehicles fitted with ESC.

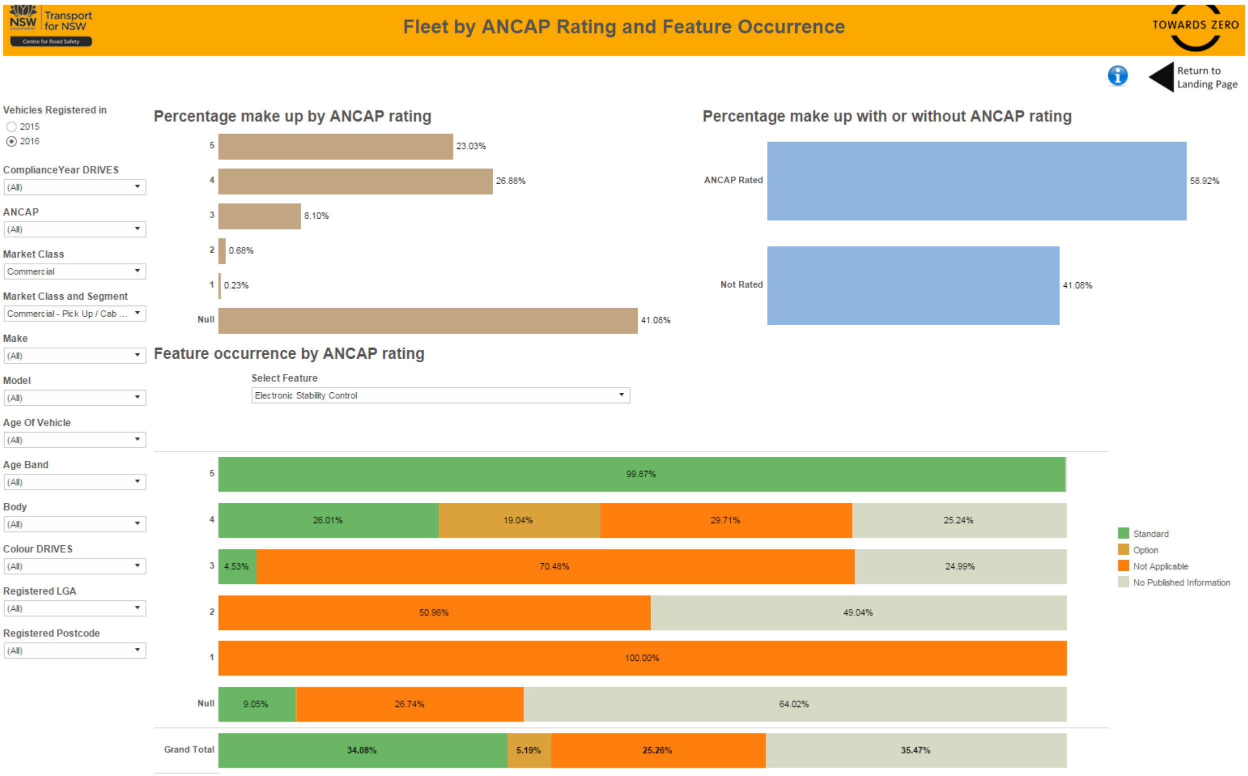

Figure 1a. Example of NSW Fleet Safety Specification query display

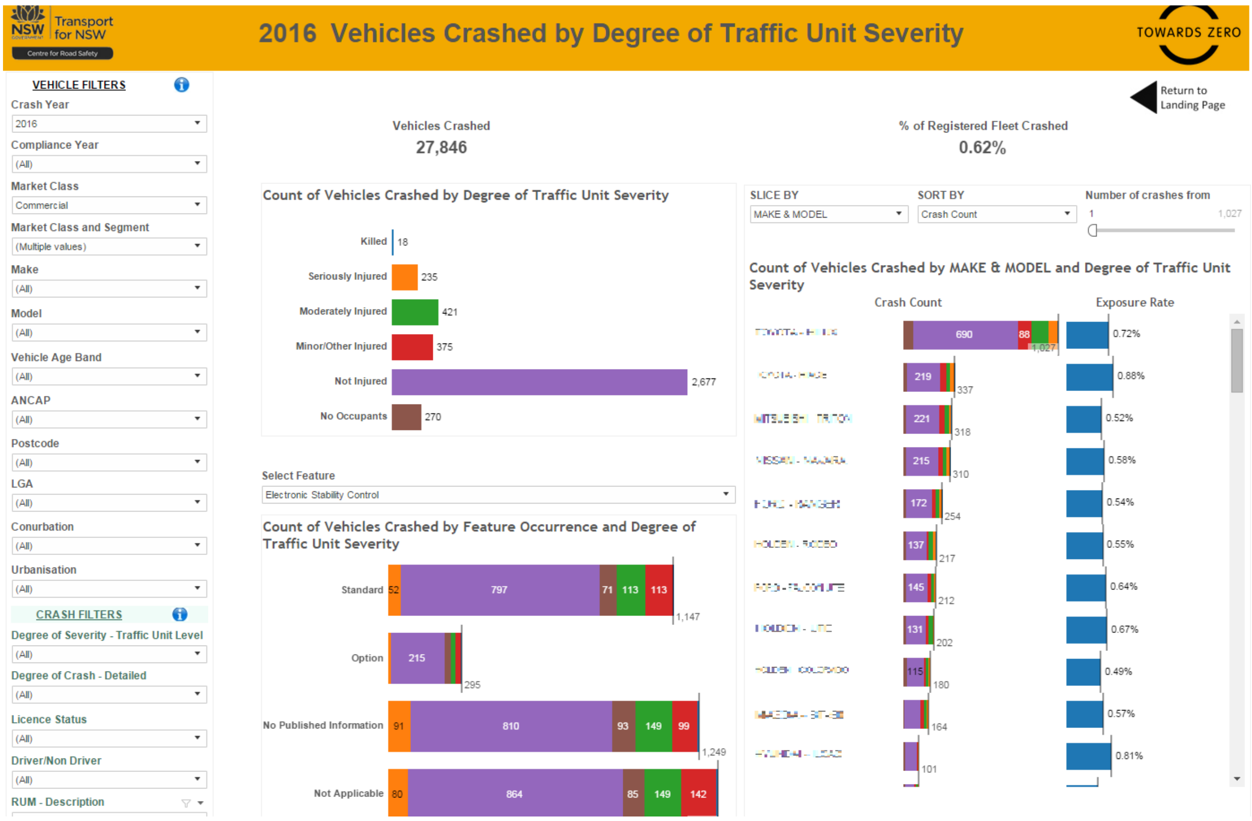

Figure 1b. Example of NSW Crashed Vehicle Specification query display

Visualisation 2: NSW Crashed Vehicle Specifications

This visualisation currently has data for over 58,000 NSW-registered and written-off motorised light vehicles (excluding plant vehicles and motorcycles) that were involved in a crash in 2015 and/or 2016, with compliance plate years 2000−2016. The information is derived from the Vehicle Fleet Safety Specifications database, matched to NSW crash data.

This visualisation is useful in establishing crash trends and levels of safety specifications for those vehicles, filtered using aspects such as vehicle age, vehicle types, controllers' licence types, crash locations and severity of the crash. For example, Figure 1b displays a query for injury severity for commercial vehicles that crashed in 2016. These results can be further filtered to show fatal crashes only, indicating that one commercial vehicle with ESC resulted in a fatality, compared to 14 fatalities for crashes for commercial vehicles without ESC. This data could inform strategies to promote purchase of commercial vehicles with ESC.

This visualisation required complex programming, and there are limitations to how 'Tableau Desktop' is able to display information, however the background matched data has been very valuable in assisting CRS with more in-depth data to refine policy and strategy analyses.

Conclusion

The vehicle fleet visualisation tools have proven useful in assisting policy-makers to quickly and simply analyse and present vehicle safety data. For example, they have been used to help influence stakeholders in decision-making about safety features such as autonomous emergency braking, and to assist in providing advice on selecting safer vehicles for government fleet purchasers. Examples will be provided in the presentation.

Embedding Road Safety in Businesses

Hannah Parnell, Ruth Graham, John Wall

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Abstract

In NSW, one in six workplace fatalities are a result of road crashes at work. All businesses have an obligation under Work Health and Safety law to ensure a safe work environment. This includes when on and around the road. The Centre for Road Safety has developed an easy-to-read guide to help businesses understand the key road safety issues and risks, and ways to help their employees reach their destination safely. It also provides clear steps to help businesses embed road safety within their organisation.

Introduction

Every road user has the right to travel safely on the road network. In NSW, one in six workplace fatalities are a result of road crashes at work (SIRA, 2017). NSW crash statistics show around 25% of fatalities are from crashes involving a vehicle being used for business (four-year average, 2013-2016). Fatal and serious injuries from crashes should not be accepted. Road safety is a shared responsibility – everyone has a role to play in keeping ourselves and others safe on the road, including businesses. However, businesses vary greatly in their application of road safety practices.

Road Safety Guide content

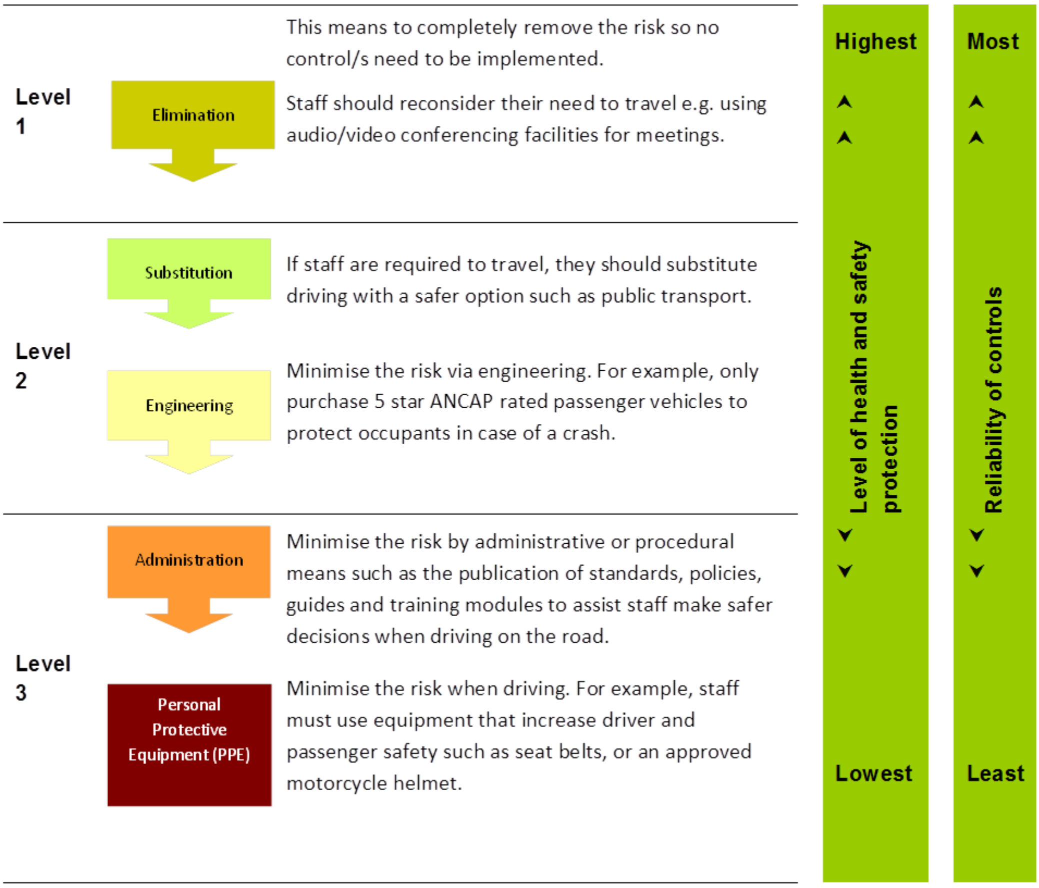
The Road Safety Guide for Businesses explains the principles of the Safe System approach, and how the four elements – safe roads, safe vehicles, safe speeds and safe behaviours – work together. This helps organisations understand, for example, that selecting a safe vehicle fleet for their workers is just as important as encouraging safe behaviours.

Even with a good understanding of road safety, it can be hard to know how to achieve a road safety culture within a business, or where to start with developing a road safety policy. The Road Safety Guide for Businesses outlines the seven steps to achieving this:

1. Gain executive support
2. Understand staff travel and associated risks
3. Set clear and measurable goals
4. Develop accountability systems
5. Document policy and guidelines
6. Launch your policy
7. Monitor, review and improve.

The 'hierarchy of controls' risk assessment model is also presented (Figure 1). Businesses can use this to understand the controls for three levels of risk – from elimination of risks, through to providing personal protective equipment. Examples are provided at each level to aid businesses with their risk management.

Figure 1. Hierarchy of controls risk assessment model applied to driving



The most substantial part of the Road Safety Guide for Businesses is about managing the risks. The first and most important task is to consider the need to travel. This can eliminate the risk altogether. Staff can be encouraged to use audio/video conferencing, use public transport, or work from a different location.

If workers have to travel, businesses are provided with safety initiatives for both them and their staff, via all elements of the Safe System approach. For example, to manage speeding employers could ensure they schedule work to allow enough time for staff journeys, including rest breaks, and/or fit vehicles with tracking systems that monitor speed. Employees can be encouraged to employ safe behaviours such as staying under the posted speed limit, following advisory speed signs, and driving to the conditions. Specific guidance on the risks and managing the risks is not only provided for drivers, but also for motorcyclists, cyclists and pedestrians.

The Road Safety Guide for Businesses is expected to be launched in 2018. The Centre for Road Safety hopes to partner with organisations with large fleets, to help them develop policies and guidelines and firmly embed road safety within their business. Each positive change a business makes is one more step Towards Zero.

References

SIRA (State Insurance Regulatory Authority), 2017. NSW Workers Compensation Statistical Bulletin 2014/15. State Insurance Regulatory Authority and SafeWork NSW. Available at: (https://www.opengov.nsw.gov.au/publications/16732)

Saving Lives on Country Roads Campaign: Helping Achieve the Towards Zero Target in Regional NSW

Lauren Fong[a], Ruth Graham[a], Bernard Carlon[a], Nicole Douglas[b], Sophie Dent[b], Tina Gallagher[b]

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Abstract

Country residents make up one-third of the NSW population, yet two-thirds of the state's road fatalities occur on country roads. The 'Saving Lives on Country Roads' campaign is the first comprehensive education campaign focused on country roads. It aims to raise awareness of the size and nature of the road trauma problem on country roads, and help achieve the State Priority target in regional NSW. The campaign encourages drivers to re-think common excuses used to justify risky driving behavior and to make safer choices. Ultimately, no risk taking on the road is acceptable and can result in serious life-changing consequences.

The crash problem

In 2016, 380 people were killed on NSW roads. Of these, 252 people (66%) were killed on country roads. From 2012-2016 a total of 1,185 lives were lost on NSW country roads. There is a commonly held belief that city people or tourists unfamiliar with regional roads are most at risk, when in fact the majority of drivers and riders involved in fatal crashes on country roads are country residents. In 2016, of the 342 drivers and riders involved in fatal crashes on country roads, more than three quarters (77%) were country residents. Of these country residents, the majority (61%) were locals who crashed in the same local government area as they lived. Based on the fatality rate per head of population, country residents are four times more likely to be killed in a road crash than metropolitan residents.

There are a number of factors contributing to the increased likelihood and severity of crashes on country roads. These include higher speed roads, roadside hazards such as trees and embankments, longer travel distances and older vehicles. However behavioural factors are more likely to contribute to road crashes. Speeding, driver fatigue, drink driving, and not wearing a seatbelt are more likely to contribute to country fatalities compared to fatalities in metropolitan areas and statewide (Table 1). This indicates there are higher levels of risk taking behaviours amongst country drivers and riders.

Table 1. Percentage of fatalities by behavioural factor and urbanisation, 2016

	All NSW	Metropolitan NSW	Country NSW
Excessive or inappropriate speed	42%	32%	47%
Fatigue	21%	8%	28%
Illegal alcohol	16%	6%	20%
Seatbelt non usage	18%	9%	21%

The need for a targeted campaign

Despite the fact that the majority of fatalities on country roads are local residents, Transport for NSW qualitative research found that country drivers may resist the notion that the way they drive puts themselves or others at risk (Centre for Road Safety, 2017). There is a tendency for complacency, over-confidence and lower perception of risk when driving on familiar roads.

The 'Saving Lives on Country Roads' campaign was developed to challenge these perceptions by helping drivers acknowledge that their everyday excuses used to justify risky behaviours have no place on the road. Acknowledging this and making safer choices on the road will help local communities drive the road toll towards zero. The key messages are:

- Country people are dying on country roads. It could be your mates, your families or you.
- The everyday excuses drivers use to justify risky behaviours have no place on the road.
- Your decision to drive too fast, drive while tired or to have one more drink can result in serious consequences for yourself and others.
- We need to be aware of the risks on the road at all times and avoid them, even on familiar roads.
- We all have a part to play in keeping ourselves and our communities safe on the road.

Figure 1. Campaign creative

The primary campaign audience is regional males aged 30 to 59 years who make up the largest proportion of fatalities on country roads. However the campaign also encourages friends, family and local communities, through a significant public relations and outreach program, to influence safe driving behavior in an effort to work towards zero.

References

Centre for Road Safety, 2017. *Research to inform the development of the Country Roads Campaign Communications Strategy*. Unpublished report prepared by Snapcracker Research and Strategy for the Centre for Road Safety, Transport for NSW.

Enhancing the NSW Graduated Licensing Scheme – Communication and Implementation

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Abstract

The NSW Government has enhanced the NSW Graduated Licensing Scheme (GLS) to align more closely with the Australian GLS Exemplar model. The changes, which impacted over 800,000 licence holders, built on a successful existing GLS policy framework.

In recognition of the complexity of the changes, a comprehensive media and communications strategy was developed to ensure accurate and consistent messaging, with the social media campaign rated as one of the most engaged-with NSW Government campaigns for 2017.

The impacts of the GLS enhancements will be evaluated at a later date.

Context

In 2014 the Australian GLS Policy Framework was developed, providing an opportunity to make further gains in novice driver road safety and work towards a national approach to graduated licensing (Centre for Road Safety, 2014). The framework outlines a best-practice approach to novice driver licensing, with three levels: a 'Standard GLS', an 'Enhanced GLS' and an 'Exemplar GLS'.

The approach recognises that each jurisdiction has a different starting point and improvements to existing GLS systems may be incremental. This results in a framework that is achievable for all states and has strong national support.

In 2016/17 the NSW Government more closely aligned the NSW GLS with the Australian GLS Exemplar model by:

- extending the ban on mobile phone use for P2 drivers, delaying the use of hands-free mobile phones by novice drivers until they complete the P2 period
- repositioning the Hazard Perception Test from the end of the P1 phase to the Learner phase
- removing the Driver Qualification Test
- extending provisional periods for higher risk drivers.

Having a strong, evidence-based and nationally endorsed framework has been critical in maintaining policy intent and achieving further incremental changes.

The GLS is part of a broader framework for novice drivers in NSW, which also includes the Safer Drivers Course, the Helping Learner Drivers Become Safer Drivers workshop, and the 3 for 1 scheme for professional driving lessons.

Implementation

The amendments impacted over 800,000 NSW licence holders. Communicating the complex changes to the various cohorts was identified as a challenge, despite strong community support. A detailed communication strategy was developed, including a mail-out, social media, radio and service centre campaign, representation at events and a media strategy.

Location-specific campaigns were launched months prior to the go-live date and remained active up to six months after launch. The social media campaign rated as one of the most engaged-with NSW Government campaigns for 2017. The GLS Changes social media posts successfully drove over 124,665 people to the Roads and Maritime website for more information, with a very high click-through rate of 3.05%. Agencies reached out to community partners, education organisations and driving schools with posters, information sheets and social media campaigns for circulation to their networks. Extensive Q&A documents were prepared for Government officers to ensure all public-facing communication contained accurate and consistent messaging.

Next steps

The impacts of the GLS enhancements will be evaluated, and the approach applied to improving the GLS for drivers will inform the review of the Motorcycle GLS and consideration of enhancements.

NSW has not adopted all of features of the Exemplar model. Additional features may be considered in future; however, close engagement with young drivers and the community would be required.

Transport for NSW is also modernising the learner driver licence experience to provide interactive and connected learning experiences for novice drivers, parents and supervisors.

References

Centre for Road Safety, 2014. Australian graduated licensing scheme: Policy framework. Centre for Road Safety, Transport for NSW, Sydney.

Safely Integrating Public Transport within the Road Environment

Luke Wilby[a], Will Warner[a], Michael Holmes[b], Ralston Fernandes[a], Melvin Eveleigh[a], Bernard Carlon[a]

[a]Centre for Road Safety, Transport for NSW; [b]Sydney Metro Delivery Office, Transport for NSW

Abstract

With increasing urban congestion there is renewed focus on public transport. Public transport networks may directly integrate with the road environment, such as bus or light rail networks, or may be segregated but provide high-demand interchanges, such as Metro rail.

Through good design and practice we can ensure these networks and interchanges provide safe access and thoroughfare for all road users – making sure we proactively create safe places for people that align with our Towards Zero vision.

This paper outlines how a collaborative safe system approach has been achieved to ensure safe integration during construction and operation of transport projects.

Background

With increasing congestion in our cities there is a renewed focus on public transport to reduce reliance on cars, increase the place function of the environment, and provide customers with options to move about the network. In NSW there are currently a number of public transport infrastructure projects being designed and constructed, including light rail, rapid bus corridors and Metro rail. These projects either directly integrate with the existing road network through on-street running, or interface with the network through high-demand interchanges.

Introducing new public transport such as light rail into urban areas can introduce new safety risks, particularly for vulnerable road users. Through good design and practice we can ensure these networks are safely integrated into the existing environment and provide safe access and thoroughfare for all road users – making sure we proactively create safe places for people and not future blackspots.

Collaborative Approach

The Centre for Road Safety has been working closely with each of the projects to ensure safety is a core focus. Road safety audits are mainstreamed into all new projects at the design, planning and construction phases.

Construction

The underground nature of Metro rail involves significant tunneling and subsequent heavy vehicle movements to remove spoil and deliver construction materials. To ensure this is carried out safely we have collaborated with the projects to ensure a safe system is maintained.

Minimum heavy vehicle safety requirements have been improved to create safer interactions with other road users. Additional training has been provided to heavy vehicle drivers and successful campaigns rolled out to remind other road users of trucks' increased blind spots and reinforce that safety is a shared responsibility (Figure 1). Appropriate speed limits have been implemented at construction sites, along with enforcement measures and infrastructure improvements to control risks associated with introducing significant heavy vehicle traffic in existing urban road environments.

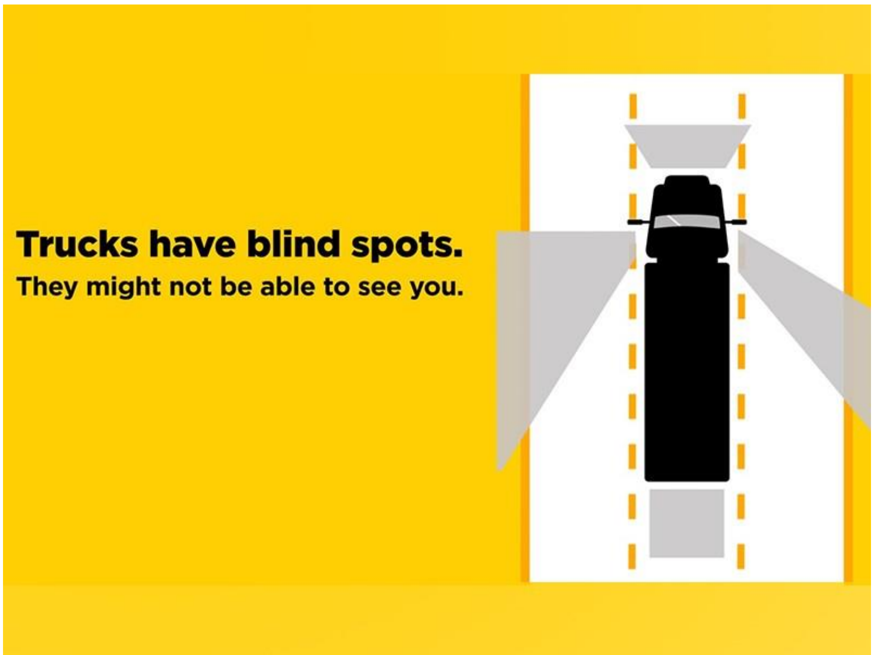

Figure 1. Example of successful truck blind spot campaign

Challenges

For projects that are introducing new modes of transport into NSW, the biggest challenge from a roads perspective is designing for future safe integration within the existing network. This involves a thorough understanding of future land use across the networks and clear goals for the movement and place function of the environments. Speed limits need to be appropriate for the surrounding environment, with lower speed limits in areas of high pedestrian demand and interchange, or frequent major events. In corridors identified as predominantly movement corridors, higher speed limits can be achieved when coupled with appropriate infrastructure such as kerb separation and controlled crossing points. Transport vehicle standards need to find a balance between protecting those on board and protecting other road users in the event of a collision. It is also important that we educate road users about risks and appropriate behaviours to assist with safe interactions across the networks.

Implications

Taking these opportunities to embed road safety into transport projects will greatly improve road safety outcomes across the existing and future NSW network. Safety in design also provides a cost-effective approach by avoiding the need to retrofit improvements in the future.

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An Investigation into Potential Migration of Run-of-road Crashes after Treatments of Sites in Rural Western Australia

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[a]Curtin-Monash Accident Research Centre, Curtin University, Western Australia, [b]Main Roads Western Australia

Abstract

Run-off-road crashes are especially problematic in rural Western Australia (WA), with lives lost and trauma that result placing a great burden on community. Factors that lead to these crashes, such as fatigue, are compounded by WA's vast land area and long distances between its towns.

Chow et al. (2017) found the State program aimed to reduce such crashes to be successful. However, the question arises, whether the treatments deployed acted to delay the crashes only, and whether the crashes "migrated" to other road sections after the treated sections. This new study aims to answer this question with up-to-date data.

Background

Run-off-road crashes accounted for almost 60% of road deaths and serious injuries in rural WA from 2008 to 2012 (ORS, 2014). A total of 984 kilometres of rural WA roads received treatments which included *audible edgelines* and *shoulder widening and/or sealing* under the rural "Run-off-road Crash Program" from 2012 to 2015. The earlier study by Chow et al. (2017) was performed at a time when data on traffic volume weren't readily available for all sites. This new study aims to rectify that with new data on traffic volume, and at the same time addresses the question on any potential existence of "crash migration".

Methods

A quasi-experimental *before and after* study design was used to compare: (1) *run-off-road crashes* (all severities); (2) *run-off-road casualty crashes* (fatal, hospitalisation, and/or medical treatment); and (3) *run-off-road killed or serious injury (KSI) crashes* (ORS, 2014), at sites treated during 2012-2015.

Updated crash data was obtained up to 31st December 2016, from the Integrated Road Information System maintained by Main Roads. The Road Use Movement code was used to identify run-off-road crashes at 59 case sites (before and after treatment). On the basis of Nicholson (1986), this study utilised five years of pre-treatment crashes, and up to five years post-treatment (if available). The regression of the mean effect was considered.

A comparison group of 63 sites (without treatments) was chosen, together with new data on annual average daily traffic, and other information on the sites obtained from Main Roads, for both case sites and comparison sites.

As each site received treatment in a different year so the length of post-treatment exposure was also different, a generalised estimating equation Poisson model (Dupont, 2002; Twisk, 2003) that accounted for exposure was used to compare crashes before and after each treatment.

Results

This new study found the 59 case sites to have observed a statistically significant 43.7% reduction in run-off-road crashes (all severities) that was due specifically to the treatment ($p<0.001$). The same case sites also observed a significant 29.3% reduction in run-off-road casualty crashes ($p=0.031$) and significant 36.6% reduction in run-off-road KSI crashes (p=0.039), thus consolidating the earlier findings by Chow et al. (2017).

The study found 63 comparison sites without treatment to have observed a relatively lower 24.8% reduction in run-off-road crashes (all severity) (p<0.001), a relatively lower 22.9% reduction in run-off-road casualty crashes (p=0.022), and a statistically non-significant 22.8% reduction in run-off-road KSI crashes (p=0.092).

The 63 comparison sites were in close proximity to the case sites. Their crash reductions were compared to the reductions as observed by the whole lengths of rural roads where both the case and comparison sites were drawn from. There was no clear evidence of crash migration within 10 km of each case site.

While there was evidence of a downward trend in run-off-road crashes across rural WA, the treatments from the Run-off-road Crash Program did work to significantly reduce the loss of lives further.

Conclusions

The fatalities and serious trauma from run-off-road crashes place a great burden on society. Given the positive outcomes in crash reductions, it is recommended WA's "Run-off-road Crash Program" be continued and extended to roads not yet treated by the countermeasures.

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Trialing connected vehicle technology in privately-owned light vehicles: An Australian first

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Abstract

This Field Operational Test (FOT) will introduce up to 55 light vehicles owned by members of the public into Transport for NSW's Cooperative Intelligent Transport Initiative (CITI), the first large-scale, long-term connected vehicle initiative in Australia. Within the CITI testbed, there are up to 60 connected trucks, 11 connected public passenger buses, two light fleet vehicles, 1 fleet motorcycle and three connected signalised intersections operating. Findings from the light vehicle study will increase knowledge of the human-machine interface (HMI) and road safety benefits of this technology. The presentation will include an update on study progress and participant recruitment and demographic data.

Aim

This study aims to:

- Gain experience in the deployment of connected vehicle technology into privately-owned vehicles
- Improve understanding of connected vehicle safety applications
- Evaluate participants' experience with the HMI
- Assess the benefits of connected road safety applications (Table 1), including:
    - harsh braking ahead (vehicle-to-vehicle (V2V))
    - intersection collision (V2V)
    - red traffic light warnings (vehicle-to-infrastructure (V2I))

Methods

The study design is a before/after study, with participants not receiving alerts during the baseline period. Participants will complete surveys during the study and some will participate in a focus group discussion at the end.

The connected vehicle technology is configured to enable communication among vehicles and traffic signals fitted with the equipment, with messages transmitted over a dedicated radio frequency. Alerts are given within the testbed area (Figure 1).

Participants

We have recruited 55 members of the public. Eligibility criteria were designed to ensure vehicles came into frequent contact. The first recruitment wave was parents/carers of a child who attends one of the supporting schools nearby Wollongong's Central Business District (CBD) and drives to/from the school 3+ times/week at the beginning/end of the school day. To boost recruitment, a second wave was undertaken through a market research company from residents living in the Illawarra and driving to/from/through the CBD 3+ times/week. In December 2017, local media (televised news, newspaper and radio) supported the recruitment of parents/carers.

Additional participant eligibility criteria include:

- Holding a full (not learner or provisional) NSW driver licence
- Owning a comprehensively insured, registered light vehicle the participant is willing to have installed with the equipment, or having permission from the vehicle owner
- Driving 5+ hours/week
- Driving the vehicle >80% of trips

This study has been approved by the University of Wollongong / Illawarra and Shoalhaven Local Health District Social Sciences Human Research Ethics Committee, NSW Department of Education, and Catholic Diocese of Wollongong. Each principal approved the school's involvement in the study, and independent schools provided a letter of support.

Study components

Participation in the study involves:

- Participants' vehicles being fitted for approximately 10 months with connected and telematics technology to monitor driving
- Halfway through the study, participants will be trained about the system, and the connected vehicle equipment alerts will be activated
- Participants will complete online surveys at the beginning and end of the study
- Some participants will attend a focus group discussion at the end of the study
- Participants will meet a researcher once a month in the CBD to exchange secure digital memory cards which store the driving data

Study progress

Thirty-three parents recruited via schools expressed an interest in the study. Of these, 48% (16/33) met the eligibility criteria. The market research company identified 98 eligible volunteers. A few volunteers contacted or were contacted by researchers. Of eligible volunteers, 42% (55/132) consented to participate in the study.

Next steps

Findings will provide a greater understanding of the road safety benefits and limitations of connected vehicle technology, and be used to inform policy about the future of this technology within NSW.

Table 1. Screen displays of road safety applications used in this study

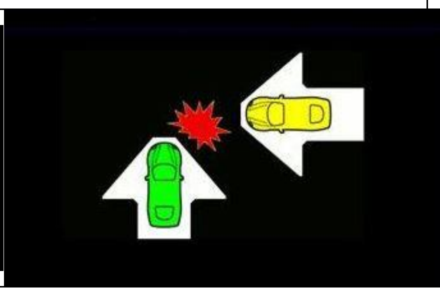
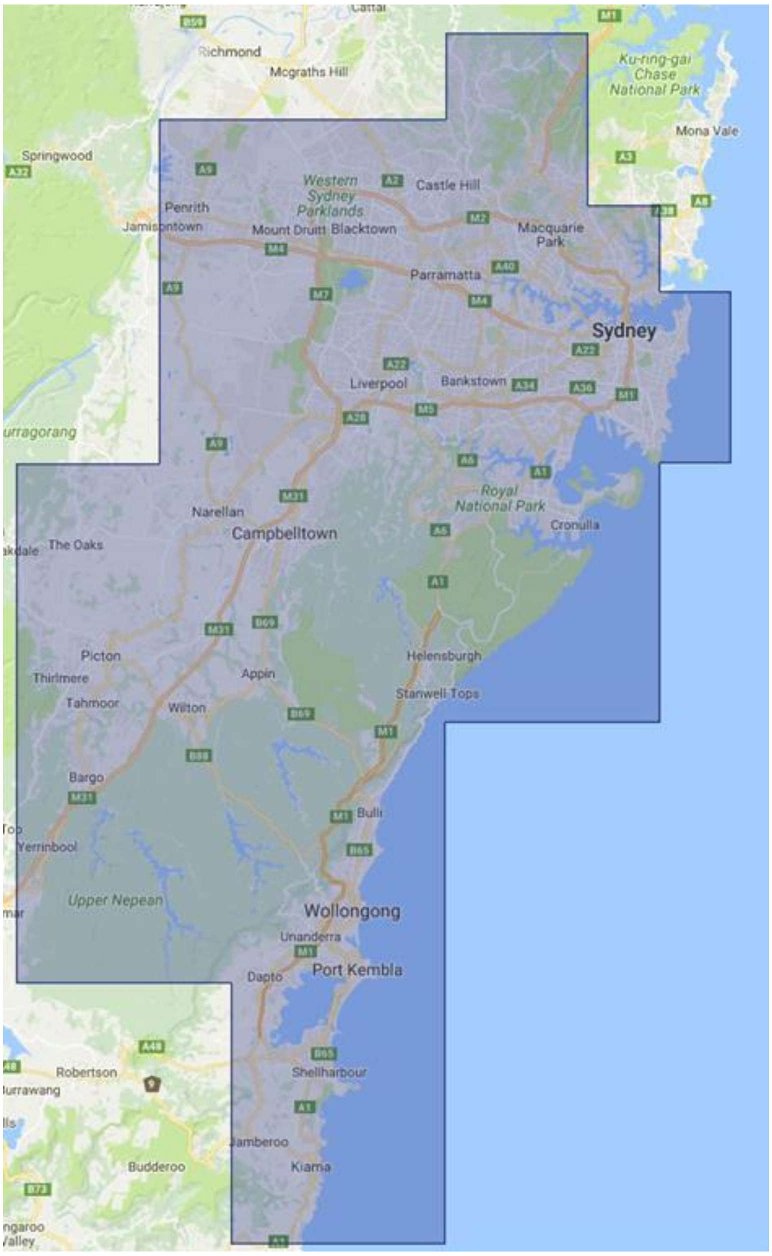
Harsh braking ahead warning	Intersection collision warning	Red light warning
		

Figure 1. Geofenced testbed in which connected vehicle technology operates for this study, including most of Sydney (excluding the northern beaches and far west) and south to Kiama



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NSW High Performance Vehicle Scheme for Provisional Drivers

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Abstract

In the interests of road safety, NSW provisional drivers are prohibited from driving high performance vehicles (HPVs). This restriction has applied since July 2005. In 2014, the definition of a HPV was amended to mean a vehicle greater than a specified power-to-mass ratio (PMR). Although this was intended to apply nationally, NSW added an additional criterion to include vehicles with a lesser PMR but which pose a high risk to novice drivers for other reasons. A new website was developed, which now allows the public to check the status of over 90,000 vehicles available in NSW.

Background

In NSW, provisional licence holders are not permitted to drive HPVs. This restriction was introduced in July 2005, in response to concerns that novice drivers were allowed to drive dangerous vehicles. At the time, a HPV was defined as a vehicle that had eight cylinders or more or was turbo/supercharged, and the road authority published a list of prohibited vehicles. A similar policy was applied in Queensland, South Australia and Victoria.

Recently, turbo/supercharging began being used to create more fuel-efficient, rather than high-powered, engines. To respond to these changes, the relevant Australian jurisdictions changed the definition of a HPV to mean a vehicle with a power-to-mass ratio (PMR) greater than 130 kW/t, and removed reference to specific engine features.

Changes to definition and administration in NSW

From August 2014, NSW applied the new definition to all vehicles irrespective of manufacture date; NSW also qualified the definition to allow it to ban vehicles that otherwise posed a high risk to novice drivers, such as vehicles with a high acceleration rate or a history of frequent crashes by provisional drivers. Other jurisdictions continue to apply the original definition to vehicles manufactured before 2010, and the new definition to later models; they do not apply the NSW policy to ban other types of high-risk vehicles.

Using a vehicle’s PMR means that its power and tare mass must be known. Transport for NSW (TfNSW) engages a supplier to provide the necessary data for the vehicles. Data for older or personally imported vehicles are often not readily available, which can pose problems in determining the PMR of older or exotic vehicles.

Additional data is necessary for TfNSW to determine other high-risk vehicles. This data has proven relatively easy to source for modern vehicles, and the NSW definition is seen to provide a safety benefit with the addition of little administrative burden.

Details of the HPV status of over 90,000 vehicles is on the TfNSW website. This allows members of the public and the NSW Police Force to access the status of individual models by a user-friendly interface (Figure 1).

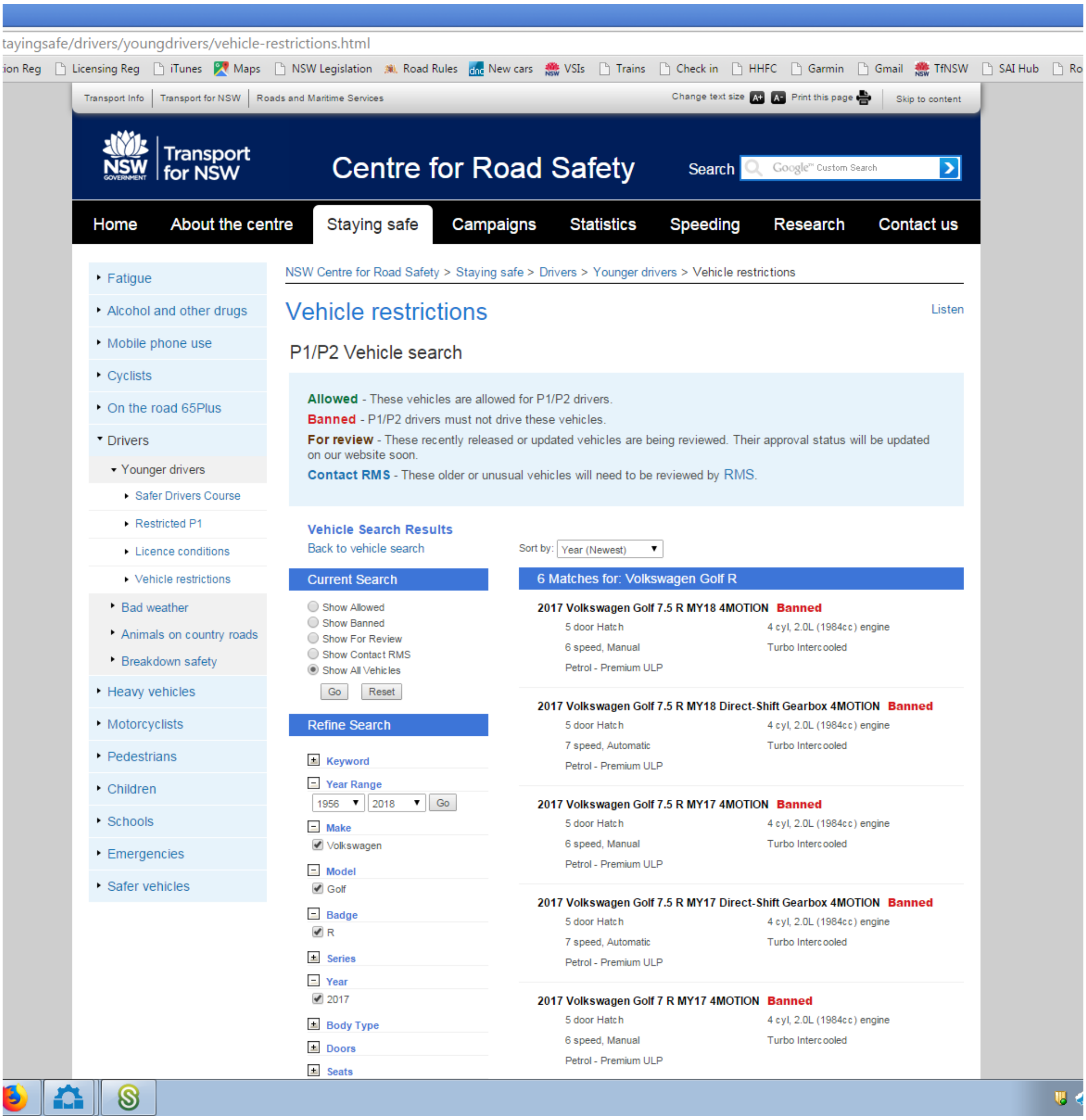

Figure 1. Screenshot showing a HPV search

Conclusions

Applying a consistent PMR-based definition of HPV to all vehicles, irrespective of build date, is a fair approach from a policy perspective. Although the difficulty in sourcing data for older vehicles creates an administrative burden, it is considered worthwhile as it produces a more equitable outcome than the previous policy, which relied on certain characteristics which do not necessarily equate to a high-risk vehicle – for example, the increasing use of turbocharging to improve fuel efficiency rather than increasing engine performance.

Specifically banning other high-risk vehicles has been relatively simple administratively and has led to some vehicles, whose performance characteristics clearly pose a high risk to novice drivers, being banned despite having PMRs less than 130 kW/t. For example, the 2007 Subaru WRX is included as a HPV despite it having a PMR of 123 kW/tonne as it can accelerate from 0 to 100 km/h in 5.9 seconds.

Using high-quality serious injury data to inform development of road safety measures

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Centre for Road Safety, Transport for NSW

Abstract

The Centre for Road Safety (CRS) has established the routine collection and reporting of data on serious injuries from NSW road crashes. This new information shows that the profile of serious injuries and fatalities are different, and highlights the need for practitioners to use serious injury data in setting the road safety agenda and delivering initiatives to reduce serious injuries on roads. This paper outlines how NSW has used serious injury data to date to improve the design and delivery of road safety measures.

Background

The National Road Safety Strategy has a target of a 30 per cent reduction in serious injuries over the decade. It is critical that serious injury data are used by road safety professionals to progress towards achieving this target.

In NSW, a serious injury in the context of road safety is defined as a person injured in a road crash who is admitted to hospital. By linking data from NSW Health, the State Insurance Regulatory Authority (SIRA), Insurance & Care NSW and the NSW Police Force, Transport for NSW has enabled the routine collection of serious injury data from crashes on NSW public roads. In 2018, ambulance services data will be added to the existing linkage process to provide better information about hospitalised injuries.

Availability of serious injury data

CRS has now published official statistics on NSW road crash serious injuries for 2005 to 2016, and has incorporated serious injury trends in the release of its annual statistical statement for NSW road crashes. CRS has also established a quarterly process of matching crash data with hospital admissions for ongoing identification and analysis of serious injuries.

Further, serious injury data trends have been included in the development of data visualisations to supplement traditional, tabular statistical reporting. These visualisations are published on the CRS website for the general public, and allow users to see the more detailed characteristics of serious injuries from crashes.

Serious injury data use

The profile of serious injuries differs to fatalities (Figure 1). Fatalities tend to occur in country areas and on higher speed roads (e.g. 100 km/h zones). In contrast, serious injuries tend to occur in metropolitan areas and on lower speed roads (50 km/h and 60 km/h zones). This highlights the need to examine existing road safety measures to ensure they address both fatalities and serious injuries, and account for serious injury data now available.

CRS has worked to improve the understanding of serious injury trends and use this in our work. Examples include:

- Release of the new Road Safety Plan 2021, which sets new road safety priorities and actions for NSW, and incorporates serious injury data in identification of key trauma trends
- Use of serious injury data in the identification of road network risk and potential locations for infrastructure treatment under the Safer Roads Program
- Road safety campaign development (e.g. placement of billboards at strategic locations based on spatial analysis of fatal and serious injuries for motorcyclists for the 'Ride to Live' campaign)
- Creation of heat maps to visually represent fatal and serious injury pedestrian trauma
- Inclusion of serious injury outcomes in formal evaluations of key programs.

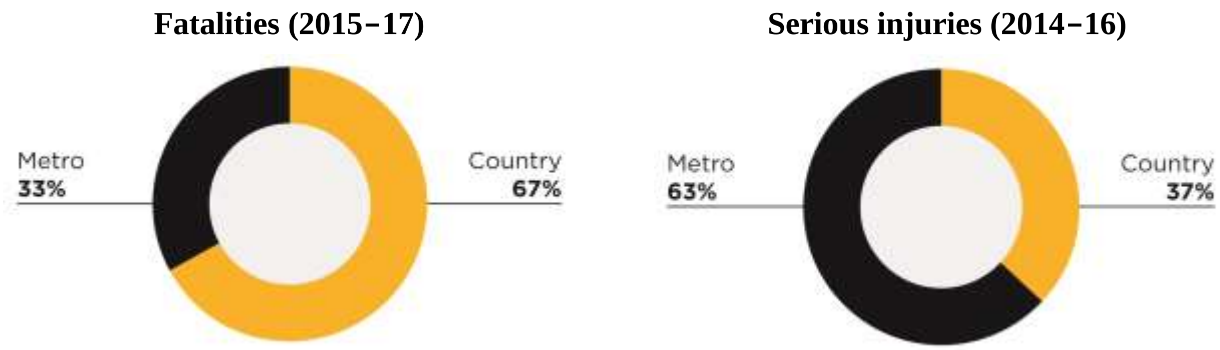

Figure 1. NSW fatalities and serious injuries by urbanisation

Discussion

Availability of serious injury data has enabled NSW to better analyse road trauma and target initiatives to reduce serious injuries. Continued use of these data in our daily work will allow NSW to remain the leading jurisdiction in identifying and addressing serious injuries on our roads. Further opportunities to embed the use of serious injury data into development of future road safety measures will be explored.

Development of a New NSW Road Safety Plan and Integration with Transport Planning Outcomes through the Future Transport Strategy

Bernard Carlon, Claire Murdoch, Antonietta Cavallo, Louise Higgins-Whitton, Robyn Preece, Melvin Eveleigh, Susan Everingham, Hassan Raisianzadeh, Ralston Fernandes

Centre for Road Safety, Transport for NSW

Abstract

A new Road Safety Plan 2021 (the Plan) has been developed to set new road safety priorities and actions that will help NSW work toward the State Priority target of a 30% reduction in road fatalities by 2021. Development of the Plan relied on detailed understanding of crash trauma, robust evidence gathering, and extensive consultation.

The Plan outlines key road safety priority areas and related measures to be implemented. Measures included in the Plan align with the Future Transport Strategy directions and vision of zero trauma for all transport customers and road users.

Background

The NSW Road Safety Strategy 2012-2021 establishes the ten-year direction of road safety in NSW. Through its delivery, significant reductions in fatalities have been achieved, with 307 fatalities in 2014 representing the lowest number since 1923. However, successive annual increases have been observed since then. The new Plan was released in February 2018 and has been developed to refocus road safety activities in NSW toward achievement of targets.

Transport for NSW has also refreshed its approach to long-term transport planning with the development of the Future Transport Strategy, and the Plan has been developed to align with its implementation.

This paper outlines the steps taken to develop the Plan, the key priority areas identified, and its relationship to the development of the Future Transport Strategy.

Development of the new Plan

The following steps contributed to development of the Plan:

- Detailed review of current NSW road trauma statistics and evidence
- Review of best practice to identify initiatives to achieve a 30% reduction in deaths by 2021 and further reductions in the long term
- Consultation with the NSW Government's Road Safety Advisory Council
- Consultation with expert researchers, practitioners and key stakeholder groups
- Community consultations.

Priority areas

The Plan identifies the following priority areas:

- Saving lives on country roads – Proven road safety infrastructure can significantly improve safety, particularly on country roads that can lack protective safety features.

- Liveable and safe urban communities – Our vibrant 'people' places need design and infrastructure that supports safe driving, walking and riding.
- Using the roads safely – Action is needed to address trauma involving situations where people make mistakes or behave in a way that increases crash risk.
- Building a safer community culture – Individuals, organisations, key sectors and government must actively collaborate to ensure shared responsibility for road safety.
- New and proven vehicle technology – Newer technologies, such as lane departure warning, are proven life-savers and need to become more common in the fleet.
- Building a safe future – The way we plan, develop, design, operate and maintain roads plays a key role in reducing the risk of road trauma.

Integration with the Future Transport Strategy

Safety is a key part of creating a sustainable transport network, and the draft Future Transport Strategy for NSW sets an aspirational target of zero trauma on the transport system by 2056 .

Measures in the Plan align with the directions of the Future Transport Strategy and the vision of zero trauma for all transport customers and road users. This will assist with embedding safety principles through all transport initiatives and across the whole transport network. Close cooperation between transport partners who play a key role in the safety of the road system is important for working toward the vision of zero trauma.

Next Steps

The focus will now be on delivery of priority actions included in the Plan. In doing so, continued efforts will be made to ensure relevant actions are delivered through better integration with broader transport planning work across NSW and other priorities included in the draft Future Transport Strategy.

Practicalities of integrating road safety with Movement and Place functions: A case study of conflict and compromise

Bernard Carlon[a], Ralston Fernandes[a], Rae Fry[a], Bryan Willey[b]

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Abstract

The Movement and Place framework is increasingly applied by jurisdictions to guide transport planning, and underpins the NSW approach to long-term transport planning. Embedding safety into Movement and Place considerations will help planners deliver safe road infrastructure. However, conflicts inevitably arise where there are strong demands for both Movement and Place functions. In these cases, compromises must be made to improve safety while balancing different road functions and supporting the needs of different road users. This paper presents a case study outlining how safety principles have been applied to balance Movement and Place functions along the Great Western Highway, NSW.

Background

The Movement and Place framework is increasingly applied by jurisdictions to guide delivery of an integrated transport system that supports a range of outcomes for different customer groups. Transport for NSW (2017) has adopted the Movement and Place framework in long-term transport planning, and the recently launched NSW Road Safety Plan 2021 presents an opportunity to integrate core safety requirements in all aspects of our transport services, network, assets and infrastructure.

Movement and Place Framework

The key principle of Movement and Place is to balance the movement of people and goods with the liveability of places and communities. However, the framework has been interpreted by road authorities as applying to motor vehicle priority, with less consideration for the needs of other road users and for the road as a place for people.

Integrating the Safe System approach with Movement and Place in transport planning will lead to environments that are safe for all road users, and help create more self-explaining road environments.

On roads where there are strong demands for both Movement and Place functions, conflicts inevitably arise and compromises to both functions may be necessary to achieve safety for all road users. To work towards a vision of zero harm, road projects and upgrades must be designed and delivered without compromising safety measures.

Case Study 1: Great Western Highway (Penrith to Lithgow), NSW

The section of Great Western Highway between Penrith and Lithgow supports several functions:

- Movement corridor to support travel linking Greater Sydney and Western NSW.
- Movement corridor to support the freight task and increased heavy vehicle movements.
- Safe urban travel for local residents around local towns.
- Places for people to support tourism along the corridor.

Various upgrades over the years have supported these different functions, including town bypasses that separate movement and place functions and minimise conflict points.

Upgrades have also included specific safety treatments such as additional pedestrian crossings and grade separation for specific road sections (Figure 1a). Importantly, speed limits have also been lowered in local centres. Historically, a large number of speed limit changes have been implemented along the corridor, and this has continued as further upgrades have been implemented. While speed limit changes are not ideal, they are a necessary alternative where funding is unavailable for infrastructure solutions such as bypasses.

Despite work completed, there remain sections that can be improved. Figure 1b shows an 80km/h section of the corridor with uncontrolled turning points across multiple lanes in both directions.

Figure 1a. Great Western Highway showing grade separation at Leura Mall, Leura (Google Maps)

Figure 1b. Great Western Highway at Sinclair Crescent, Wentworth Falls (Google Maps)

Conclusion

Balancing Movement and Place functions is a challenge on road corridors that serve several purposes for different road users. Integration of Safe Systems with the Movement and Place framework requires practitioners to acknowledge that conflicts are inevitable where there are strong demands for both functions, and to advocate for safety measures even where this requires compromises to Movement and Place needs.

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Characteristics of offenders attending a Traffic Offender Intervention Program in New South Wales, Australia

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Abstract

In 2008, when the NSW Traffic Offender Intervention Program commenced, seven in ten offenders enrolled in the Blacktown Traffic Offenders Program (Blacktown TOP) were drink drivers. By 2015, this proportion had reduced to five in ten of unrestricted driver offenders, and three in ten novice driver offenders. Five in ten novice driver offenders attending Blacktown TOP in 2015 were appealing a driver licence suspension following speeding offences. Offences for non-compliance with traffic signals/ signs and GDLS restrictions were also frequent. This paper considers the future of the Traffic Offender Intervention Program in light of these changes in the offender population.

Background

Whether through intended illegality or through errors and misunderstanding, drivers who have committed offences are subject to punishments such as fines and licence sanctions. Drivers may need to complete an education course before they are able to continue or resume driving. In NSW, the Traffic Offender Intervention Program (TOIP) is an elective program targeting driving offenders (Henson, 2010) that commenced in 2008 and is used by Local Courts as a pre-sentencing option for driving offenders.

This paper reports the characteristics of offenders who were enrolled in the Blacktown Traffic Offenders Program (Blacktown TOP) located in western metropolitan Sydney over 2008-2015, and then provides a more detailed description of the characteristics of the 2015 offender cohort.

Method

Copies of annual summary reports by Blacktown TOP were obtained for the period 2008-2015, inclusive. These reports were based on enrolment records for 6,031 offenders, and provide information of offender characteristics (gender, age, offences). De-identified driver offender records relating to the enrolment of 429 offenders during 2015 were also obtained from Blacktown TOP.

Results and Conclusions

Generally

Offenders who enrol in Blacktown TOP are overwhelmingly male (80%), with a slight trend towards more women enrolling over the period 2008-2015. Almost all offenders are under 50 years of age, with more-or-less equal numbers of offenders being aged under 25 years and 25-49 years.

Drink driving offenders comprised 68% of the offenders who were enrolled in 2008, but this proportion had fallen to 33% by 2015. Offenders who were charged with dangerous and negligent driving similarly fell from to 13.0% of offenders enrolled in 2009 to 4.5% of the enrolments in 2015. Conversely, speeding offender enrolments increased from 8.4% in 2008 to 40% of all enrolments during 2015. The percentage of drug driving offenders enrolled remained more-or-less constant at 3-4% over the 2008-2015 period. Offences associated with non-compliance with graduated driver licensing system (GDLS) requirements – typically novice drivers not displaying L-plates or P-plates – rose from 4.0% in 2008 to 14% in 2015.

Novice drivers

The percentages of each licence class of offenders who enrolled and attended Blacktown TOP in 2015 are given in Table 1(a). In 2015, almost two-thirds (63.6%) were novice drivers, that is, they held a NSW learner, P1 provisional, or P2 provisional driver licence.

Table 1. Offenders attending Blacktown TOP in 2015

(a) Licence class of traffic offenders (%)

Driver licence type	**%**
Learner	5.6%
P1 provisional	19.3%
P2 provisional	38.7%
Unrestricted	35.9%
Never licensed	0.5%

(b) Principal offences (%)

Traffic offenders with a novice driver licence (L, P1 or P2)		**Traffic offenders with an unrestricted driver licence**	
Speeding	50.2 %	Speeding	27.3%
Drink driving	24.2%	Drink driving	54.5%
Driving unlicensed	11.0%	Driving unlicensed	9.7%
Disobey traffic signals/signs	5.1%	Disobey traffic signals/signs	1.3%
Not comply GDLS conditions	3.7%	Not comply GDLS conditions	NA
Use mobile phone	1.1%	Use mobile phone	0.0%
Drug driving	0.7%	Drug driving	3.9%
Other road transport offences	2.6%	Other road transport offences	3.2%
Not stated	1.5%	Not stated	0.0%

The principal – or most serious – offences of these novice drivers are shown in Table 1(b) (after Corbett, 2010). Speeding is the most common offence (50.2% of novice driver offenders). Drink driving (24.2%) and driving unlicensed (11.0%) were also frequent offences. For unrestricted drivers, drink driving is most common (54.5%), followed by speeding (27.3%) and unlicensed driving (9.7%). While proportions differ, these are the three most common offences of both groups of offenders.

Discussion and Conclusions

NSW uses a "one-size-fits-all" TOIP model for all traffic offenders. This may not be the best option. There is a need to explore alternative ways to allow for the provision of better targeted course content to address the specific risks faced by different types of offenders, their individual needs for education and offender rehabilitation, and to ensure that they are each responsive to the safety messages provided.

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UNDERSTANDING USER PERCEPTIONS AND EXPERIENCES WITH COOPERATIVE AND AUTOMATED VEHICLES

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Abstract

With the increasing availability of vehicles with various levels of technology, many State transport agencies are investing in pilot programs and trials, designed to prepare for the arrival of cooperative and automated vehicles on their road networks.

The Queensland Department of Transport and Main Roads (TMR) sought to understand the perceptions, experiences and understanding of cooperative and automated vehicle technologies through an online survey. This paper discusses the methodology and results of this survey, and implications for the development of public education and participant recruitment materials.

Background

TMR is delivering the Cooperative and Automated Vehicle Initiative (CAVI), with the purpose of preparing the department for the emergence of advanced vehicle technologies with safety, mobility and environmental benefits on Queensland roads. The Initiative incorporates four components, including the largest on-road testing trial in Australia of cooperative vehicles and infrastructure (C-ITS Pilot, around 500 participants), and the testing of a small number of cooperative and automated vehicles on public and private roads (CHAD Pilot). Both pilots will involve members of the public interacting with these new technologies.

Method

In 2017, TMR conducted an online public survey, open to all Queensland road users, with either an open or provisional licence.

The survey was accessed by an open web link, and was distributed through 12 key organisational stakeholders. Participants who completed the survey were eligible for the survey incentive prize draw (10 x $50 Myer Gift Cards).

The questionnaire was divided into five modules, covering general demographics (two modules), current driving, awareness and understanding of cooperative and automated vehicles and attitudes towards/willingness to use cooperative and automated vehicles.

For module four (attitudes towards/willingness to use), participants were randomly assigned to one of two sub-modules, the cooperative vehicles module (n=867) or the automated vehicles module (n=871). This was to limit the survey duration, and prevent survey fatigue.

Results

1,738 complete responses were analysed (52% Female, 32% 45-54 years, 54% Brisbane resident, 35% Certificate/Trade qualification, 39% $50,000-$150,000 household income) for residents of South-east Queensland (SEQ). Data was weighted to Australian Bureau of Statistics population estimates by age, gender, and location.

The results reported here are a sub-set of the overall findings that are particularly applicable to future CAVI communication and pilot participant recruitment. The survey found that whilst nearly all drivers were aware of the term automated/autonomous vehicles (94%), only 28% were aware of the term cooperative/connected vehicles. Males, younger drivers, those with a post-graduate education, and those in the upper income groups were more likely to have heard of cooperative vehicles.

More established technologies, such as GPS, Bluetooth, and reversing cameras, are most likely to be considered beneficial, whilst drivers may still be getting used to some of the newer vehicle technologies – such as lane keep assist and auto park – which are not yet considered as beneficial (11% and 5% respectively).

When asked to consider the importance of different aspects of cooperative and automated vehicles on encouraging willingness to use, safety and affordability were rated as having the most impact on the decision to use cooperative vehicles (average rating of 7.5 and 7 out of 8 respectively) or automated vehicles (7.5 and 6.8 out of 8 respectively). Supporting these findings, overall just over three-quarters of SEQ residents expressed a willingness to use a cooperative vehicle in the future (77%) whilst 73% of motorists expressed a willingness to use a partial/conditional automated vehicle (Level2/3). Willingness to use dropped off as the level of automation increased.

Conclusions

From these results, and others from the survey, we confirmed that in order to maximise the success of recruiting participants for the C-ITS Pilot (around 500), further work needs to be done to develop appropriate recruitment and public education materials that address the differences in the Queensland public's awareness and understanding of cooperative and automated vehicles. In addition, materials would also need to address motorists experience with and understanding of the benefits of varying vehicle technologies, to encourage increased familiarity and comfort with vehicle technologies.

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How does Inattentional Deafness and Auditory Exclusion impact on Urgent Duty Driving of Heavy Vehicles in Emergency Services?

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Abstract

Driving Emergency Response Vehicles under operational conditions can be stressful and particularly so when responding to a time critical emergency situation. Auditory Exclusion (AEX) and Inattentional Deafness (ID) are both characterised by a temporary loss of hearing that occurs when highly stressed or during high levels of cognitive load. Driving an emergency response vehicle under operational conditions could increase the likelihood that AEX and ID could occur which has implications for road safety. The intent of this research is to investigate the phenomena of AEX and ID in emergency services when driving under operational conditions.

Introduction

Driving of an Emergency Response Vehicle (ERV) is a necessary part of emergency services for operational response, however, this becomes significantly more demanding when there is a need to travel at speed as well as receive directions from within the cabin from crews and operate communication equipment. There is also an expectation from the public that driving behaviour should be of a standard above the expected norm for ordinary drivers.

Current research into ERV driving is limited in its range. The majority of research into ERVs has focused on identifying characteristics of ERV crashes such as: crash types, timing and location of crash and fatality numbers (Fahy, 2008; Symmons, Haworth, & Mulvihill, 2005); the risks associated with driving of ERVs (Gormley, Walsh, & Fuller, 2007); and the impacts on injuries and fatalities of ERV occupant seating position, restraint use and vehicle response status (Becker, Zaloshnja, Levick, Li, & Miller, 2003). Thus, there is a notable paucity in evaluation of actions of the driver in an operational response immediately prior to any road incident, and the role of training in shaping driver actions.

Auditory Exclusion and Inattentional Deafness

Auditory Exclusion (AEX) has been defined as a form of temporary loss of hearing occurring under high stress. As such, it is related to the phenomena of tunnel vision and "the slowing of time in the mind" (Lindsey, 1999). Inattentional Deafness (ID) is defined as a transient deafness to normal environmental sounds, such as speech, when the individual's attention is highly focused on a visual task (Giraudet, St-Louis, Scannella, & Causse, 2015; Raveh & Lavie, 2015). A critical factor for experiencing ID is the level of cognitive load on visual attention and processing (Macdonald & Lavie, 2011).

Given the stressful demands ERV drivers encounter when driving under operational conditions, the occurrence of AEX or ID would potentially have serious consequences, given that there is already an inherent increased crash risk associated with driving in stressful situations (Gormley, et al., 2007). Moreover, the additional driving demands placed on ERV drivers travelling at speed, while simultaneously operating communication equipment and receiving directions from within the cabin from crews, can further increase both the stress of the ERV driver and the cognitive load.

To date the majority of research into AEX and ID has been conducted in work environments other than ERV driving. AEX has predominately been explored with law enforcement officers and soldiers. The majority of empirical literature on ID has been performed in the the air industry, particularly among Air Traffic Controllers (Causse, Imbert, Giraudet, Jouffrais, & Tremblay, 2016; Dehais et al., 2012; Dehais et al., 2014; Giraudet, Imbert, Tremblay, & Causse, 2015). Thus, there is a significant gap in the literature with regard to ERV drivers and their experiences with AEX and ID. This omission has acquired greater significance with the introduction of the *Work Health and Safety and Other Legislation Amendment Bill 2017* into Queensland Legislation in October 2017, which has placed increased responsibility on organisations to address work-related road safety and therefore has implications for emergency services.

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An Educated Prevention: the effectiveness of police-led, school-based driver education programs.

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Abstract

Background

This study examines the effectiveness of police-led school-based education programs in reducing the high-risk driving intentions of young people. Road traffic crashes are the second leading cause of death for young people aged between 15 and 24 years of age (Australian Institute of Health and Welfare, 2015). In 2016, 46 young people were killed on Queensland roads (Bureau of Infrastructure Transport and Regional Economics, 2016), this accounts for 18.47% of the road fatalities which is an over representation on the 13.5% that this age group accounts for within the Queensland population One key countermeasure used to address this over representation is driver education. There are many different types of driver education (Beanland et al., 2013) (Anderson et al., 2018). A qualitative evaluation of a compulsory pre-learner driver education course in the Australia Capital Territory identified that interactive components and a high level of engagement are important factors in a successful course (Lennon and Bates, 2015). Previous research into driver education and training suggests that apart from providing basic vehicle control skills and road law knowledge, previous driver education programs are ineffective at impacting the crash risk and infringement rate of young drivers (RACV, 2001). The Life Awareness Workshop is a program designed by the Road Policing Command of the Queensland Police Service which is both interactive and engaging for grade 12 students it is delivered to. The Life Awareness Workshop is the police-led education program utilized by this study.

Method

This study draws on a sample of 294 students from fourteen different private high schools who completed the Life Awareness Workshop delivered by the Queensland Police Service in 2017. Participants completed a pre-intervention and post-intervention survey that measured self reported behaviours and intentions. All grade 12 students at schools receiving the LAW program were invited to participate provided parental consent was obtained. Those without parental consent were unable to participate in the study but still received the LAW program. The survey consists of a number of socio-demographic and risk assessment questions, a thrill-seeking index and a modified version of the Behaviour of Young Novice Drivers Scale (BYNDS) (Scott-Parker et al., 2010). A series of T-tests, regressions and ANOVAs were used to examine changes across the sample of students prior to receiving the intervention program with their survey responses after completing the Life Awareness Workshop.

Results

Of the sample, one-hundred and eight participants were male (36.7%). The average age was 17.13, with a range of 16 to 18 years. Most had entered the graduated driver licensing system with 105 (36.8%) holding a learner license, 163 (57.2%) holding a provisional one license and 14 (4.9%) holding a provisional two license. Only a small proportion (n = 3 (1.1%)) of participants were pre-license. Males had a significantly higher score in almost all aspects of the thrill-seeking index. T-tests comparing the responses before and after the deliverance of the Life Awareness Workshop show statistically significant changes in the young driver intentions. These differences were found for all

four sub-scales tested within the modified BYNDS; Transient, Fixed, Misjudged, and Driver Emotions. Changes in behaviour for each of these factors would include the reduction of speeding (transient), drink driving (fixed), greater attention to detail (misjudgments) and not allowing emotion to effect driving styles/behaviour (driver emotions).

Paired T-Test comparing BYNDS sub-scales means before and after intervention

	Valid Responses	M (SD) (Before)*	M (SD) (After)*	Sig. (2-tailed)
Transient (TR)	259	1.8246 (0.66112)	1.2469 (0.38390)	<0.001
Fixed (FI)	267	1.1607 (0.27637)	1.0719 (0.19999)	<0.001
Misjudged (MS)	259	1.6654 (0.44557)	1.2377 (0.36229)	<0.001
Driver Emotions (DM)	272	1.9436 (0.85290)	1.3358 (0.56260)	<0.001

*The BYNDS is a five-point scale from 1 (Never) to 5 (All the time).

Limitations and Biases

While this pilot research shows a promising impact for the involvement of police in young driver education programs, there are some limitations with this research. Firstly, this study looks at only private school students due to ethical clearance difficulties within government schools in regards to illegal behavior. Due to the wide administration of the LAW program on the Sunshine Coast, a suitable control groups was unable to be identified and included.

Conclusion

The findings of this study indicate that police-led school-based education programs can be an effective means of altering the driving intentions of young people. Given the positive results of this study, there is the potential to expand this study to a wider audience including schools statewide which would include the adaptation of the LAW program for that location including localized examples. Further research should be undertaken to measure how long the altered intentions remain and is the inclusion of police-officers is a key element in the success of school-based road safety programs.

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Transitioning from driver to non-driver: Be safe and not a risk

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Abstract

Driving is fundamental for convenience, freedom, and independence, but there is increasing recognition of the need for many older adults to cease driving, due to age-related functional limitations. While much is known about this transition in developed countries, much less is known about driving cessation in developing countries. This study aims to understand the mechanism of driving cessation involving older Malaysian former drivers. Five themes and 16 sub-themes were identified relevant to driving importance, deciding factors, challenges faced, and strategies adopted. Findings suggest that driving cessation is an outcome of a transition process to discover safer mobility opportunities beyond driving.

Background

Each year millions of car occupants are killed or seriously injured in collisions, and a substantial proportion involves older adults (ITF, 2017; Ang, Chen, & Lee, 2017). It is widely held that older drivers self-regulate their driving and this can minimise their risk of collision, provided that adjustments made adequately match their shortcomings (Charlton et al., 2006). While extensive research has been undertaken to understand self-regulatory behaviour and its impact on safe mobility in developed countries, much less is known about the driving patterns of older adults in an Asian context. With the emerging ageing population in Malaysia, it is timely and essential to conduct research to better understand and support retiring drivers to maintain safe mobility, while mitigating some of the negative consequences (Chihuri et al., 2016), making the transition experience more acceptable (Oxley & Charlton, 2009).

The objectives of the study are to:

- Gain insight into their feelings, experiences, and perceptions on driving cessation
- Identify potential factors influencing driving cessation
- Understand the effects of this decision and coping strategies adopted

Method

This study had been approved by Monash University Human Research Ethics Committee. Recruitment was done via advertisements posted on notice boards of senior citizen organizations and snowball sampling. Malaysian former car drivers aged 60 years and above were interviewed using guided questions and thematic analyses of transcribed interviews were performed using NVIVO version 11.

Results

A total of 18 former drivers were interviewed, with a majority were very elderly (75 years and above) and women. Five major themes with 16 sub-themes identified were linked together in a series of four cessation phases providing a clear picture of mechanism involved, including pre-cessation, decision, transition, and post-cessation (Figure 1). According to Park, Yoon, Hamilton, & Cook, (2015), Korean older adults do not view driving as part of their independence. This was not true in our sample. The pre-cessation phase emphasized themes surrounding the importance of driving range from the basic needs for mobility to psychological needs for identity and how driving becomes a burden with increasing age, requiring them to make adjustments in driving patterns to reduce risks and extend safe driving. Reduction of trips and avoiding challenging situations were associated with being aware of their driving limitations and transitioning to being a non-driver. Older adults may choose to or are forced to stop driving for various reasons. Apart from physical limitations, psychological and social factors were important contributors to driving cessation. During the transition, older adults reported facing various challenges underscoring the need for support to attain and maintain the transition successfully. Two of the most common coping strategies adopted were depending on other principal drivers and travelling by public transports.

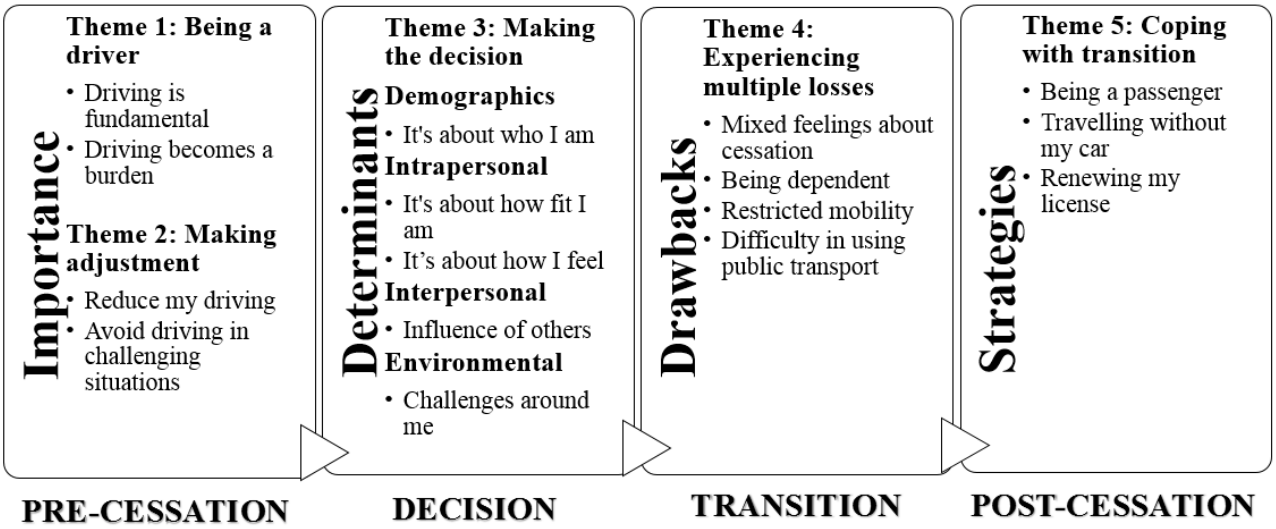

Figure 1. Self-regulation of driving among older Malaysian former drivers

Conclusions

Changes in one's ability to be mobile is not viewed only as a physical event, but a complex process that involves psychological and social well-being. Therefore, a good understanding of psychological and social implications in self-regulation are important aspects in the development of policy and intervention to support retiring drivers discover safer mobility opportunities.

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Targeting Drink Drivers on our Motorways

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Abstract

Operation 'NABBED' was developed to target alcohol affected drivers on the M4 Motorway in western Sydney. The operation was developed to overcome the WHS issues surrounding stationary RBT duties in a 110km/h area. The recent restructure of HWP resources in the NSW Police Force allowed for a large scale traffic enforcement along the entire length of the motorway consisting of Stationary RBT on every westbound off ramp from the M4 Motorway.

Background, Method, Results and Conclusions.

The M4 is the major Motorway that links the Greater Western Sydney to the large commercial centres of Sydney, Parramatta and Penrith. Mobile Enforcement and Last Drink Analysis identified the M4 as being used by alcohol impaired driver to travel home from where they had been drinking. From speaking to some of these drivers, it became apparent that motorists believed that stationary random breath testing was not carried out on motorways due to the 110km/h speed limit.

In 2014 I had been the Team Leader at Mt Druitt Highway Patrol for the previous 14 years. Providing a high profile traffic enforcement presence on this stretch of road had been a priority. There are significant risks to Police Officers when conducting traffic enforcement on this type of road. These risks limited the detection strategies that I could employ. Additionally, the previous structure of Highway Patrol resources in NSW limited me to only being able to task the 11 officers under my direct Supervision.

In December, 2011 all Highway Patrol resources were brought together under the Traffic and Highway Patrol Command. This allowed for large scale Traffic Enforcement to target a specific issue. The NSW Centre for Road Safety Enhanced Enforcement Guidelines indicate that to have maximum impact on a road safety issue, '…..short sharp bursts should see a geographical area targeted for a defined period of time with as many resources as possible'.

With that in mind, I developed Operation 'NABBED'. The mission of this operation was to: *'Detect Alcohol Impaired Drivers using the M4 Motorway'*. The concept of the Operation was simple. To provide high profile stationary random breath testing on every westbound off ramp of the M4 Motorway.

It was decided that the operation should run on the second weekend in December 2014, between the hours of 10.00pm and 3.00am on a Friday and Saturday to have maximum impact on the pre Christmas Holiday period. We first ran 'Nabbed' in 2014 with 60 officers targeting 13 off ramps. A total of 12,295 breath tests were conducted resulting in 54 PCA charges, 25 other Traffic Charges and 415 Penalty Notices issued. Every possible way of leaving the motorway was covered by breath testing, even the u-turn bays were monitored. This resulted in some motorists being detected at the end of the motorway in the Blue Mountains, who had intended exiting at Merrylands, some 30km earlier.

On both occasions, to maximize impact, print, television and social media was used. The timing of the operation was also well received as it coincided with pre Christmas work parties and School Holiday vacations approaching.

Operation NABBED M4 is now a yearly scheduled operation. The concept of operations has been adopted for enforcement on the M1, M2 and M7 connecting Sydney to the Central Coast and the Sydney Orbital Network. In total, NABBED has been conducted over 10 nights with a total of 69,111 Breath Tests conducted and 364 PCA Offences detected. An additional 251 charges were laid and 2,705 Penalty Notices were issued.

Citations:

- NSW Centre for Road Safety. (2014/15). Enhanced Enforcement Program, Additional Operation Guidelines, page 8 paragraph 3.

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Focusing Investment on Zero - A New Investment Strategy for Victoria's Safe System Road Infrastructure Program (SSRIP)

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VicRoads

Abstract

VicRoads and the TAC (Transport Accident Commission) have recently reviewed the Investment Strategy behind Victoria's Safe System Road Infrastructure Program (SSRIP). The fulfilment of the Towards Zero vision has been the underlying focus in the development of this revised strategy. The strategy seeks to make investments that meet the requirements of a future Safe System by taking into consideration the vehicles, users and speeds which will be part of this future system rather than those which are present today. The strategy also defines a leading role for Movement and Place in road safety investment decision making.

Background

When the SSRIP was established in 2013 Strategic Investment Guidelines were established which identified specific treatment types and their funding allocations. A revised approach has been devised which allows the SSRIP team to make investment decisions that fit a clear, long term strategy.

Investment Philosophies

The revised SSRIP Investment Strategy is based on four simple investment philosophies:

- **Safe System Infrastructure Transformation:** systematically transforming components of the road network to achieve such that no fatalities or serious injuries (FSIs) will occur on the treated component in the future. Once a road component has been treated under this philosophy it should be expected that no future infrastructure improvement will need to be made to that component in order to achieve the Towards Zero Vision.
- **Cost-Effective Interim Treatments**: making highly effective use of available funding to rapidly reduce the risk that FSIs will occur in the future. Treatments implemented under this philosophy will generally be proven through evaluation such that value for money can be determined with confidence.
- **Safe System Supporting Treatments**: focused on supporting safe vehicles, road users and/or speeds and requiring improvements in one or more of these pillars.
- **Safety Preservation:** preserving the performance of critical safety specific infrastructure.

The overarching concept behind these philosophies is alignment with the Towards Zero Vision. A road component can be considered to align with Towards Zero Vision when the infrastructure and speeds are compatible with human body tolerances and it is expected that no FSIs will occur in future.

Investment Strategy

The investment strategy identifies the investment philosophy which will apply to a given road component using two key considerations; risk and road function.

- **Collective risk** is the likelihood that FSIs will occur in the future
- **Road function** is related to the relative importance of a given road component

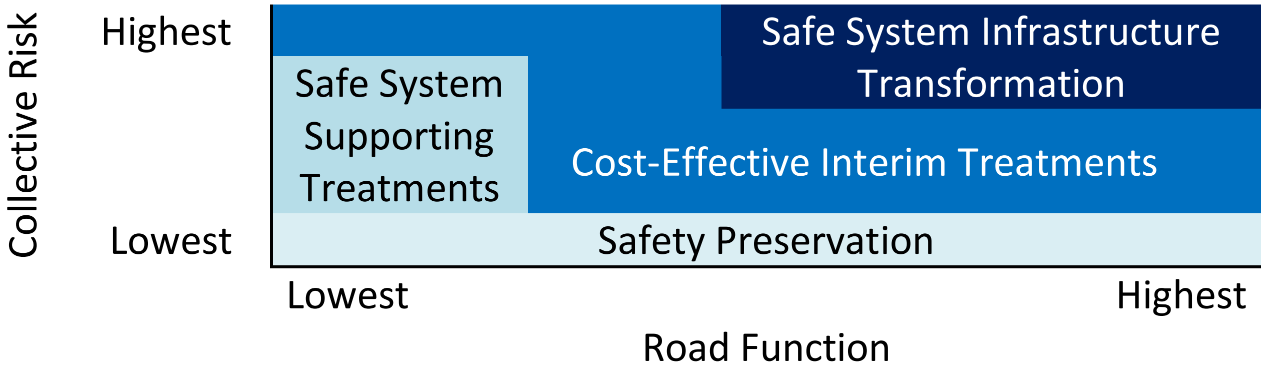

Figure 1: SSRIP Investment Strategy

- **Safe System Infrastructure Transformation** will be applied to roads which are high risk and high function. This philosophy is applied to high function roads as these are the roads where the application of alternative pillars of the Safe System (such as Safe Speeds) would have the greatest impact on Movement and/or Place objectives.
- **Cost-Effective Interim Treatments** will be applied to all road components which are not priorities for Safe System Infrastructure Transformation and where the benefits of infrastructure investments significantly outweigh the costs.
- **Safe System Supporting Treatments** will be applied to low function roads. As there is a very large network of roads across Victoria it is not possible for the SSRIP to implement significant infrastructure improvements to those of the lowest function.
- **Safety Preservation** will generally be applied to the safest roads regardless of function

Movement and Place Integration

The Movement and Place framework will be used to define the road function under this strategy. The Movement function of a road will be key in deciding which roads should be transformed so that they can operate safely at high speed. The Place function will help determine which roads should be transformed to allow vulnerable road users safe access.

Calculating the personal, community and social impact: a social return on investment analysis of vehicle modifications for people with disability

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Abstract

With vehicle modifications (VMs), it is possible for many people with acquired disability to return to driving as part of their rehabilitation goals. VMs can range from simple and relatively inexpensive, to highly complex and costly. Though a number of schemes have funded VMs, it is envisaged that NDIS will become a major future funder of VMs for people with disability. Therefore, it is important for funders and other key stakeholders to understand the personal, community and social impact of VMs to justify such investment. We present our recent findings from conducting a social return on investment analysis of VMs.

Background, Method, Results and Conclusions (NOTE: suggested headers only for research focused papers – practitioner/other paper context can choose other headers to suit).

Background

Returning to driving increases participation and productivity outcomes, and improves quality of life for people with disability (van Roosmalen, Paquin & Steinfeld, 2010). Advances in VM technology mean that driving is now possible for people with lifelong disability previously excluded from this type of independent mobility (Eley, 2016).

A number of schemes currently fund VMs, but it is envisaged that NDIS will be a major future funder. All funders need to justify that such investments are equitable, targeted to need, and produce positive outcomes. The long term individual and social benefit of investment in VMs is unknown.

Social return on investment (SROI) is a systematic and transparent methodology for measuring and valuing a range of personal, social and community outcomes, and broader social impact (Nicholls, Lawlor, Neitzert & Goodspeed, 2012). SROI encapsulates the views of multiple stakeholders into a singular monetary ratio which represents net present value of benefits / net present value of investment, e.g a ratio of 1:3 indicated an investment of $1 delivers $3 of social value (Banke-Thomas, Madaj, Charles & van den Broek, 2015). Well-conducted SROI also elicits rich qualitative data on the experiences and perspectives of key stakeholders.

Method

We were guided by the Guide to Social Return on Investment (Nicholls et al, 2012); produced by the British Government, its quality standards for the design and conduct of SROI analyses are widely accepted by academics and practitioners (Arvidson, Battye & Salisbury, 2014).

Stage 1 Data Collection (Scoping Outcomes)

Participants participated in either a focus group or interview. Participants included: consumers, rehabilitation physicians, driver-trained occupational therapists, driving instructors, vehicle modifiers and rehabilitation engineers (n=20).

Ethics approval was granted by the Human Research Ethics Committee at the University of South Australia.

Stage 2 Data Collection (Evidencing Outcomes)

A range of primary data from consumers and Australians of driving age, as well as secondary data from published academic journal papers and other data in the public domain were used. This data provides proxy values for outcomes identified in Stage 1.

Rich contextual data on the experiences and perspectives of stakeholders was analysed for key themes and implications for policy and practice extrapolated. The SROI methodology was evaluated for its effectiveness in meeting the needs of VM stakeholders.

Results

Emerging results from Stage 1 suggests consumers experience a broad range of positive outcomes:

- Independence / choice
- Positive mental health
- Reduction in social isolation
- Participation in employment and study
- Enactment of family roles
- Participation in community
- Managing dignity / (re)establishing privacy

Positive benefits for other stakeholders included reduced burden on carers, and experiences of job satisfaction for many professional groups involved in the VM process. In particular, stakeholders reported experiencing their work as meaningful and making a positive different to the lives of others.

To establish the SROI ratios, authors developed three case studies costed separately to reflect the range of potential variations in terms of complexity and costs of VMs. This data and qualitative themes influencing recommendations for policy and practice will be presented.

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Police Pursuits in NSW: Just the Facts…and figures

Kris Cooper

New South Wales Police Force

Abstract

Police pursuits are a contentious area of discussion and often lacks a firm understanding of the actual numbers involved. The NSW Police Force for calendar year 2017 engaged in 2543 pursuits. Each one of these pursuits was monitored, managed and recorded. These records and their analysis provide valuable insight as to who is involved in these pursuits, their duration and corresponding resources applied to them. This in turn informs development of policy and procedures for the NSW Police Force and enables a greater focus for training.

Background

The NSW Police Force engaged in 2543 pursuits for calendar year 2017. Data is obtained in relation to these pursuits as they are monitored.

The definition of a pursuit varies across jurisdictions and is generally tailored to suit the operational environment of the respective policing agencies and the policy framework of that agency. This mix of definitions can lead to misinterpretation of data supplied by various policing agencies.

Method

All reported pursuits recorded by NSW Police Operations Group and documented in real time are collated and reviewed by Traffic & Highway Patrol Command. The information available is generally self reported by the involved police at the time of the incident. This in turn can be subject to various means of verification through police "Event" reports sourced from the Computerised Operational Policing System (COPS) and review of in car video material. Through analysis of this information, a profile of pursuits and their conduct can be derived. This is then further supported by additional police holdings.

A pursuit is defined under NSW Police Force policy in the following terms

- A pursuit, regardless of speed, commences at the time a police officer decides to pursue a vehicle that has ignored a direction to stop.

- It is an attempt by a police officer in a motor vehicle to stop and apprehend the occupant(s) of a moving vehicle, regardless of speed or distance, when the driver of the other vehicle is attempting to avoid apprehension or appears to be ignoring police attempts to stop them.

A collision is recorded where there is any contact between any of the involved vehicles, the involved vehicles and other vehicles, or the involved vehicles and other objects.

An injury is recorded where any of the involved parties reports an injury, irrespective of its severity and prior to any medical assessment by a medical practitioner.

The very low threshold for defining where a collision or injury is incurred is designed to improve transparency and for ease of reporting.

Results

The average pursuit, from statistical data for 2017, occurs during the hours of darkness (on a Friday or Saturday (36% total). The originating offence will be a traffic offence. Traffic conditions will generally be light (88%) and weather will be good (96%). It is more likely that the pursuit will occur in a regional location (62%) than metropolitan (38%)

The pursuing officer will most likely be attached to Highway Patrol, be a senior constable of police (75%) and have between 6 to 10 years service (28.6%; mode is 10 years at 222(8.7%)). The pursuit is likely to be resolved in less than 2 minutes (69%) the most likely outcome is that the pursuit will be discontinued by the police driver (31%) or terminated by a police supervisor (25%) in accordance with the Police policy (56% total).

The likelihood of the pursuit involving a collision is less than 1 in 10 at (9%) with the likelihood of that pursuit collision giving rise to an injury at (2%).

Conclusion

The data available to enable review of pursuit incidents forms a key element for policy development and implementation of procedures to best govern how these incidents are managed and resolved. The information also allows improved focus on training needs for those police more likely to be involved in police pursuits.

Safe System Assessment: delivering Safe System outcomes

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Abstract

Safe System Assessments quantify the alignment of existing roads or proposed designs with Safe System principles. The output is then presented to the project team who are encouraged to improve their alignment with Safe System principles. From the first 50 Safe System Assessments undertaken in Victoria, a number of design choices reoccur on large projects where there is the ability to improve alignment with Safe System principles and reduce fatal and serious injuries.

Background

The Safe System seeks to eliminate death and serious injury on roads. It consists of four elements; safer: roads, speeds, vehicles, and people; to which post-crash care is often added. The philosophy has been adopted by road authorities such as VicRoads. Converting the philosophy into action has been slower – because infrastructure projects usually adopt conventional practice and follow existing guidelines. Safe System Assessment (SSA) is a tool to convert Safe System principles into practice. SSA distinctly 'raises the bar' beyond the work of a Road Safety Audit (RSA). A RSA qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in a traditional sense, but does not measure compliance with Safe System principles.

Safe System Assessments (SSAs)

A SSA is an examination of an existing length of road or intersection or a proposed infrastructure project to assess the extent to which existing conditions, or proposed projects, align with Safe System principles, specifically, in eliminating fatal and serious injury crashes. Guidance on conducting SSAs is in Austroads (2016) and VicRoads (2018)

SSAs in practice

The Austroads Safe System Assessment Framework (2016) includes assessment of the road and travel speeds as well as other elements such as road user issues; vehicle-related issues; and post-crash care. The Framework when applied to infrastructure:

- Scores infrastructure (existing and proposed) on alignment with Safe System principles
- Scores are based on key crash types
- A full Safe System would have a score of zero

To ensure that Safe System elements are considered, or to measure how well a given project (e.g. an intersection, road length, area, treatment type etc.) aligns with Safe System principles, a Safe System matrix is used (Table 1). A full SSA also needs to consider these additional elements: Road users; Vehicles; Post-crash care.

Table 1. SSA framework for infrastructure projects (from Austroads, 2016)

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Exposure	AADT; length of road segment	AADT; length of road segment	AADT for each approach; intersection size	AADT; length of road segment	AADT; pedestrian numbers; crossing width; length of road segment	AADT; cyclist numbers; pedestrians	AADT; motorcycle numbers; length of road segment
Likelihood	Speed; geometry; shoulders; barriers; hazard offset; guidance and delineation	Geometry; separation; guidance and delineation; speed	Type of control; speed; design, visibility; conflict points	Speed; sight distance; number of lanes; surface friction	Design of facilities; separation; number of conflicting directions; speed	Design of facilities; separation; speed	Design of facilities; separation; speed
Severity	Speed; roadside features and design (e.g. flexible barriers)	Speed	Impact angles; speed	Speed	Speed	Speed	Speed

Quantifying the benefits

The output of a SSA shows where a project scores in relation to alignment with Safe System Principles; with lower scores presenting better alignment with Safe System principles. Figure 1 below illustrates an output graph from a SSA.

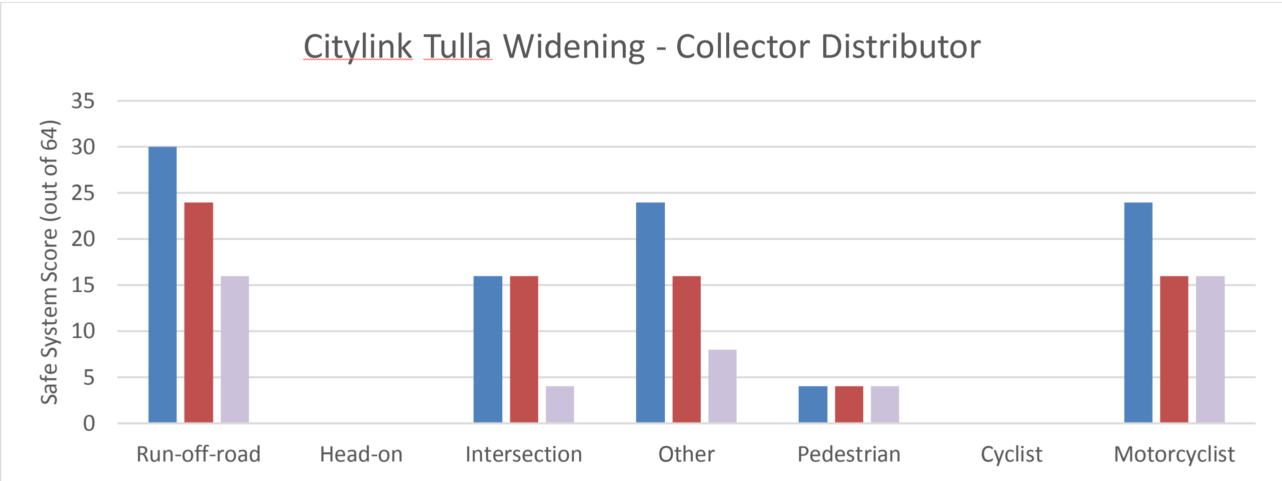

Figure 1. Improvements in road safety after undertaking a Safe System Assessment of the widening of the Tullamarine Freeway in Melbourne. The three bar charts show scores for the existing conditions (left), the original design (middle), and the post-SSA design (right).

In Victoria, over 100 SSAs have been completed on projects including Freeway upgrades, intersection upgrades, road duplications, route upgrade projects and new town bypasses. SSAs were also used in Austroads' Technical Report AP-T330-17 (2017) Safe System Infrastructure for Mixed Use Arterial Roads (along with Crash Reduction Factors) to quantify the benefits of road upgrade proposals.

Results

The preliminary results from reviewing the first 50 Safe System Assessments identified common issues of planning and road design that have less than desirable alignment with Safe System principles and appear frequently in large projects. These include unprotected roadside areas of interest, intersections with high potential kinetic energy crashes, mixing of high speed traffic with vulnerable road users and designs that cause maintenance and/or emergency vehicle access difficult and dangerous.

VicRoads is also working to predict fatal and serious injury reductions as a result of Safe System Assessment outcomes. Results from this analysis will be presented.

References

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Austroads Technical Report AP-T330-17 (2017) Safe System Infrastructure for Mixed Use Arterial Roads, available online at: https://www.onlinepublications.austroads.com.au/items/AP-T330-17

VicRoads (2018) Safe System Assessment Guidelines (Draft January 2018), available shortly.

Safe Travel to School – Treatments to Encourage Walking and Cycling to Primary School

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Abstract

Darebin City Council supports walking and cycling to school. Between 2012 and 2017 Darebin conducted travel audits on many schools and implemented recommended infrastructure treatments. To identify what should be included in future travel strategies, Safe System Solutions Pty Ltd evaluated a sample of the changes as a result of the audits.

The present understanding of risk assessment emphasizes that perceived risk is as important as the technically determined actual risk. In an analogous manner, if a treatment that road safety experts consider highly effective (the actual effectiveness), is unpopular with key stakeholders (the perceived effectiveness) then the process of reconciling such disagreement is an important part of determining effective road safety treatments.

Background

Walking and cycling play an important role in creating a more healthy and sustainable community. Darebin City Council supports walking and cycling to school and aims to make every child's journey safer, easier and more sustainable. Between 2012 and 2017 Darebin conducted travel audits on 32 of its 37 primary schools and subsequently implemented some of the highest priority recommended infrastructure treatments. To identify the most effective types of treatments and what should be included in future travel strategies Safe System Solutions Pty Ltd evaluated 10 of the audits by:

- Engaging with the schools to identify current travel concerns and perceptions of the implemented treatments
- Identifying, classifying and determining the impact of the implemented treatments
- Evaluating implemented treatments and ranking them for effectiveness (and cost)
- Providing conclusions on the audit approach – whether it is sufficient and effective, or whether other approaches should be considered

Method

Feedback on the treatments (Table 1) was obtained from four stakeholder groups: parents/guardians, students, school principals, representatives of the City of Darebin.

The feedback was obtained through an online survey. Key information sets included:

- Distance travelled to school and maximum distance parents would allow their child to walk or cycle to school
- Primary mode of transport to and from the school
- Why the primary mode of transport is used
- Barriers to walking and cycling; travel difficulties and ideas for improvements
- Perceptions of the treatments

- ***Table 1. Treatments that were examined along with a representative advantage and disadvantage***

Treatment	Key Advantage	Key Disadvantage
Raised Path Crossing Point	Reduces fatal and serious injury crashes	No priority for pedestrians or cyclists and unpopular with broader driving community
Children's Crossing (at grade)	Positively perceived by parents as it allows safe independent travel	Does not force a speed reduction
Raised Children's Crossing	Positively perceived by parents as it allows safe independent travel	Unpopular with broader driving community
Zebra Crossing	Permanent pedestrian priority that allows safe independent travel at all times	Does not reduce vehicle speed
Wombat Crossing	Reduces fatal and serious injury crashes and allows safe independent travel at all times	Unpopular with broader driving community
Pedestrian Refuge	Traffic calming measure that reduces crossing distance	Does not allow for independent travel; also reduces road width (noting that this can also be viewed as an advantage)
Kerb Outstand	Enhances other treatments and reduces crossing distance	Impacts cyclists by creating pinch points
Kiss and Go	Reduces indiscriminate parking	Encourages driving over active transport
Pedestrian Operated Signals	Active control for all road users thus allows safe independent travel at all times	Costly; Pedestrian wait times may be long
Speed Management	Reduces vehicle speeds thus improving safety	May not be supported by the driving community
Gateway Treatments such as signage to warn of a school zone	Indicates a change in road environment highlighting pedestrian areas	Only effective if supported by other treatments
Wayfinding	May improve parents' perception of safety	May not influence pedestrian behavior
Shared Paths	Improves safety by separating vulnerable road users from vehicles	Can lead to conflict between cyclists and pedestrians
Raised Intersection	Reduces fatal and serious injury crashes	Costly and unpopular with broader driving community

The safe travel treatments implemented at the schools were tabulated to show the following key treatment characteristics:

- Type of treatment
- Impact
- Influence
- Safety
- Costs

Results

There are situations where a treatment that road safety experts believe to be highly effective, may be unpopular with particular segments of the community. An example: speed reduction on a major arterial road near a school (to enable safe road crossing for children using public transport) is unpopular if the school itself is not visible and few children use public transport because drivers do not then link the speed reduction with visible children.

The treatments in Table 1 fall into two broad classes. Those for which there is agreement amongst all stakeholders as to their utility and effectiveness, and those for which options vary based on how people use the space.

Conclusion

The present understanding of risk assessment emphasizes that perceived risk is as important as the technically determined actual risk. In an analogous manner, if a treatment that road safety experts consider highly effective (the actual effectiveness), is unpopular with key stakeholders (the perceived effectiveness) then the process of reconciling such disagreement is an important part of determining effective road safety treatments.

Psychosocial factors, goals for driver education and perceptions of driver education

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Abstract

While previous research has identified benefits from certain types of driver education, there has been little research undertaken regarding how psychosocial factors affect this intervention. This research begins to address this gap by examining how four psychosocial characteristics: thrill-seeking, normlessness, attitudes relating to traffic flow and rule obedience as well as attitudes towards speeding, affect perceptions of what should be taught in driver education courses. An online survey was completed by 114 participants aged 17 to 19 years that had completed a driver education course. A series of regression analyses identified that psychosocial factors have an effect.

Background

Young novice drivers experience higher levels of crash rates when compared with older more experienced drivers (Curry, Pfeiffer, Durbin, & Elliott, 2015; Elvik, 2010). Additionally, the crash risk of young drivers is affected by a range of factors including socio-demographic, attitudes and personality (Bates, Davey, Watson, King, & Armstrong, 2014). One countermeasure that is used to increase road safety is driver education (Bates, Filtness, & Watson, 2018). However, there is an extensive range of driver education programs offered around the world (Beanland, Goode, Salmon, & Lenne, 2013). Thus, it is useful to use a framework to guide the development and evaluation of education programs.

The Goals for Driver Education (GDE) framework organises information about driver behaviour, training and skills development to inform driver education and training practitioners (Berg, 2006). It contains four levels and three categories (see Table 1) and is useful to capture the wide range of information that can be taught in courses.

This study examines if psychosocial factors such as thrill seeking and normlessness as well as young driver attitudes towards traffic flow and rule obedience affect perceptions of what would be beneficial for learner drivers and pre-learner drivers to be taught in driver education courses.

Method

Individuals aged 17 to 19 years that had completed a young driver education course in the past three years were approached to complete a survey regarding their perceptions of driver education. Of those approached, 114 participants completed an anonymous online survey between February and March 2016. There was a response rate of 18.01%. The survey collected information regarding socio-demographic factors as well as using scales to measure their perceptions of the benefits of driver education at each of the four levels of the GDE framework. The psychosocial characteristics measured were driver thrill seeking (Matthews, Desmond, Joyner, Carcary, & Gilliland, 1997), normlessness, attitudes towards traffic flow versus rule obedience and attitudes towards speeding (Ulleberg & Rundmo, 2003). Multivariate regression analyses were used to identify the effect of these psychosocial factors on perceptions of the importance of learning various aspects of driving at each level of the GDE framework.

Table 1. Goals for Driver Education Framework including examples for each cell

	Knowledge and skills	**Risk-increasing factors**	**Self-evaluation and awareness skills**
Level 4: goals for life/ skills for living	Knowledge of personal tendencies that affect driving	Non-acceptance of social norms regarding drug use	Ability to recognise and control impulses
Level 3: goals and context for driving	Trip planning knowlege	Risks associated with driver condition	Personal planning skills
Level 2: mastery of traffic situations	Safety margins	Driving skill in relation to weather conditions	Awareness of personal driving style
Level 1: vehicle manoeuvring	Non-declarative knowledge of how to operate a car	Insufficient automatisation of psychomotor skills for operating the vehicle	Realistic self-evaluation of ability to reverse park

Adapted from Peraaho, Keskinen, and Hatakka (2003)

Results

The results suggest that psychosocial factors affect what young people believe would be beneficial for learner drivers or pre-learner drivers to acquire while on a driver education course (GDE Level 1: R^2 = .11; GDE Level 2: R^2 = .17; GDE Level 3: R^2 = .29; GDE Level 4: R^2 = .78). Thrill seeking had more of an impact on the lower three levels of the GDE where there was a clearer link to driving (GDE Level 1: β = .29; GDE Level 2: β = .29; GDE Level 3: β = .23; GDE Level 4: not significant). In contrast, those with more positive attitudes to speeding indicated that it was less beneficial for learner drivers or pre-learners to undertake driver education at the lower levels of the GDE (GDE Level 1: β = -.31; GDE Level 2: β = -.32; GDE Level 3: β = -.29; GDE Level 4: not significant).

Conclusions

Previous research has identified that certain types of driver education can improve driving intentions (Anderson, Bates, & Madon, 2018), hazard perception skills (Poulsen, Horswill, Wetton, Hill, & Lim, 2010) and driving skills (Beanland et al., 2013). However, there is little work that examines how psychosocial factors affect perceptions of driver education. This study suggests that these factors are important with those who have more positive attitudes to speeding believing it is less beneficial to learn about vehicle maneuvering, mastery of traffic situations and the goals and context for driving. Although further research is required, particularly given the low number of participants and response rate, this suggests that psychosocial factors may affect the efficacy of driver education and need to be considered in the design or delivery of relevant programs. It is possible that the driver education could be designed so that participation increased favourable perceptions. Additionally, there is a need to identify if participation in education has benefits regardless of the perceptions held.

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Development of a new drink- and drug-driving package for Victoria

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Abstract

Alcohol interlocks were first introduced in Victoria in 2003, and drink-driving laws have been progressively strengthened since. Victoria also has long-standing mandatory alcohol and drug education and assessment requirements. In December 2017 legislation was passed that further extends these countermeasures. All Victorian drink-drivers at any illegal BAC reading will now have their driver licences cancelled, while first-time drug drivers face longer suspension periods. All impaired drivers must complete a new behaviour change program, and all drink-drivers will be required to use an alcohol interlock. This strong package of measures will assist in further reducing impaired driving in Victoria.

Background

Alcohol interlocks have been a mainstay of Victoria's drink-driving strategy. Introduced in 2003, Victoria's alcohol interlock program was expanded in 2006 and 2014. At this point alcohol interlocks became mandatory for most drink-drivers. To address the ongoing contribution of alcohol to road trauma, the Victorian Government determined it would complete the rollout of the alcohol interlock program to all drink-drivers.

It was also recognised that the nearly twenty-year-old drink-driving education and assessment program mandated for some Victorian drink- and drug-drivers required revision to reflect contemporary practice.

Both initiatives are contained in Victoria's road safety strategy and action plan *Towards Zero 2016 // 2020*.

Policy Development

For three years to March 2018 VicRoads worked with subject matter experts spanning road safety, clinical and forensic psychology, alcohol and drug treatment and drink and drug-driving program delivery to develop the new package of measures.

VicRoads had recently conducted a comprehensive outcome evaluation of Victorian drink-driving countermeasures that underpinned policy decisions about the expansion of the alcohol interlock program and the role of licence bans in preventing further crashes and offending. It was clear from the evaluation that a licence ban was an essential component of the reforms. The rising contribution of drug-driving to road trauma also indicated an increase in the licence ban for drug-driving was warranted.

A literature review, expert consultations and review of current programs including discussions with drink and drug-driving program providers informed the development of best practice principles that were used to develop a new behavior change program. The program design caters for both drink and drug-drivers.

Outcomes

From 30 April 2018, full driver licence holders with a first offence BAC between 0.05 and 0.069 and commercial drivers with a BAC above zero but below 0.05 receive a 3 month licence ban instead of 10 demerit points. When licensed, these drivers must use an alcohol interlock for a minimum of 6 months. The interlock condition will not be removed unless performance requirements are met. This means all convicted Victorian drink-drivers now receive a driver licence ban and interlock condition.

First offence drug-drivers receive a 6 month licence suspension, increased from 3 months, while repeat offenders face a minimum 12 month licence ban, up from 6 months.

All drink and drug-drivers must also complete the new VicRoads-managed behavior change program. The program comprises a 6-hour drink-driver program for first offenders with a BAC below 0.15, a 6-hour drug-driver program for first offenders and a 10-12 hour intensive program for high risk drink and drug-drivers. The program includes motivational interviewing techniques and cognitive behavioural strategies along with screening and assessment for alcohol and other drug issues and referral for further assessment as appropriate.

A comprehensive communications campaign accompanied the changes.

Implementing these reforms has entailed overcoming concerns about penalties, program design issues and implementation challenges.

Conclusion

In April this year Victoria implemented a significant new package of evidence based measures to address drink- and drug-driving. Increasing driver licence bans, mandating behavior change programs and extending alcohol interlock conditions sends a clear signal to the Victorian community that impaired driving will not be accepted. The package of measures will assist in driving down alcohol and drug related road trauma, as well as reinforcing the key message to the community that substance use and driving should be completely separated.

Picture this – You're In A Traffic Jam. The use of imagery to influence road user behaviour

Sonia Roberts

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Abstract

Picture this, you are in a traffic jam and the queues are long – what would make you feel like you had more understanding of the situation? Would seeing livestreaming video or an image from the crash site increase your empathy for the first responders trying to do their job? In 2015, it was identified that one of greatest challenges facing road policing in Australia was the delays caused as an incident is resolved and the roadway is returned. Research examines if the use of imagery would improve road user understanding and attitude and how this may help first responders.

Setting the scene

Picture this, you are in a traffic jam and the queues are long – what would make you feel like you had more understanding of the situation? Would seeing a video or image from the crash site increase your empathy for the first responders?

In 2015, it was identified that one of greatest challenges facing road policing in Australia was the delays caused as an incident is resolved and the roadway is returned. Through mainstream and social media it was identified that not knowing the reason for the delay as the greatest frustration of the public.

How are we getting there?:

The survey was conducted via Survey Monkey and case studies of crashes where long delays occurred were also made.

Looks like we've all been there

Approximately 96% of respondents had been caught in a traffic jam that was the result of an earlier crash. Thirty six per cent thought about the welfare of those involved before thoughts turned to how long they would be delayed.

Those who thought of delays casually or emotively counted for a combined 57% of respondents.

Eighty five percent relied on radio news and 32% on social media to find out the length of any delay. One third of first responders said they were verbally abused by motorists while trying to process a crash site.

Conclusions:

Provided victim care has been addressed and suitable steps have been taken to protect the identity of the deceased or next of kin are notified, two thirds of survey respondents said they would be receptive to being shown a photo/video of the crash site.

Data shows the majority of respondents turned to radio bulletins before social media to determine the length of any delay. It is suggested social media posts need to target those who are yet to make their journey while commercial radio is to be used for those already on the road or caught in any delay.

Some mainstream commercial media outlets have prefaced updates of crashes by confirming the fatality and offering context to motorists.

For emergency services this would place a moderate demand on field personnel to ensure appropriate imagery was provided to organisational media teams. This would require supplementary training or over the phone briefing from media advisors. Effectiveness of any posts would be based on monitoring of mainstream and social media.

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Thanks for the memories. Better driver behavior, one laugh at a time

Sonia Roberts

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Abstract

Images on social media can be likened to theatre's tragedy/comedy masks when applied to road policing and road safety. While there are many factors which influence road user behavior, can any link be established between a popular social media post and their influence on driver behavior?

What does a picture really say?

Images in social media can be likened to theatre's tragedy/comedy masks when applied to road policing and road safety.

Can introducing a humorous image or concept to road safety allow for a serious message to be absorbed and retained by the public?

The use of lighter themed imagery such as memes to convey a more serious message was a strategy adopted by the NSW Police Public Affairs Branch for the main corporate Facebook page in early 2017.

The NSW Police Force Digital Media Team targeted common offences among motorists such as incorrect use/non-use of indicators and keep left when overtaking. Drivers detected travelling at more than 45km/h over the speed limit were targeted using a series of posts featuring the hashtag "#roasted".

Let me give you an indication

The popularity of these posts touched a chord with road users as one indicator themed post in May 2017 resulted in an audience reach of 19 million people, 25K likes and 16K shares. (Source – NSWPF Facebook - 11 May 2017)

In May 2016 legal action was taken against 105 people in relation to indicator offences. This figure peaked at 181 in January of 2017. In May 2017, this figure was 134 and the number of people detected was 134.

Data since has shown the number of people detected has stabilised and showing signs of decline. This could be attributed to more awareness of the behaviour from drivers (in not committing the act to begin with) and road policing personnel in detecting the offence.

Do you really feel the need for speed?

On 29 May 2017, the NSW Police Force published the meme – “”Bae is home alone.” This is not a valid excuse for speeding. #slowdown” The post generated a reach of 2.1M users, 41K likes, 9.5K comments and 9.7K in shares. NSW Police Force data for actions taken against people exceeding the speed limit by 45km/h or more shows 293 people detected in April 2017 with a drop to 243 and 227 people detected in the following months.

Another key feature of the posts targeting drivers travelling above the speed limit was the element of peer pressure appearing in comments for the posts grouped under the hashtag of “#roasted”. One post from May 2017 quotes “If they don't want to be shamed, they shouldn't speed.”

Again, based on offence data and social media analytics, it could be argued the use of memes was an initial factor in the downward movement for this offence category in the months following publication.

Which way do we go?

Works highlight the teaching method of John Hopkins University nursing professor Ron Berk, PhD, who uses humour to convey dry statistical principles that allows him to tap into a variety of learning styles to allow a serious message to be conveyed. While there are some elements of road safety and road policing that should never be treated lightly, other sectors can certainly derive benefit from the use of lighter text and imagery as an educational tool.

Citations:

- *All social media data and post references:* NSW Police Force and Traffic and Highway Patrol Command Facebook pages.

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Partnership policing and road policing: Is there value?

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Abstract

Traditionally road policing has relied on deterrence theory to guide its interventions. However, more recently, there has been interest in exploring alternative frameworks. One possible framework that may be worth exploring within a road safety context is partnership policing. This poster will explore the validity of this approach for young drivers. In this area police could partner with parents. Although further research is required, it does appear that road policing policy and practice could be improved by exploring alternative frameworks such as partnership policing.

Background

Road policing is frequently an important part of programs that are used to change driver behaviour and improve road safety (Bates, Soole, & Watson, 2012). Increasingly, theoretical frameworks are being used to underpin traffic enforcement programs with the traditional theory used in this area being deterrence theory (Watling & Leal, 2012). However, other frameworks such as procedural justice are increasingly being expored in this context (Mazerolle et al., 2015) suggesting that there may be value in using alternative frameworks to improve road policing approaches. One alternative framework that has received little attention in the area of road policing is community and partnership policing. Partnership policing would enable policing organisations to leverage off the resources of others to improve enforcement activities.

Community and partnership policing

A key element of community policing are the partnerships that are formed with members of the community (Ray, 2014). A partnership between police and communities enables both to bring their relative strengths and capabilities to solve problems (Makin & Marenin, 2017). Benefits of this type of policing include increased input from citizens, improving police-citizen interactions and a better understanding of the tasks undertaken by police (Dantzker, 2002). It differs from third party policing which requires a legal lever where police can 'force' other agencies and individuals to undertake the enforcement actions (Mazerolle & Ransley, 2005).

Partnership policing and novice drivers

An example of where partnership policing may be an appropriate and effective strategy to improve road safety is young drivers. Jurisdictions in Australia, the United States, Canada and New Zealand use graduated driver licensing systems to introduce new drivers, particularly those that are young, to the driver licensing system (Bates, Filtness, & Watson, 2018). Frequently a key element of these systems is the implied assumption that parents will be involved in teaching their child to drive and then to enforce restrictions once they commence driving by themselves (Simons-Morton, 2007). There appears to be strong potential for parents to more actively partner with police, for instance by actively monitoring their access to the family vehicle, given that young drivers appear more concerned about their parents finding out about their traffic infringements when compared with police officers (Allen, Murphy, & Bates, 2017).

Conclusions

Although further research is required, it appears there is value in identifying which road safety areas would benefit from a partnership policing approach and its implementation. One area that may benefit from this type of approach is novice driver safety.

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Development of non-redirective crash cushions for improving the safety of occupants

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Abstract

The fatal accident was occurred when vehicle collision with road facilities. This research was conducted to prevent collision of pole among facilities on the road. The guideline and manual was reviewed to provide performance criteria to ensure occupant safety. This study was conducted 4 types of simulation to assured the performance of pole protection of the occupant safety. This research was conducted THIV, PHD were used to verified a protection of pole which assured the occupant safety. And then this research proceeded to simulation and on-site test. The results of this study are expected to contribute researches for improving traffic safety.

Background, Method, Results and Conclusions

In 2016, 232,035 traffic accidents occurred and 32 of them were caused by collision with facilities on the road. The classification according to the type of traffic accident shows that 169,471 (73.0%) of traffic accidents occurred in type of vehicle to vehicle accidents, 50,980 (22.0%) in type of vehicle to human accidents, and 11,579 of traffic accidents occurred in type of vehicle-solo accident. Especially, in vehicle-solo accidents, 2,188 cases (0.9%) have occurred in the case of vehicles colliding with road facilities. These values have been reported to be four times higher than the traffic accidents caused by the rollover (0.2%) and off-roads (0.2%) traffic. Street lights, traffic signs, poles and road sign are representative road facilities. In particular, when comparing with the number of fatalities per 100 traffic accidents, the total fatal rate of traffic accidents in 2016 was 1.94 per 100 person, and the traffic accident fatal rate by facilities was 11.06 per 100 person cases. It is required to reduce the fatalities by improving the occupant safety. In this study, to reduce the severity of accidents, it is important to develop a protection of pole which assured the occupant safety. Particularly, this study was conducted to prevent collision of bridge pole among facilities on the road.

In order to verify the performance of the facilities protection using the guardrail, we reviewed guidelines and manuals in Korea and abroad. THIV (Theoretical Head Impact Velocity) and PHD (Post Head Deceleration) were used as indicators for assuring occupant safety. Simulation was conducted using LS-Dyna Program mainly used for simulating the collision of vehicle. This study was conducted 4 types of simulation to assured the performance of pole protection of the occupant safety. This research was conducted THIV, PHD were used to verified a protection of pole which assured the occupant safety. The simulation were conducted 900kg-head on, 1,300kg-head on, 900kg-1/4 offset, 1,300kg-head on 15°. The simulation result presented that all the types of the collision condition ware passed to the reference value (THIV : under 44km/h , PHD : under 20g).

Table 1. The results of collision simulation.

	Direction of Impact	Vehicle Mass(kg)	THIV(Km/h)	PHD(g)
Type-1	Head-On	900	39.8	17.0
Type-2	Head-On	1300	35.2	14.9
Type-3	1/4 Offset	900	40.3	14.9
Type-4	Head-On 15˚	1300	36.1	15.4

And on-site test carried out by performing a real impact test in testbed certified by authorities. The collision test result meets the guideline. It is expected that the results from in this study will be utilized for developing the occupants safety in the field of traffic safety.

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The analysis of the factors affecting the severity of traffic accident

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Abstract

According to the traffic accident statistics in Korea, the number of fatalities and injuries caused by traffic accidents has been decreasing over the last 5-years. However, since traffic accidents are constantly occurring, it is needed to find out the factors affecting the accident. This study was performed to analyze the factors using the Ordered Probit Model and Random Effect Probit Model. The results of both models were compared to the influence and severity for traffic accidents of vehicle accidents. Independent variables concerning road cross sectional factor and severity of traffic accident were used and the severity of accidents were dependent variables. The results of this study are expected to improve the traffic safety.

Background, Method, Results and Conclusions

In the report of the traffic accident statistics, the number of fatalities and injuries of traffic accidents has been decreasing over the last 5-years but the severity of traffic accident was showed a high value. Especially, the value of vehicle accidents related with the fixed objects on the road shows a 7.9 which is 4 times greater than the average for all accidents. Generally, traffic accidents compacted with the fixed object were related with the road composition such as the radius, vertical curve, cross sectional grade, road width, median, and curb. Therefore, this study was conducted to analyze the factors affecting the traffic accident using the Ordered Probit Model and Random Effect Probit Model. The ordered probit model was mainly used to analyze the severity of traffic accident and random effect model was used to compare the effects of changes in similar sections.

This study was conducted by operating an equipped vehicle to investigate the road information. So, the data at the point where the traffic accident occurred was directly acquired to improve the reliability. The lane width(m), radius(m), vertical curve(%), cross sectional grade(%), road width(m), median, curb, number of main stream, climbing lane, shoulder lane, intersection, weather, drink were used as independent variables. The dependent variable was used as a traffic accident data for 3 years on the national highway of about 2500 km, and classified 3-category(Fatal, severe injury, injury into the severity of traffic accident were classified.

The results of ordered probit model was shown in table 1. The weather is the significant factor between the models. It appeared that the number of observations was 544 and the iterations were 112, the value of log likelihood was -63.43. The same variables were used in random effect probit model. The differences between the models were compared according to the mean, standard error of variables. As a result, the common value affecting the traffic accidents was weather.

Table 1. The results of ordered probit model

Variable	coefficient	Std.	z-value	P-vlaue
Constant	-6.071	8.069	-0.752	0.452
Lane width	0.072	2.206	0.329	0.742
Radius	0.000	0.000	0.091	0.927
Vertical curve	-0.006	0.015	-0.398	0.691
Cross sectional grade	0.015	0.014	1.029	0.303
Road width	-0.006	0.015	-0.040	0.968
Median	0.039	1.407	0.278	0.781
Curb	0.061	0.095	0.642	0.521
Number of main stream	-0.002	0.099	-0.030	0.976
Climbing Lane	-16.400.	1316.000	-0.001	0.999
Intersection	-10.210	246.000	-0.049	0.961
Weather	-1.166	0.077	-1.109	0.268
Drink	-0.001	0.000	-0.024	0.981

It is required to discuss the results from models. And the results of this study are expected to improve the technologies of traffic accident.

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Contemporary Guidance in Procuring and Managing Road Safety Audits

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Abstract

Although there is good awareness of road safety auditing (RSA) as a proactive technique for identifying and mitigating road safety related risks throughout Australasia and internationally, local practices in procuring, managing and conducting audits can vary between jurisdictions. The benefits of more effectively guiding practitioners towards good practice are obvious, as well as the need to better integrate current Safe System thinking into the RSA process. To this end, ARRB was engaged by Austroads in 2017 to manage a revision to the current Guide to Road Safety Part 6: Road Safety Audit (Austroads 2009). This paper presents the scope, method and key outcomes of the revision of the existing guide.

Background and Method

A stakeholder workshop, attended by representative from the Australasian jurisdictions, was held in May 2017 to identify and discuss a number of contemporary issues in the principles, commissioning and undertaking of RSA (Austroads 2017). Following the workshop, ARRB was commissioned to scope and prepare a revision of the current Austroads guide. An overarching emphasis was placed on providing more appropriate and user-friendly guidance to project managers and sponsors, to encourage those with limited awareness and/or experience of RSA to commission, and hence see firsthand the benefits of RSA. An issues paper (Karndacharuk, Hillier & Tziotis 2017) was raised to direct the on-going work on the update of the current Guide, with this being supplemented by further consultation workshops and interviews with key stakeholders and representatives from a range of functions within road agencies in Australia and New Zealand.

Project Purpose and Scope

The purpose of the Austroads project (SAG2060) is to:

- Further embed the Safe System philosophy, and to raise awareness of the Safe System Assessment Framework (SSAF) and other similar risk management tools (Austroads 2016), within the context of the undertaking of RSAs
- Provide practical assistance to project managers in their management of crash risk on the road network

The project scope can be outlines as follows:

In scope

- Produce a clear, concise guide for project managers to manage risks of the road network
- Review of existing and applicable documents on road safety audit processes across Australia and New Zealand
- Consultation and a facilitated workshop with road safety audit representatives from each jurisdiction
- Integration of Safe Systems principles into the Guide
- Focus on updating the 2009 Guide to Road Safety Part 6: Road Safety Audit only

Out of scope

- Recommendations relating to existing processes within jurisdictions
- Harmonisation of implementing the revised guide
- Specific guidance to road safety auditors on technical issues

Guidance for Procuring and Managing RSA

The paper will provide guidance on setting a RSA policy to better integrate the Safe System thinking by focusing the RSA process to tackle risks that have the potential to result in fatal and serious injury (FSI). Guidance on the assessment of road safety concerns in accordance with the contemporary Safe System assessment techniques (such as SSAF) is included to address the FSI risks in the context of possible crash severity, exposure and likelihood.

A discussion of the responsibility and independence of the various roles in the RSA process will be offered, along with key principles to procure, initiate, administer, respond to and close out RSA activities. Example of good practices and case studies will also be provided to demonstrate how the undertaking of RSA contributes to the Safe System outcomes.

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Implementation Principles for 30 km/h Speed Limits and Zones

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Abstract

In the context of the Safe System and harm minimisation approach where fatal and serious injuries are not accepted as inevitable costs of mobility in any transport system, there is an increasing need to consider implementing speed limits within the tolerance of road users, especially in urban areas with high pedestrian activity. Through a literature review, stakeholder consultation with Australia and New Zealand road transport agencies and a Safe System analysis, this paper presents the development of potential high-level principles and implementation criteria for 30 km/h speed limits and zones.

Background

The Australian Road Research Board (ARRB) undertook a literature review and stakeholder consultation on the topic of 30 km/h speed zone implementation in order to inform its potential application on public roads as part of a revision of speed zoning guidelines for an Australian jurisdiction.

In Australia, current practices and guidelines foster the implementation of a 40 km/h speed limit in high pedestrian activity areas and a 10 km/h limit in designated shared zones. While there are trials and pilot tests in the country, the use of area-wide 30 km/h speed limits are not generally accepted, partly due to regulatory barriers. Internationally, particularly in Europe, a speed limit of 30 km/h (or 20 mph), by contrast, has long been employed as a measure to reduce vehicular dominance and for improving pedestrian safety and amenity. This reflects a recognition of Safe System speeds where the pedestrian fatality risk at 50 km/h is more than five times higher than the risk at 30 km/h (Rosén & Sander 2009)

Method

The research method involved a review of the literature on the 30 km/h speed limit practice, consultation with Australian and New Zealand road transport agencies and analysis to determine the extent to which the 30 km/h speed zone implementation requirements align with the Safe System approach and its pillars (Karndacharuk & McTiernan 2017). The preliminary output of the project was a set of high-level evidence-based principles for setting 30 km/h speed limits and zones.

Literature review

The outcome from the literature review revealed a shift from a linear or ‘pockets’ 30 km/h implementation towards an area-wide practice in both residential and mixed-use areas. A wide-ranging implementation of techniques from using either signs only or traffic calming measures only, to a combination of both measures have been employed. Some jurisdictions use these measures to protect vulnerable road users without explicitly posting speed limits in light of the effectiveness of the Self-Explaining Road design to slow down the speed of motorists (Preston et al. 2013).

Stakeholder consultation

Consultation with Australasian transport agencies at both state and local levels was undertaken to obtain their views on 30 km/h speed limits and zones. While none of the Australian road transport authorities that responded to the survey requests opposed lowering the speed limit to 30 km/h in appropriate locations, only four jurisdictions (i.e. ACT, NSW, Tasmania and Victoria) have either planned or implemented 30 km/h speed zones. Collectively, the 30 km/h area has been or is being applied, albeit on a relatively small scale, to school zones, activity centre areas and selected residential streets in Australia. In New Zealand, major cities (e.g. Auckland, Christchurch, Hamilton and Wellington) have implemented 30 km/h zones in mixed-use areas on an area-wide basis.

High-level implementation principles

The purpose of the implementation principles is to ensure the consistency and credibility of establishing a 30 km/h limit that is matched, as closely as possible, to the road environment. With this in mind, the following 12 principles have been developed to maximise the potential for the zone to operate successfully by ensuring commonality and legibility for the end user.

1. Embrace the **Safe System** approach for harm minimisation
2. Enable a more balanced approach by taking into account **multi-modal** and **multi-functional** objectives for the use of the same road space.
3. Prioritise a location with strategic place significance in the **movement and place framework**.
4. Target **activity centres** and selective residential areas with a high level presence of vulnerable road users.
5. Focus on an **area-wide implementation** in homogeneous road sections.
6. Employ **traffic calming measures** for speed management and control.
7. Utilise a **mean speed** as a primary measure of actual traffic speed for a road section.
8. Consider **residual crash risks** associated with road, roadside and traffic characteristics.
9. Manage the impact of the 30 km/h implementation in **school zones**.
10. Set **technical criteria** (e.g. minimum length and provision for repeater signs and markings) that are consistent with the requirements in the existing guidelines.
11. Establish an **on-going evaluation** and monitoring process.
12. Engage key **stakeholders and communities** for support.

The paper will provide the discussion of high-level principles and potential implication of applying 30 km/h speed limits and zones for general urban speed limits, high pedestrian activity areas and school zones as well as the Safe System assessment against five Safe System pillars of road & roadside, vehicle, road user, speed and post-crash response.

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Validation of a driving simulator for research in human factors of vehicle automation

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Abstract

This study evaluated the behavioural validity of the Monash University Accident Research Centre driving simulator for research in human factors of automated driving. The study involved both on-road and simulator driving. Twenty participants gave ratings of their willingness to resume control of an automated vehicle and perception of safety for a variety of situations along the drives. Each situation was individually categorised and ratings were processed. Statistical analysis of the ratings confirmed the behavioural validity of the simulator, in terms of the similarity of the on-road and simulator data.

Background

Driving automation is on the brink of becoming the mainstream from a technological point of view but there are many unanswered questions from human factors perspective that are preventing legalisation of automated driving. These questions are difficult to answer without proper testing facilities such as naturalistic field operational tests on automated vehicles which are not readily available. The natural approach to this problem is utilisation of driving simulators.

Objective

The aim of this study was to evaluate the behavioural validity of a driving simulator for research in human factors of automated driving.

Method

As automated vehicles were not available, several technical obstacles needed to be overcome in preparation for this study. Simulator and on-road drives were compared, while all other conditions were kept as similar as possible. The simulator drives were conducted in a Monash University Accident Research Centre (MUARC) simulator that incorporated two seats mounted on individual motion bases providing motion and vibration cues. The main caveat of the adopted approach was that in both driving environments participants were seated in a passenger seat while the researcher was controlling the vehicle and therefore playing the role of an automated driving system.

20 fully-licenced participants were presented with automated driving in both an instrumented car and the simulator. The two experimental drives were conducted on similar road types and consisted of the relatively similar events. Each drive comprised both freeway and urban sections.

At various points in the drives, participants were asked to indicate the level of their willingness to resume manual control of the vehicle as well as their perception of safety rating for the current situation. Each drive contained between 20 – 25 such situations. Willingness to resume control was rated with four available categories (Very willing, Willing, Unwilling, Very Unwilling) while the perception of safety was rated using a slash line on a linear scale, from 1 to 100. At the end of each drive, participants were asked to give their ratings for willingness to engage automated driving and the perception of safety over the whole drive. Participants' responses were recorded and later analysed. Before the start of the experimental session, each participant completed a questionnaire containing demographics, driving habits and attitudes towards automation data. Each drive was video recorded. Using video recordings, each situation (decision point) was coded in order to facilitate data analysis. Several parameters were used to categorise decision points such as specific events, situation complexity, traffic density, road type and speed limit.

Results

Statistical analysis consisted of series of tests using generalised estimating equations. Results show that for the large majority of events, there was no statistical difference (p-value > 0.05) in ratings when comparing two driving environments.

The only events that produced significant statistical differences in ratings were merging onto the freeway and to a lesser extent unrestricted driving on an urban road.

Conclusions

The results confirmed the behavioural validity of the MUARC driving simulator. These will be used for the design of future simulator experiments investigating willingness to resume control or engage automated driving and associated perception of safety.

Who uses child restraint fitting stations? Results of a parent survey

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Abstract

The use of a child restraint fitting stations has been shown to increase the odds of correct use of child restraints, but their use is not universal. This study aimed to characterize the differences between parents who use child restraint fitting services and those who do not, using an online survey of 470 child restraint users. Of survey respondents, approximately a third had used a fitting station. Fitting stations users had higher levels of education, tended to be more likely to think installation was difficult, and to have purchased their restraint from a specialist baby store.

Background

Child restraint fitting stations provide expert installation of child restraints, and advice and training for parents on fitting and securing their child correctly in a child restraint. Fitting stations have been shown to increase the odds of correct use of child restraints (Brown et al, 2011). However, there is little data on which parents and carers make use of these services. Understanding the characteristics of child restraint fitting service users, compared to non-users, may assist in better targeting these services to reduce incorrect use of child restraints.

Method

Participants were recruited to participate in an online survey via the NRMA's electronic mailing list. Ethical approval was granted by the UNSW Human Ethics Committee.

Data. The survey collected data on participant demographics (age, education, income, language spoken at home, and gender), the type of child restraint being used, whether the participant had had the restraint installation checked at a fitting station, where the restraint had been purchased, how easy the participant found it to install the restraint (Likert scale), and how often the restraint was moved from vehicle to vehicle. In addition, the participants completed the Parent Supervision Attributes Profile Questionnaire (PSAPQ) questionnaire which evaluates parental supervision and risk perception, and has been suggested to be relevant for assessing unintentional injury risk (Morrongiello and Corbett, 2006).

Analysis. Descriptive statistics and univariate logistic regression modelling was performed to evaluate potential relationships between participant characteristics and whether or not they had used a child restraint fitting station, using SPSS v24 (IBM statistics).

Results

There were 470 respondents to the survey, with the 25-34 (54%) and 35-44(33%) year old age groups the most common. 31.3% of respondents had had their restraint checked at a fitting station. A range of restraint types were being used (rear facing 25%, forward facing 50%, booster seat 25%). Very few respondents moved their restraint more than once a week (0.2%). Most variables were not significantly associated with fitting station use. Fitting station users were more likely to have tertiary or postgraduate education (Chi-Sq, $p=0.035$, Fig 1), and more likely to purchase their restraint at a specialist baby store ($p<0.001$, Fig 2). More educated participants were more likely to agree that installing a restraint was difficult. While the PSAPQ overall score was not associated with fitting station use, a higher score on the supervision subscore was associated with fitting station use. The sample was dominated by English-speaking respondents, so may not reflect non-English speaking child restraint users.

Conclusions

Fitting stations were more commonly used by the more educated participants in this sample. This may be due to purchasing restraints at specialist stores who offer such services, and/or due to their increased perception of difficulty of installing child restraints. There is considerable scope to increase use of child restraint fitting stations, thereby reducing incorrect restraint use. Encouraging their use by families in lower socioeconomic areas may be worthwhile.

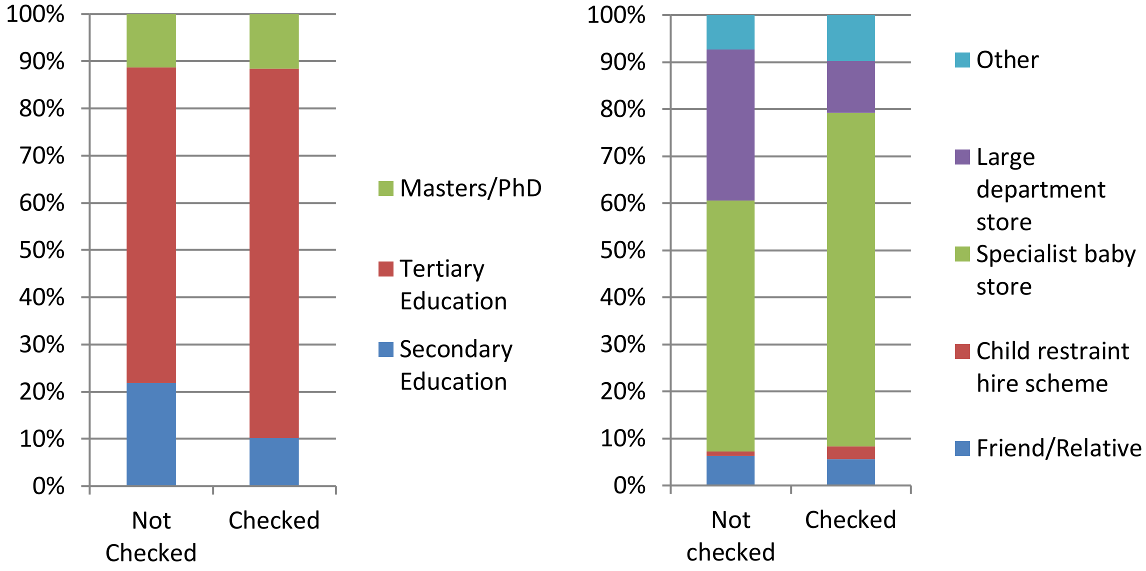

Figure 1. Differences in use of child restraint fitting station (restraint checked or not checked) for different levels of education (left) and different purchase locations (right)

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#BagAPhoneNotABody: A low cost and high reach social media campaign

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Abstract

Distraction is one of the 'Fatal Five' in Queensland, and causes many road crashes and deaths each year. Recognising this deadly problem, RACQ decided to launch a thought-provoking campaign to encourage real change to motorists' driving habits. RACQ used a collaborative staff workshop to develop the tagline and narrative for the campaign, observational studies to provide data on behaviour and evaluated the campaign using before and after surveys. The campaign proved to be a low-cost and high-reach initiative, with a total spend of less than $5,000 and a total audience of over 4.5 million people.

Background

In 2005 Regan (2005) highlighted the four to six times increase in crash risk associated with using a hand-held or hands-free phone while driving, and proposed a 'Not Now' approach to driver distraction. RACQ supported and helped promote this message, and campaigned for driver distraction to be included to make the 'Fatal 5' in Queensland.

However, with approximately one quarter of road crashes attributed to driver distraction (Klauer, Dingus, Neale, Sudweeks & Ramsey, 2006), RACQ wanted to continue to help educate road users on the risks and how to avoid driver distraction while driving.

Method

A brief literature review on driver distraction was presented to a group of 40 RACQ staff of varied demographics and areas of expertise (including journalism, economics, , education and engineering) who were asked to brainstorm potential education campaign taglines and storyboards.

The #BagAPhoneNotABody concept was selected as the winner, as it was clear enough to incite change and confronting enough to grab the audience's attention.

To complement existing research on the risks and prevalence of driver distraction and especially mobile phone use, RACQ staff members carried out observational surveys at seven South-East Queensland locations. These surveys were conducted in 90-minute windows on weekdays (around 2-3:30pm) at intersections on main arterial roads throughout Brisbane, Ipswich, the Gold and Sunshine Coasts.

A survey of RACQ members examined drivers' self-reported behaviours and attitudes to distracted driving.

A similar survey was conducted at the end of the campaign, to see if there was any change in self-reported behaviours and attitudes.

The Campaign

The RACQ Corporate Communications team produced two #BagAPhoneNotABody videos for social media. The videos were high quality, featuring professional actors, and two endings to appeal to differing audiences: one resulted in a crash scene, the other did not.

Video 1 No Crash - https://youtu.be/P5DSzCZJvUI

Video 2 Crash - https://youtu.be/NHDsuApIrug

Article: https://live.racq.com.au/2017/06/bag-phone-not-body/

The three-week campaign during June 2017 was run in partnership with The Sunday Mail. Numerous media outlets featured the campaign, including the national breakfast program, The TODAY show.

Results and Conclusion

The observational studies showed that with 5,789 vehicles monitored, 4.2% (n=241) of drivers were seen texting or interacting with hand-held phones. Of these, less than 1% (n=43) were talking on hand-held mobile phones and 2.2% (n=129) were using hands-free phones.

The campaign resulted in 167 media items with a total audience of 4,570,660 people and a total media value of $910,849. This is staggering considering the total campaign budget was under $5,000.

The market survey of 758 RACQ members conducted at the end of the campaign showed that of the 8.6% (n=65) of respondents who were aware of the campaign, 72.2% (n=46) believed that the campaign was effective in informing them of the issues around using mobile phones while driving.

Perhaps most encouragingly, of the 8.6% (n=65) of respondents who were aware of the campaign, 46.2% (n=30) said that it had changed their attitudes and behaviours towards using a mobile phone while driving, and 40% (n=12) of those drivers said they no longer use a mobile phone at all while driving.

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Effects of lane width and posted speed limit on speed selection behaviour of drivers

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Abstract

Driving speed is a critical factor in road traffic crashes. Empirical evidence suggests that narrow roads and narrow lanes on roads lead to drivers selecting slower speeds. A program of study has been designed to examine the relationship between roadway design parameters and speed selection among drivers using both a driving simulator experiment in the QUT CARRS-Q advanced driving simulator and an observational study. The key research aim is to examine speed selection behavior of drivers in response to geometric feature changes.

Background

Driver behaviour is complex as it involves many differencing factors often at odds with each other. As an example, some drivers see trip time as more important than their safety, as they cannot quantify safety as easily [1]. Speed remains a main contributing factor to road crashes [2],[3] and is an important factor in road safety.

Drivers select the speed at which they travel as a function of many driving clues related to design and operational factors, as well as their own risk perceptions, risk taking behaviour, and skills and abilities. The resulting speed distributions along a road segment arising from numerous drivers are routinely used to design posted speed limits. Operating speeds are fundamental to the development of any roadway corridor and are used to determine an appropriate design speed, which in turn is used to identify and select appropriate roadway design elements[4]. There exists a complex and often circulatory relationship between the design and operating speeds of a roadway.

A literature synthesis by Deller [5] reported that the influence of roadway design such as lane widths and roadside features on speed selection behavior of drivers has not been well studied, and thus the relationship between design speed, posted speed limit and operating speeds in urban areas is unclear. The intent of this research is to uncover and better understand some of the complexity between roadway design and operating speeds, and how drivers respond to these roadway design characteristics.

Method

A program of study has been undertaken to examine the relationship between roadway design parameters and speed selection among drivers by using a comprehensive driver behaviour survey and a subsequent driving experiment using the QUT CARRS-Q advanced driving simulator. A repeated measures ANOVA and generalised estimation equation (GEE) models were used to model speed selection behavior of drivers with the data collected from the experiment. The results of the analysis were validated with an observational study implemented in an Australian urban local road environment.

The above research aims to achieve the following specific objectives:

- Understand the impact on speed selection when there is an inconsistency between design and posted speeds within an urban roadway corridor;

- Determine the effect of changes in roadway corridor attributes on drivers speed selection;
- Determine the change in speed distributions as a result of geometric feature changes;
- Examine the role of 85th percentile in setting posted speed limits.

Results and Conclusions

A variety of roadway design factors associated with driver speed selection behavior are identified and discussed, including road width, lane width, and driver characteristics.

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Why Bulk Liquid Cargoes Shall Be Secured For Safe Transportation In Mobile Tanks.

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Abstract

Bulk liquid cargoes have not been secured in mobile tanks primarily because the significance of improving the safety of liquids transportation using means to secure liquid cargoes which include the elimination of any dynamic behaviour of liquids during transportation, had never been established nor fully been realised. Secondly, no bulk liquid load securing means were developed nor become available to bulk liquid transportation companies.

Research, recently concluded at the University of Twente, the Netherlands, not only provides for bulk liquid slosh mitigating and securing means but also has demonstrated the need for applying such means.

Details

Bulk liquid cargoes should be secured just like tree-trunks or boxes with cans of apple sauce are to be secured before transporting these. Vehicle legislation stipulates that the vehicle must have a braking system in addition to the engine that can and does absorb all energy from the vehicle and the load during deceleration. However, this is not happening in bulk liquid transport. Liquid cargoes are required to lose their energy, during tank truck braking and after this tank truck having come to a stand-still, by dampening in a sloshing process. The (kinetic) energy of a liquid charge is therefore not absorbed by the brakes (nor by the engine) during braking nor after having come to a stand-still of the mobile tank. The dampening of liquid can be increased by using baffles. Baffles however, not only during braking but continuously dampen and thereby mainly result in a higher and unnecessary diesel consumption of the tank truck. The energy lost by dampening the liquid requires to be re-supplied by the engine of the truck resulting in the higher diesel consumption. In addition, baffle baffles do not offer any lateral stability, and this is precisely the direction in which (tank) trucks keel-over. (Eenkhoorn E.J., 2017).

Figure 1. First "ADR" (see Reference) tank-truck with liquid load securing "Cairbag©" system in Germany

When bulk liquid cargoes are secured, the driver has the possibility of maximum braking in emergency situations, with a deceleration in accordance with the law stipulated for that purpose. Now, he or she brakes intuitively based on experience gained with driving tank vehicles and based on own confidence in still being able to control the vehicle and load and movements thereof. Subject to the experience of the driver, this leads to braking distances which are unnecessarily too long, especially, as researched, when ABS braking systems are also used on the tank vehicle. This is assumed to contribute to sometimes very serious head-tail collisions.

Liquid load securing was proven by referenced research to mitigate the risk of keeling-over of a mobile tank. Furthermore, the brake performance of mobile tanks is significantly improved by securing the liquid cargo. The reduction of fuel consumption when liquid loads are secured is not only economically attractive but also makes liquid transportation environmentally sustainable.

The scientifically incorrect "baffle plate" regulation in the international legislation for transportation of Dangerous Goods by Road, mostly based on the UN guidelines thereto will therefore be recommended to be corrected in a presentation to the UN “Tank Working Group” on 19 September 2018, as:

- The UN guideline on which for example the European Law on "Transportation of dangerous goods by road", the "ADR" is based, to state in Article 4.3.2.2.4 that:

  "Liquid cargoes which only partly fill the mobile tank in which they are transported must be secured in accordance with Article 7.5.7.1".

- Similarly, ”load-securing” as specified in article 7.5.7.1 is recommended to be corrected into:

  “All loads shall be secured.”

  Possibly with the addition of:

  “Such securing shall be done prior to commencing the transportation”.

Liquids that do not resort under legislation based on the UN guidelines for transportation of dangerous goods are recommended to be treated identically to liquids that must comply with such legislation as the dynamics of a liquid being transported are not subject to such liquids being “flammable” or “toxic”.

The immediate “tolerating” of scientifically justified, liquid cargo-securing solutions will also be proposed for formal ratification by the UN “Tank Working Group” through “interpretation clarifications” of the current relevant articles of the UN guidelines for transportation of dangerous goods.

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Note 1: Ausstralian reference: Australian Code for the Transportation of Dangerous Goods by Road & Rail, published by the National Transport Commission.
Note 2: ”ADR” does <u>not</u> refer to: Australian Design Rules for motor Vehicles and Trailers.

Can we explain attention-related errors while driving?

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Abstract

Driver inattention is one of the main causes of road crashes. Factors that result in drivers' attention-related errors, especially from the perspective of driver characteristics, have not been systematically investigated. This study conducted a questionnaire survey and investigated the inter-relationship between driver characteristics and their attention-related errors. Results indicated that (1) driving experience decreases attention-related errors while driving; (2) a higher frequency of driving violations, high disinhibition, and high susceptibility to involuntary distraction are associated with frequent attention-related errors. The findings shed light on the direction of countermeasures to reduce distracted driving and attention-related errors.

Background

Driving is an attention demanding task that requires continuous interactions between humans, vehicles and road infrastructure. However, with the proliferation of cell phones and other nomadic devices in daily life, drivers often engage in secondary tasks while driving such as texting or listening to music, which potentially interrupts the driving process. This interference could result in road crashes. For example, in Australia, it has been reported that use of a mobile phone up to 10 minutes before a crash was associated with a fourfold increased likelihood of crashing (McEvoy et al., 2005). Nonetheless, there are still many unknown factors regarding crash processes in mobile phone distracted driving (Oviedo-Trespalacios, Haque, King, & Washington, 2016).

Educational campaigns, legislation and enforcement have been frequently implemented to stop distracted driving, however their success has been insufficient. In Australia, the high prevalence of mobile phone use while driving confirms that there are a large number of distracted drivers on roads and the need to explore new approaches to prevent attention-related errors is imperative (Oviedo-Trespalacios, King, Haque, & Washington, 2017; Waddell & Wiener, 2014). Therefore, the aim of this research is to characterize the inter-relationship between a group of driver characteristics (e.g. age, gender, driving experience, sensation seeking, and distracted driving susceptibility) and attention-related errors.

Method

Participants

A cross-sectional design was selected. A total of 466 participants (65% females) completed a 30-min questionnaire. Participants have an average age of 29 years and reported holding a valid driving license for 11 years on average. Personal characteristics of the participants are reported in Table A1.

Questionnaire

The scales utilized in this study are showed in Table 1.

Data analysis

Reliability of the scales was studied using Cronbach's alpha coefficient. A value of 0.70 or greater was considered adequate. Additionally, a correlation analysis was conducted to determine any relationships among the variables tested.

Table 1 – ***Scales included in the Questionnaire***

Scale	Definition	Subscales	Responses	Author
Sensation Seeking (SS)	Sensation seeking is explained as the need for novelty and complexity of stimulation	(a) Experience seeking, (b) Boredom susceptibility, (c) Thrill and adventure seeking, and (d) Disinhibition	(1) "Strongly disagree" – (5) "Strongly Agree"	Hoyle, Stephenson, Palmgreen, Lorch, and Donohew (2002)
Attention-Related Driving Errors Scale (ARDES)	ARDES mainly refers to the non-deliberate errors in driving performance resulting from an attentional failure	N/A	(1) "never or almost never" – (5) "always or almost always"	Rubén D. Ledesma, Silvana A. Montes, Fernando M. Poó, and María F. López-Ramón (2010)
Condensed Behaviour of Young Novice Drivers Scale (BYNDS)	Inventory of risky driving behaviours in Australia	(a) Transient violations (risky driving behaviours that can change throughout the journey, such as speeding), and (b) fixed violations (risky driving behaviours that are not transient in nature, such as not wearing seatbelt)	(1) "Never" – (5) "Nearly all the time"	Scott-Parker, Watson, King, and Hyde (2012)
Crash-involvement Scale	Prior involvement in crashes (at least one in the last three years)	N/A	(1) "No" – (2) "Yes"	N/A
Susceptibility to Driver Distraction Questionnaire	Involuntary and voluntary distraction involvement	(a) Distraction engagement, (b) Attitudes and Beliefs about Voluntary Distraction, and (c) Susceptibility to Involuntary	(1) "Strongly disagree" – (5) "Strongly Agree"	Feng, Marulanda, and Donmez (2014)

Results and conclusions

The correlations are reported in Table A1. Some of the findings include:

- Years with a valid driving license was negatively correlated to attention-related errors. Experience driving serves as a protective factor against attention-related errors. A focus on novice drivers' prevention is essential.
- Attention-related errors are positively correlated with transient and fixed driving violations. Tackling distraction would potentially benefit other risky driving behaviors. This also supports a systematic approach for driver safety, and it is not efficient to just target one behavior. Further research is necessary to study causality relations. Based on the literature we know that distracted drivers change their driving performance (Li, Yan, Wu, Radwan, & Zhang, 2016).
- Disinhibition was positively correlated to attention-related errors and presented as the largest correlation among the SS subscales. In addition, disinhibition has been consistently linked with mobile phone use while driving and multitasking (Oviedo-Trespalacios, Haque, King, & Washington, 2017). This personality trait seems to be characteristic of distracted drivers who present frequent attention-related errors.
- Distraction engagement was not correlated directly with attention-related errors. A potential explanation is that disinhibition regulates the distraction-error relationship. Particularly, highly disinhibited drivers could be more invested in mobile phone tasks. This is also a promising line of research.
- Susceptibility to involuntary distraction is positively correlated to attention-related errors. A potential explanation for this phenomenon is that drivers are not able to activate timely self-regulation behaviours such as selective engagement or workload management (Li et al., 2016; Oviedo-Trespalacios, King, et al., 2017). Efforts to prevent involuntary distraction could reduce the number of inattention errors.

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Appendix

Table A1 – *Participants' characteristics, responses to scales, and correlation analysis*

Variables	M	SD	Driver Characteristics				Sensation Seeking (SS)				Risky Driving (BYNDS & Crash involvement)			Susceptibility to Driver Distraction Questionnaire			Attention -Related Driving Errors Scale (ARDES)
			S	A	YDL	DW	EX	BO	TA	DI	TR	FI	CI	DE	AB	SID	
Sex (S)	0.35[a]	N/A	1	-.1	-.07	-.06	-.08	-.05	-.17**	-.14**	-.09*	-.15**	.04	.06	-.01	-.00	-.04
Age (A)	29	11		1	.95**	.08	-.03	-.24**	-.20**	-.30**	-.22**	-.03	-.43**	-.2**	-.21**	.08	-.06
Years with a valid driving license (YDL)	11.0	11.1			1	.07	.02	-.23**	-.18**	-.25**	-.17**	-.01	-.45**	-.2**	-.16**	.02	-.10*
Driving hours per week (DW)	2	1				1	.13**	.11*	.04	-.11*	.05	-.04	.01	.05	.02	-.08	-.09
Experience seeking (EX)	3.54	.99					1	.46**	.40**	.26**	.13**	.04	-.11*	.22**	.23**	-.14**	-.01
Boredom Susceptibility (BO)	3.07	.96						1	.34**	.36**	.15**	.11*	.01	.22**	.19**	-.07	.10*
Thrill and adventure (TA)	2.65	1.16							1	.44**	.23**	.19**	-.04	.20**	.19**	-.04	.11*
Disinhibition (DI)	2.49	1.12								1	.38**	.27**	.02	.33**	.27**	-.07	.17**
Transient Violations (TR)	2.16	.69									1	.44**	-.01	.48**	.37**	-.00	.33**
Fixed violations (TR)	1.20	.43										1	.02	.11*	.11*	.11*	.56**
Crash-involvement (CI)	0.5[b]	N/A											1	-.04	.00	.04	.01
Distraction Engagement (DE)	3.34	.63												1	.55**	-.07	.09
Attitudes and Beliefs (AB)	3.28	.48													1	-.25**	-.01
Susceptibility to Involuntary Distraction (SID)	2.78	.64														1	.29**
Attention-Related Driving Errors Scale (ARDES)	1.49	.46															1

[a] represents the percent of male drivers;
[b] represents the percent of drivers that are involved in crashes before;
* represents a significance level of 0.05;
** represents a significance level of 0.0

Black Spots and Telematics: the link between driver behaviour data, road safety, and the Black Spot program

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Abstract

The emergence of vehicle telematics data (location, speed, acceleration etc) for insurance purposes has opened the possibility of using this data to improve road safety. Treatments to Black Spot intersections were used to analyse correlation between telematics data, and the effect of changes to road infrastructure on driver behaviour. Telematics measurements, including harsh braking, were used to compare driver behaviour before and after road safety treatments at three known, high-risk intersections, with a view to identifying the traits of the driver behaviour that change with the inferred improvement of safety that comes with treatments applied at the intersection. Data analysis at the three sites showed negligible change in behaviour, or even a slight increase in harsh braking, though this was not statistically significant. Consequently, no identifiable characteristics of safe or risky driving behaviour could be determined by comparing behaviour before and after a treatment.

Background, Method, Results and Conclusions

Recent emergence of Usage-Based Insurance (UBI), also referred to as Pay As You Drive (PAYD) insurance adjusts your insurance premiums based on your driving behaviour using a fitted black-box device that records GPS location and accelerometer data. The collection of large quantities of this data has opened up the possibility of using it to analyse driver behaviour across the road network.

Research around telematics data has primarily focused on using feedback to improve driver behaviour. Missing from the equation was whether the telematics incidents were the fault of the road infrastructure, or could be minimised through changes to the infrastructure, as per “Safe Systems” theory. Clusters of telematics events at Black Spot sites may indicate that drivers, operating at their typical capabilities, are consistently struggling to navigate the local infrastructure and environment.

Proactive methods to identify high-risk locations with potential for crashes and injuries (particularly high severity injuries) have been developed and continue to evolve (e.g. ANRAM, AUSRAP). These methods have often identified unsafe road infrastructure out of context with its intended use and environment. Road surveys have also been used to examine risky infrastructure, however the frequency and breadth of surveys required has limited their application across entire road networks. These established methods often draw on available research evidence and road data inventories, and do not take advantage of up-to-date road user behaviour information.

This research uses a case study approach to investigate promising links between driver behaviour data and black spots. Driver trips were isolated around three recently treated black spot sites in semi-urban Melbourne, using de-identified data provided by Capesure, which collates insurance telematics data. Statistical analysis was unable to yield relationships between driver behaviour and treatments at black spot locations, using data recorded both before and after treatments to quantify the characteristics of high-risk behaviour (before treatment) and safer behaviour (after) at Black Spots. Indeed no significant change in behaviour occurred at any site across the observed period.

Future research in this area should examine larger sets of trip data across many more locations in order to find more minute results than could be determined in this pilot study.

On-road and driver fatalities at Toll Group: what the data reveals about risk and opportunity in our pursuit of zero

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Abstract

On-road and driver fatalities at Toll Group: what the data reveals about risk and opportunity in our pursuit of zero

Background

Toll Group is the Asia-Pacific region's largest provider of transport and logistics services, operating across 1,200 locations in more than 50 countries. In 2017 Toll undertook an analysis of all 'on-road and driver fatalities' that occurred in its operations between 1 July 2007 and 31 December 2016.

This paper represents the first in-depth public articulation of Toll's research. Our results suggest that key opportunities to influence the road toll are being missed by industry, community and government.

Method

Toll defined 'on-road and driver fatality' as all situations where:

- a Toll employee, contractor or casual was killed on a road or road related area
- a Toll employee, contractor or casual was involved in (but not necessarily responsible for) an on-road incident that resulted in a fatality
- a Toll driver (employee, contractor or casual) died at a Toll premises or in a Toll vehicle, regardless of the cause

Incidents meeting the definition were extracted from Toll's Incident Management System (IMS). Internal reports, insurance data, investigation material and coroners and police reports were consulted to ascertain trends, patterns and common characteristics in the data.

Results

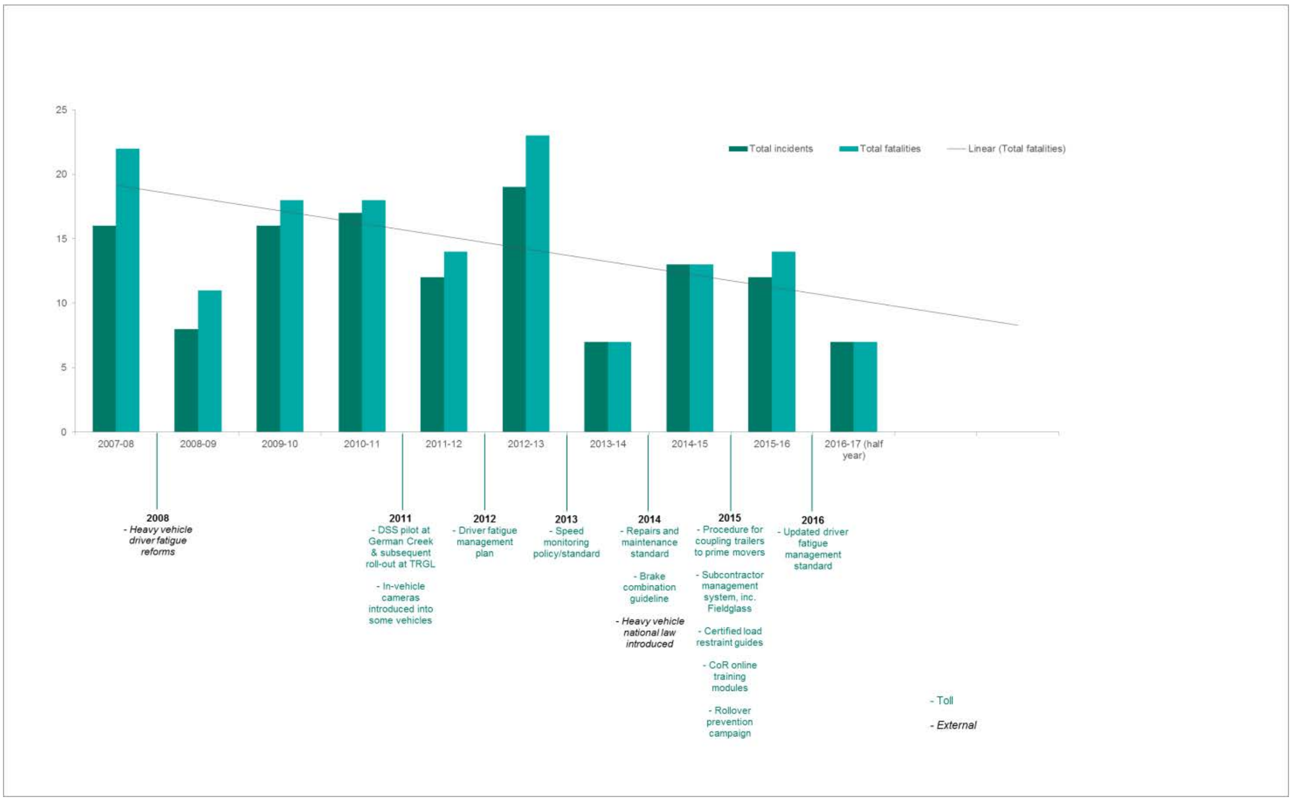
During the timeframe under review there were 147 fatalities arising from 127 incidents.

Toll's trendline broadly mirrors the downwards movement of the national road toll.

The improvement is particularly apparent for Toll employees. In 2010/11, an employee died for every 29 million kilometers travelled. In 2015/16 that number was nearly 116 million kilometers: an improvement by a factor of more than 4.

As indicated in the chart on the following page, there are variations year-on-year but the overall trend is downwards.

Figure 1. Toll Group Fatalities and Policy Interventions



Conclusions

The key conclusions arising from the investigation and analysis are:

- Industry can impact the road toll through policy and technology interventions designed to prevent speed and fatigue.
- Fatalities appear more likely to involve contractor and casual drivers (69%) than employee drivers (29%). Industry needs to understand why subcontractor drivers constitute a higher risk and manage it.
- In most instances of fatality liability is attributed to parties other than Toll. This suggests a need for third party road users to be more educated in how to share the road with heavy vehicles. Despite this, national and state road safety strategies are almost entirely silent on light and heavy vehicle interaction.
- Non-work related fatalities occurred in 9% of incidents and are overwhelmingly the result of a heart attack experienced on a Toll premises or in a Toll vehicle. This suggests a need to address the cardiovascular health of drivers.
- Fourteen percent of the fatality incidents are confirmed suicides by truck. This is almost certainly a considerable underestimate and an issue that Toll cannot resolve unilaterally. It requires community and government involvement.

Enhancing driver education with driving simulators: what do novice drivers perceive as effective?

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Abstract

Technology developments, and particularly driving simulators, provide an opportunity to bridge the gap between research and practice in driver training. However, few studies investigate how young people are likely to engage with technologically-augmented driver education using driving simulators. This study surveyed novice drivers aged 18 to 20 with provisional driving licenses (N=273) and investigated their perceptions of what medium and high fidelity simulators could be effective at if included in a driver education course. We found that, despite a large focus on procedural skills, novice drivers thought that simulators could be used also for higher level skills, and that it aligned with their expectations about driver education, which suggests that enhancing this countermeasure with driving simulators would be accepted by novice drivers.

Background

Previous research suggests that conventional driver education may improve a range of driving skills but most evaluations show it to have a negligible impact on crashes (Beanland, Goode, Salmon, & Lenne, 2013). This shortcoming can be partly explained by the lack of emphasis of conventional training on the perceptual and cognitive skills required for safe driving (Watson, 2003), despite research suggesting good practice should largely focus on training such higher level skills. This highlights a misalignment of the perceptions of what should be taught during driver training from various stakeholders. The Goals for Driver Education (GDE) was developed to provide guidance about the types of skills that should be considered to increase the effectiveness of formal driver education (Berg, 2006). It has also been shown that driving simulators can be effective for training higher-order cognitive driving skills (Pollatsek, Vlakveld, Kappe, Pradhan, & Fisher, 2011), suggesting that they could be used to enhance driver education. However, research also indicates that it is important to consider end-user perceptions of technology (King & He, 2006) in order to ensure their uptake. The aim of this study is to examine novice drivers' perceptions about what driving simulators could be used to teach, and how this relates to their beliefs about what should be taught in a driver education course, in order to understand whether driving simulators are likely to be an effective facilitator for aligning driver training with state of the art research.

Method

Provisional drivers (Queensland P1 and P2) (N = 273; M_{age} = 18.8 years [SD = .8]; 76% female) completed an online survey about driver education and driving simulators. Participants were recruited via university research participation pools, social media, email lists, recruitment flyers and word-of-mouth. Using the GDE as a framework, likert-type questions examined perceptions about what skills and attributes formal driver education should focus on developing, considering the difference between medium and high fidelity simulators. Regression analyses were used to identify which levels of the GDE novice drivers perceive as the most effectively trained with driving simulators.

Results

The results (see Table 1) indicated that novice drivers thought that all levels of the GDE should be taught in formal driver education, but placed more importance on Levels 1 and 2. Similarly, they perceived simulators to be most efficient for these lower levels. Regression analyses highlighted that the more novice drivers reported that it was important to train GDE Level 2 (interactions in traffic), the more the use of a medium fidelity simulator was likely to be effective at enhancing such training ($\beta = .20$; t = 2.6, DF = 270, $p = .001$). Similar results were observed for high fidelity simulators ($\beta = .19$; $t = 2.5$, DF = 268, $p = .012$). Alternatively, the results suggest that the more they thought driver training should focus on teaching Level 3, the less they thought a driving simulator of any kind would be effective ($\beta = -.10$; $t = -1.8$, DF = 268, $p = .070$). Overall, novice drivers thought that high fidelity simulators would be more effective than medium fidelity ones ($\beta = 3.9$ versus $\beta = 4.6$; $t = 15.9$, DF = 270, $p < .001$).

Table 1. Perceptions of the skills that (i) driver training should focus on, and (ii) driving simulators are effective at training

	Level 1: vehicle manoeuvring	**Level 2: mastery of traffic situations**	**Level 3: goals and context for driving**	**Level 4: goals for life/ skills for living**
Skills that driver education should focus on (Likert scale 1-5)	4.0 [SD=.7]	4.3 [SD=.7]	3.7 [SD=.9]	3.8 [SD=.9]
Skills that simulators can effectively train (Percentage [95th confidence interval])	30.3 [24.7 - 35.9]	27.9 [22.5 - 33.3]	25.2 [20.0 - 30.4]	18.8 [14.1 - 23.5]

Conclusion

Young drivers in this study believed simulators could be used to train a range of skills, although most commonly those related to Vehicle Manoeuvring (Level 1) and Mastery of Traffic Situations (Level 2). The negative relationship between Level 3 and simulator effectiveness indicates that young drivers believed simulators would be less effective at educating motivational aspects of driving less related towards the immediate driving task. These results align somewhat with previous research examining perceptions of simulators (Rodwell et al., 2017; Rodwell et al., under review). Importantly, while novice drivers thought that high fidelity simulators would be more effective, medium fidelity ones – which are more likely to be used by driver education organisations (Lang et al., 2007) - were also considered as very effective. This suggests that driving simulators are likely to be accepted by novice drivers in a technologically-augmented driver education program, and could be an effective facilitator to increase training of higher level driving skills.

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Jaywalking at Signalised Intersections in Melbourne

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Abstract

Vehicle-pedestrian collisions are a major road safety concern because of the relatively smaller mass and lack of protection for the pedestrian. Moreover, the risk of fatality or serious injury resulting from crashes involving jaywalking and distracted walking have been increasing over the last two decades. The objective of this study is to explore the prevalence and contributing factors of pedestrian jaywalking behaviours using video data collected at three locations in Melbourne, Australia. A binary logistic regression model will be applied to examine the influence of gender, apparent age, herding or group behaviour, and use of mobile devices on jaywalking. It will provide useful information to develop suitable engineering, education or enforcement measures to reduce jaywalking behaviour at the intersections.

Regulating safe driving behavior passing stationary emergency and enforcement vehicles with flashing warning lights

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Abstract

Emergency and enforcement workers perform diverse and time-critical tasks on the road and in road-related environments, placing them at risk of being struck by passing vehicles. In response to ongoing concerns from emergency providers and other agencies, VicRoads undertook a collaborative process to investigate the nature of roadside incidents involving emergency or enforcement workers and the feasibility of regulating driver behavior. Informed by research and consultation, a new road rule was introduced requiring drivers and riders to safely slow to 40 km/h when passing stationary or slow-moving emergency and enforcement vehicles with red, blue or magenta flashing warning lights.

Background

Emergency and enforcement workers perform diverse and time-critical tasks on the road and in road-related environments, placing them at risk of being struck by passing vehicles. There is limited data on the prevalence of roadside incidents involving emergency and enforcement workers however anecdotal reports suggest near misses are common. In response to ongoing concerns for the safety of emergency and enforcement workers, VicRoads worked with stakeholders to explore the extent and nature of incidents and options for regulatory reforms.

Policy Development

From November 2015 to September 2016, a range of investigatory and policy development activities were conducted. This included (i) establishing a cross-agency Working Group to guide activities, (ii) stakeholders surveying over 1,600 Victorian emergency and enforcement workers to ascertain the extent and nature of roadside incidents (The Police Association Victoria, 2016), (iii) investigating the key contributors to roadside incidents (iv) reviewing local and international approaches, including effectiveness of countermeasures introduced (v) undertaking a network impact analysis to determine potential impacts on travel time of potential regulatory solutions (Clark & Strickland, 2016). A consultation process was undertaken on potential regulatory options, including a universal speed limit, differing speed reduction requirements depending on road type and speed reduction requirements in combination with a move-over requirement.

Outcomes

Survey: The worker survey indicated that in the previous three years seventeen per cent of respondents were involved in a near miss on four or more occasions. Eight per cent of respondents had their vehicle struck by a passing vehicle and three per cent had been injured while evading a passing vehicle. Eighty-six per cent of respondents supported regulating driver behavior passing stationary emergency vehicles with flashing lights to improve safety (The Police Association Victoria, 2016). *Evidence Review*: The main contributors to roadside incidents involving stationary emergency services were excessive speed and driver inattention. South Australia was the only Australian jurisdiction to have laws in place requiring drivers to slow within the vicinity of emergency vehicles with flashing lights. Internationally, move-over laws operate throughout North America, however no outcome evaluations of these laws could be found. Community awareness and simplicity were seen as essential to fostering driver compliance with move-over laws in these jurisdictions. *Network Impact Analysis*: Using police vehicle intercept data as a proxy for roadside incidents, the network impact analysis showed a 40 km/h speed limit passing emergency or enforcement vehicles would add approximately 29,000 vehicle hours to the Victorian freeway network annually, equating to a non-significant 0.01% volume increase in annual travel time (Clark & Strickland, 2016). *Consultation*: A regulatory response was considered warranted and three regulatory options were canvassed for stakeholder comment. A universal 40 km/h limit when passing stationary emergency and enforcement vehicles with flashing lights received strongest support.

Conclusion

Following Ministerial approval, road rule 79A commenced in Victoria on 1 July 2017. It requires drivers to slow to 40 km/h when passing stationary or slow-moving emergency or enforcement vehicles with flashing red, blue or magenta lights. Monitoring of effectiveness and driver compliance is ongoing.

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What are Australian drivers doing behind the wheel? An overview of secondary task data from the Australian Naturalistic Driving Study

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Abstract

Using data from the Australian Naturalistic Driving Study (ANDS), this study examined patterns of secondary task engagement during everyday driving trips to determine the type and duration of secondary task engagement and the number and type of incidents associated with secondary task engagement. Results revealed that driver engagement in secondary tasks is frequent, with drivers engaging in one or more secondary tasks every 1.6 minutes, on average. Many of these secondary tasks involved short, discrete button presses and interactions with vehicle controls that lasted less than 5 seconds total duration.

Background

Distracted driving is the main contributing factor in almost 16% of serious casualty road crashes resulting in hospital attendance in Australia (Beanland, Fitzharris, Young & Lenné, 2013). To date, much of our knowledge of Australian drivers' engagement in distracted driving has been informed by self-report surveys and crash data, both of which are subject to reporting bias (Shinar, 2017). The Australian Naturalistic Driving Study (ANDS) offers a unique opportunity to examine driver engagement in secondary tasks not essential to driving, under real-world driving conditions.

Using data from ANDS, this study examined patterns of secondary task engagement during everyday trips to determine the type and duration of secondary task engagement and the number and type of incidents (i.e. errors, violations or safety-related events) associated with secondary task engagement.

Method

This study used data collected as part of ANDS (Regan et al., 2013). Three hundred and fifty-two privately owned vehicles (n = 191 from New South Wales; n = 161 from Victoria) were equipped with Data Acquisition Systems (DAS) and driven for a period of four months. The DAS comprised sensors and data-loggers, allowing continuous recording of vehicle data and video while the vehicle ignition was on.

The data used in this paper comprised randomly selected trips from the available data set. Two analysts (KY, RO) viewed entire trips and coded sections where drivers were observed engaging in at least one secondary task. A preliminary dataset of 100 trips (i.e., 1,396 minutes of driving) has been coded.

Results

A total of 892 secondary task events were identified from the coded trips. On average, drivers engaged in a secondary task every 1.6 minutes of driving. Table 1 displays an overview of driver engagement in secondary tasks. Many commonly performed tasks involved short, discrete presses of the steering wheel and/or center stack controls that lasted a total duration of less than 5 seconds. Almost one quarter (23.9%) of the secondary task events involved the driver engaging in multiple tasks at once. When multiple tasks were engaged in, this typically included drivers interacting with passengers while also performing other tasks. Only 5% of the secondary tasks events were associated with a driving incident. Many of these incidents involved a delay in drivers detecting that the traffic lights had turned green or that vehicles in front had moved away; however, several incidents were more serious, with drivers veering out of their lane or failing to detect the vehicle ahead braking suddenly.

Conclusions

ANDS data revealed that driver engagement in secondary tasks is frequent, with drivers engaging in a secondary task every 1.6 minutes, on average. It was also not unusual for drivers to engage in multiple tasks at once. Many secondary tasks involved short, discrete button presses and interactions with non-essential buttons and controls lasting less than 5 seconds total duration. While many tasks were fairly short in duration, as a next step it is important to examine if drivers can effectively share even short secondary tasks with driving using short (< 2 sec) eye glances.

Table 1. Number, percentage and mean (SD) total task duration (s) of secondary tasks in each category

Secondary Task	n (%)	Duration (s)	Secondary Task	n (%)	Duration (ms)
Adjusting/Monitoring devices integral to vehicle	184 (20.6)	3.9 (15.5)	Reaching for phone (includes moving)	15 (1.7)	5.1 (3.7)
Adjusting/Monitoring centre stack controls	141 (15.8)	3.6 (7.2)	Manipulating Object (other than phone)	14 (1.6)	61.4 (148.3)
Looking at object/event OUTSIDE the vehicle	105 (11.8)	32.5 (236.5)	Mobile phone, holding	11 (1.2)	40.7 (78.6)
Interacting with passenger	81 (9.1)	222.9 (409.9)	Talking/listening phone (hands-free)	10 (1.1)	306.2 (323.9)
Personal Hygiene	62 (7.0)	82.0 (574.7)	Eating	10 (1.1)	123.4 (17.7)
Reaching for object (includes moving object)	51 (5.7)	4.4 (4.7)	Manipulating phone (hands-free)	9 (1.0)	32.4 (52.6)
Talking/Singing to self	43 (4.8)	23.2 (50.1)	Pet in vehicle	4 (0.4)	5.8 (3.6)
Adjusting steering wheel buttons	42 (4.7)	2.1 (2.6)	Talking/listening phone (hand-held)	2 (0.2)	52.1 (35.8)
Looking at/for object INSIDE vehicle	31 (3.5)	3.3 (4.9)	Inserting/retrieving CD	1 (0.1)	15.5 (-)
Manipulating phone (hand-held)	25 (2.8)	18.5 (21.4)	Writing	1 (0.1)	36.8 (-)
Holding object (other than phone)	19 (2.1)	31.7 (54.9)	Other	12 (1.3)	16.2 (17.5)
Drinking	19 (2.1)	88.9 (13.0)			

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Simulation Platform for the Prototyping, Testing, and Validation of Cooperative Intelligent Transportation Systems at Component Level

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Abstract

Cooperative Intelligent Transport Systems (C-ITS) are widely considered as the next major step in the development of driving assistance systems (ADAS), and Autonomous Vehicle (AV), aiming at increasing robustness of information for algorithms thus, increasing services, safety and comfort aspects for drivers. Infrastructure managers also benefit from C-ITS data as up-to-date and detailed information about road uses. Simulation platforms that allow prototyping and evaluating of such applications, are crucial. We propose a virtual cooperative simulation platform which integrates models and tools for road environments modelling, embedded virtual sensors and communication devices, which are all consistent with the laws of physics.

Introduction

The development of C-ITS for safety improvement requires additional resources in terms of extended and enriched perception functions which are both time-consuming and expensive. Therefore, it becomes essential to have a simulation platform that allows prototyping and evaluating extended, enriched and cooperative ADAS in the early stages of the system's design. This virtual cooperative simulation platform has to integrate models and tools for road environments modelling, embedded virtual sensors (proprioceptive & exteroceptive), infrastructure-based sensors and Inter-Vehicular Communication (IVC) devices, which are all consistent with the laws of physics. Similarly, a physics-based model for vehicular dynamics coupled with actuators (steering wheel angle, torques on each wheel) is required. Within such a simulation platform, it becomes possible to obtain a fine and accurate simulation of each component of cooperative applications, especially for the communication systems, in order to model the fine interaction of these complex systems

Positioning with regards to the state of the art

Several simulation softwares already address the simulation of specific C-ITS applications in complex environment. They mostly focus on the system level and overall impact assessment: IPG simulation software derives from the vehicle dynamic simulation, TASS PreScan came from the traffic simulation environment and I-Tetris is the result of a European Project. They have enhanced simulation capacities but do not take into account a fine description of the sensors and communication devices and the impact of environment.

Methodology

In order to have a realistic simulation, we need the capability to simulate realistic sensors, vehicles, cooperative ADAS applications, and more important, realistic communication means (propagation channel, antenna diagram), which is done by interconnecting state of the art softwares and libraries.

- The cooperative ADAS prototyping is made with existing softwares (Matlab or RTMaps).
- The communication standard with the OSI layers is provided by the NS3 library. NS3 is a simulator of communications protocol and networks. It contains implementations of Geonetworking protocols (Car2X), Geo-Unicast, TopoBroadcast and advanced protocols. It also contains an IPv6 stack.

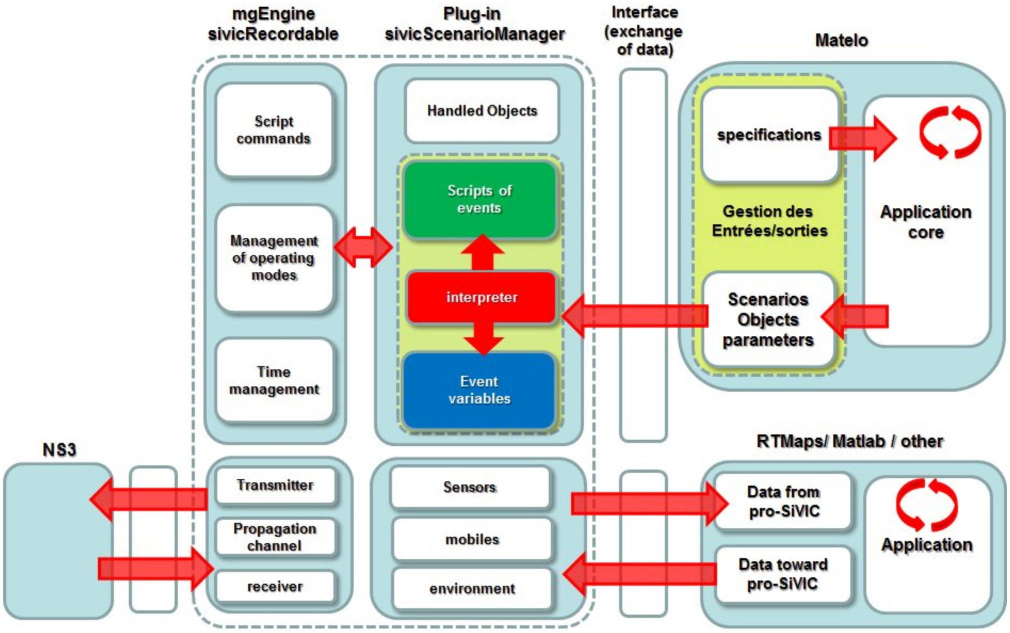

Figure 1 General simulation architecture for the simulation platform

- The vehicle, infrastructure, embedded sensors, communication propagation channel, and antenna diagram are simulated in the pro-SiVIC platform. Pro-SIVIC (CIVITEC-ESI) allows to simulate custom scenarios involving environment conditions, multiple sensors and communication systems, up to physical model, dynamic actors and people to perform prototyping and testing stages through simulation.
- The interconnection of softwares is obtain with the pro-SiVIC's DDS communication bus.

Results and Conclusion

This paper present the development of a new simulation platform dedicated to the prototyping, the test and the evaluation of cooperative applications involving communication means. In order to process this issue of cooperative ITS development, we propose an adaptive (complexity of the use case), distributed (several applications and several computers) and interconnected simulation platform.

From a technical point of view, this work provide a reliable, efficient, generic, and dynamic environment for the development of C-ITS application. More precisely, about the communication means, we propose a realistic environment with the simulation of OSI layers, propagation channel (wave gain and energy attenuation, multi-reflexion path length, Doppler information …), and antenna diagrams.

Frontline Support – Enhancing Child and Family Health Nurses' Knowledge about Child Car Seats

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Abstract

In NSW, a significant burden of injury and death of children is road related, including children as passengers in vehicles. Child and Family Health Nurses (CFHN) are uniquely positioned to reach families, especially in regional, rural and remote areas. Kidsafe NSW launched a four-staged project, funded by Transport for NSW, to increase awareness and understanding of road rules and child car seat use. Evaluation of the project showed that the CFHN participants gained knowledge and passed this information to parents and carers of young children. The project reached 537 CFHN, which carries a potential reach of 7500 families per week.

Background

In New South Wales (NSW) road trauma is the leading cause of death and the third leading cause of injury to children (NSW Child Death Review Team, 2015). While child car seats are being used, upon inspection, it is found that in the majority of cases they are not being used correctly (Koppel, Charlton, & Rudin-Brown, 2013; Brown, Hatfield, Du, Finch, & Bilston, 2010; Neuroscience Research Australia (NeuRA), 2017).

Child and Family Health Nurses (CFHN) offer support, education and resources to families throughout NSW. One nurse reaches approximately 20 families per week. Educating nurses in road safety, especially on correct selection and use of child car seats, provides an excellent opportunity to get information out to parents and carers on child car seats at an early stage in a child's life. These frontline health professionals need customised resources to support families and culturally and linguistically diverse (CALD) groups as well as more staff development opportunities to address the complexity of issues (Borrow, Munns, and Henderson, 2011). Due to the high rates of child injury and death on NSW roads, combined with the need for child car seat information, Kidsafe NSW created a child car seat information session specifically for CFHN.

Implications

Discussions with a number of staff from local health districts informed the adopted delivery model. The CFHN had limited time and availability to participate in dedicated training offsite so training was included as a component of regular professional development. Kidsafe NSW conducted comprehensive 2-hour sessions. The project included locations throughout NSW with a specific focus on regional and rural NSW as defined by NSW Health (NSW Health, n.d). Evaluation included a questionnaire directly after the session with a follow up questionnaire at a later date.

Results

Upon completion, 537 CFHN participated in the information sessions across regional/rural (61%) and metropolitan (39%) areas of NSW. While qualitative data regarding participation of Aboriginal Community Health Services nurses was not collected, anecdotal evidence indicates there was representation from these groups (Milne, personal communication, 2018). The pre- and post-evaluation of the pilot project (n=24) indicates that the participants reported a 63% increase in knowledge of changes of legislation. There was a significant uptake of overall knowledge of child car seats including, laws, types available, information and resources.

Conclusion

The implications from this work with CFHN around proper selection and use of child car seats is providing parents and carers valuable information about child car seats and reinforcing the safety messages promoted by Kidsafe and road safety organisations across Australia. This is especially important for the introduction of new or changing road rules to compliment the efforts of policy and legislation. This is based on: evidence (Bilston, Du, & Brown, 2011); advice provided by participants; perceived limited access to information on child car seats being readily available for CFHN; and, the fact that these nurses have access to a large number of families each week.

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Keys2drive: the evolution continues

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Abstract

Keys2drive, Australia's largest-ever learner-driver education program, recently celebrated two milestones – its eighth birthday and its 500,000th participant. Keys2drive is aimed at arresting the overrepresentation of novice drivers in road trauma across Australia. Citizens aged 17-25 comprise only 13% of the Australian population, but more than 20% of the annual road toll (Senserrick, 2015). In 2009, when Keys2drive lessons began, there were 291 road crash fatalities among drivers and passengers aged 17-25, which equates to 28% of the total number of fatalities. In 2016, that number dropped to 192 (BITRE, 2016), or 23% of the total. Although not solely responsible, Keys2drive has helped shape this outcome by boosting the skills, confidence and risk management of novice drivers and their supervisors.

Background

Keys2drive was borne from a strong community desire to 'do something' about high crash rates for novice drivers. Leading up to the 2007 federal election, the Australian Automobile Association, and its constituent motoring clubs, approached the Federal Government (and Federal Opposition) and asked them to fund a program that would look at new ways to address the overrepresentation of young people in road trauma. At the time, evaluations of many other driver education and training programs from around the world had shown mixed or inconclusive results. Keys2drive sought to overcome this by incorporating the latest research and changing the way novice drivers are taught by professional driving instructors and by their supervising drivers. Keys2drive was designed to address a number of fundamentals:

- The importance of novice drivers having extensive real-world driving experience on the road
- Addressing the overconfidence and optimism bias of novice solo drivers
- Upskilling those parents who felt underprepared for supervising a beginner driver
- Harnessing and enhancing the existing driving instruction sector by providing new training
- Focusing on active learning methods, self-management skills and the higher levels of the Goals for Driver Education (GDE) Matrix
- Designing a program applicable to all Australian states and territories
- Complementing the (at the time) newly-introduced state and territory-based graduated licensing systems.

Method

The essence of Keys2drive is education for three critical parties: driving instructors, parents (or supervisors) and learner-drivers. Participants learn the reasons behind the elevated crash risk for newly-licensed drivers and strategies to mitigate them. Through Keys2drive's 'long, wide and deep' methodology, participants also learn ways to critique their own driving skills and decisions, as a qualified instructor or assessor would. For supervisors, the program aims to counteract the traditional, and usually unhelpful, method of simply telling learner-drivers what they should know and do. Keys2drive is not about driving, per se. It is about human behaviour in a driving context. It helps to make novice drivers, and their key influencers in life, more aware, more resilient, and better prepared for solo driving.

Results

To date, Keys2drive has trained more than 2,500 driving instructors and has discussed road safety with more than 560,000 people, a number higher than the population of Tasmania. Keys2drive has been evaluated five times, most recently by Transport and Road Safety (TARS) Research. That evaluation contained a retrospective analysis of questionnaire data from learner-drivers and supervisors, and showed that surveyed Keys2drive participants held a learner's licence for longer than the mandatory 6-12 months and were less likely to break road rules or crash in the first six months on their P-plates (Senserrick & Mitchell, 2013). Keys2drive has also conducted its own nationwide surveys into the outcomes of the program from a supervisor's perspective. These surveys have shown that Keys2drive's 'train the trainer' approach and mandatory parental involvement are having an impact. Parents and supervisors have become more aware of road safety issues and are better teachers and mentors, having learnt how to pass on safe habits and driving practices to learner-drivers to, hopefully, make them safer.

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Keys2drive - a guide to making smarter decisions on the road

FAST FACTS

Available across Australia

More than **2,500** instructors trained

More than **600,000** participants

KEYS 2 DRIVE
it's in your hands

Now in its **8th year**

$51 million total investment from the Commonwealth and motoring clubs. Funded until 2021

Largest learner-driver intervention ever implemented in Australia

Winner of a Prince Michael International Road Safety Award

Why?

- Address high crash rate for novice drivers
- Look at the problem through fresh eyes
- Incorporate the latest research
- Build a foundation for a lifetime of safe driving
- Upskill driving instructors, parents and supervisors – 'train the trainer'

What?

- One-hour free lesson with an accredited instructor – theory and practical
- Mandatory parental involvement
- Promotes student-centred learning
- Encourages learning that is:
  - Longer – more supervised hours
  - Wider – diverse range of driving conditions
  - Deeper – understanding the responsibilities

Results?

2013 University of NSW report found:

- Higher number of supervised driving hours
- Longer time spent on L-plates
- Less likely to break road rules or crash in first six months

2017 supervisor survey found:

SAFETY FIRST

- 92% of supervisors were more aware of safety issues
- 78% said Keys2drive made them a better teacher for their learner-driver

THE FUTURE

- ANCAP vehicle safety message in future lessons
- Greater spread of lessons in regional Australia
- Refresh of curriculum and online training

Australian Government

Proudly sponsored by Australian Automobile Association, NRMA, RACV, RACQ, RAA, RAC For the better, RACT

www.keys2drive.com.au

Are highway constructions associated with increased transport incidents? A case study of NSW Pacific Highway construction zones 2011-16

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Abstract

Construction zones are associated with higher rates of transport incident. While these incidents are preventable, there is limited data in Australia on the effects of high way construction zones on the rate of transport incidents. This is a retrospective study focused on the construction zones and periods along the NSW Pacific Highway and aims to investigate if the number of people who have major trauma as a result of a transport incidents in construction zones is higher than the number of people with incidences in highways out of construction zones.

Background

A number of studies in USA reported that construction zones are associated with higher rates of transport incident (Graham et al., 1977, Khattak et al., 2002). However, these incidents are preventable, and observance of particular standard work procedures are suggested as being instrumental in improving safety level of the construction zones (Jin et al., 2008).

Nevertheless there is limited data in Australia on the effects of high way construction zones on the rate of transport incident. A recent unpublished review of trauma admission to two regional trauma services – Port Macquarie Base Hospital and Coffs Harbour Health Campus, has indicated an increase in major trauma admission rates in some particular time spans. Based on the knowledge of the local healthcare practitioners, it is speculated that these peaks in admission rates might have occurred during the times of construction along the NSW Pacific Highway upgrade.

This study focused on the construction zones and periods along the NSW Pacific Highway and aims to investigate if the number of people who have major trauma as a result of a transport incidents in construction zones is higher than the number of people with similar incidences in other situations.

Research questions

1. Is the number of patients who have a transport incident in Highway construction zones higher than those out of construction zones?

2. Is there any difference in the mortality rate and level of injuries sustained by people who have had a car accident in highway construction zones and those out of construction zones?

Method

This is retrospective study that collect data by screening the patients admitted to the surrounding trauma services: the Mid North Coast Local Health Districts Health Regional Trauma Services and corresponding Major trauma services of John Hunter Hospital and Gold Coast University Hospital, as well as Coronal cases from reported deaths in the same region. (Figure 1).

Results

In addition to the data gathered in this study, external information regarding construction zone locations and periods are obtained from the NSW Roads and Maritime Services (RMS) Pacific Highway project office. The combination of these data is entered into a geospatial mapping program for visual demonstration. Moreover, this information is used to make a comparison between the length of construction zones (Kilometres) and those data of non-construction zones in a similar time span, which assist calculating the relative expected number of incidences that is considered when comparing the observed number of incidences in construction zones and non-construction zones by a binomial test (research question 1). Finally, the severity of injuries sustained and outcomes (such as mortality, hospital length of stay, discharge destination) is compared using Chi Square and T-test between people who were involved in transport incident in construction zones and others (research question 2).

Conclusion

This study shed light on the potential risk that highway construction might have for road traffic safety and can lead to further investigations aiming for improving safety of road users during highway road constructions.

Figure 1. Pacific Highway construction zones

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Local and global evaluation of risk, impact of C-ITS

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Abstract

Nowadays, an increasing number of assistances is available to help the driver: they are growing toward automated functionalities. Given the sensing capacities, it now becomes possible to have a local view of the surrounding and, with existing communication capacities, this view can be shared. Standardization activities show even that future messages exchanges between vehicles and with the infrastructure will provide an in-depth knowledge of surrounding vehicles dynamic states and position. We propose to provide a broader and more accurate understanding of the traffic situation, at the vehicle level and infrastructure manager level using high level indicator as risk definition. At the vehicle level, it allows a faster evaluation of the surrounding, simplifying decision process. At the infrastructure level it enables a fine description of the road usage.

Background

Even with the introduction of engineering solutions, as driving assistance and dynamic control or better road surface, of better education policies and enforcement procedures as speed camera, the number of fatalities remains high. However, detailed car accident studies show that whatever the use case, the driven is often seen as being responsible. With the increasing development of driving assistances, we can access to an overall description of the vehicle close environment. Communication devices are also common, even using a third party devices, but the trend is going to the standardization. ETSI Group, in Europe, now provides a common references and vehicles can exchange basic information with CAM. A payload part allows more flexibility and, possibly, more information.

Methods

An Autonomous Vehicle must (i) understand the overall environment, (ii) predict the short term future behavior and inform their intention to the other road users and (iii) react to the environment to ensure safety (e.g. minimizing longitudinal and lateral acceleration, maintaining a safe inter distance with the front vehicle, obey to the driving rule…). For this last part, most of the approaches now define a two steps planning, regarding the overall risk and accurate definition of the trajectory. This specific description of risk has a large impact on the remains of the decision process. Moreover, the risk definition could also be used at the infrastructure level to describe the safety of a road segment.

The risk, related with an event includes two parts, namely, the gravity and the probability. In order to define the last one, we use a monte-carlo approach. However, these class of method are time consuming and require a large computation architecture. We describe an implementation on a GPU architecture, which, comparatively, achieved far better results than a traditional CPU based process.

Next, the risk evaluation relies on the description of the environment. We discuss about three different architectures, in term of data exchange that provides the data needed for the monte-carlo process, in term of sensing, from expert knowledge to full communication.

Results

We compare the results of our methodology on the risk evaluation and prediction of the environment evolution with respect to existing criteria that define the risk related with the road traffic description (as Time to collision and Time Headway), with comparable results and under one evaluation process. The risk evaluation gives significant results (see Figure 1) on three different scenarios in order to define the vehicle speed in a decision process. The GPU based architecture is also compared in term of performance with a CPU based approach in order to assess the feasibility in real time and embedded in existing solution. Based on a NVIDIA Quadro M4000 and depending on the number of particles in the Monte Carlo process, the algorithm performs 30 times faster than the CPU version (Intel® Core™ i7-6700HQ).

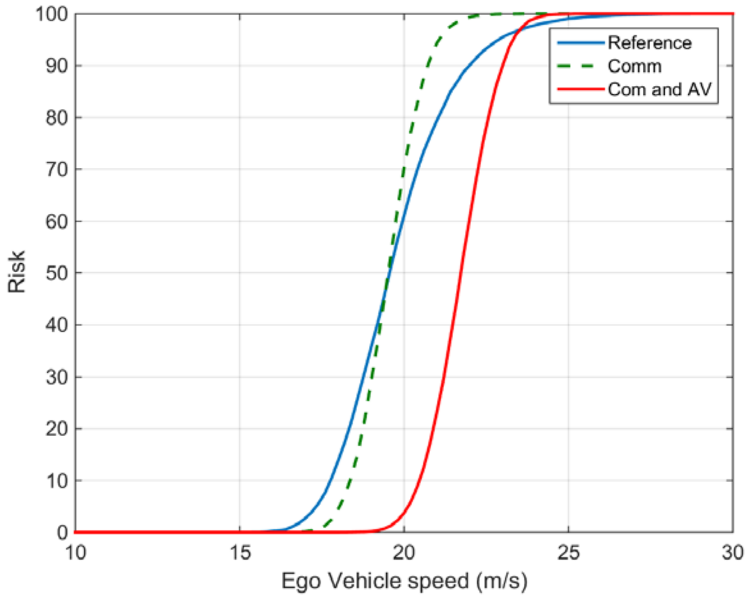

Figure 1 Risk related with a leading vehicle under three scenarios : Human driven vehicle as a reference, CITS enabled vehicle and AV

Conclusion

In this article, we develop a risk evaluation to describe the surrounding of the vehicle, first from a local point of view, it is extended with the use of communication devices to a global risk evaluation. The feasibility of the approach is assessed regarding the performance of existing architecture available in the vehicle. We show the impact on low level and high level description of the traffic safety and the adequation with existing description.

Defining Practical "Consistent Look and Feel" for Light Rail Customers and Road Users

Airdrie Long[a], Gareth Hughes[a]

[a]Asset Standards Authority, Transport for NSW, Chatswood, Australia

Abstract

With the move towards integrated public transport systems, providing a consistent look and feel for both customer service and marketing purposes has become more important than ever. The Human Factors profession recognises that consistency in the system can reduce injuries and errors, increasing safety. However, consistency in look and feel is not well defined.

This paper describes how a transport agency defined what is meant be consistent look and feel so that the benefits of consistency could be gained without providing unnecessary constraints on the systems designers. The result is a publically available guideline for suppliers of light rail to NSW.

Background

Over a short period, three light rail systems were announced in NSW, Australia, introducing a new on-road transport mode into NSW. The projects were issued as independent contracts aiming to generate strong market competition. As the three projects developed, 'consistent look and feel for customers and road users on and around light rail' was identified as necessary. The Asset Standards Authority Human Factors team recognised that this concept was seen as intangible and difficult to define with people interpreting it in different ways. Some interpreted it to mean everything looked exactly the same, while others considered it to be full interoperability between the systems. Recognising a need for a better understanding of the concept, we took on the challenge of defining what this meant practically in terms of benefits for the customer and road users on or around light rail.

Method

Our starting point was determining what the benefits of consistency were. In doing so we also considered what the benefits of difference were.

Next we defined what elements of the light rail system affected customers and road users on and around the system that we needed to consider for consistency and difference.

From this we determined there were levels of consistency required and developed a schema that defined seven levels; the highest being consistency across all NSW (all public transport) to the lowest being no need for consistency at all.

Armed with our initial findings we used a collaborative approach engaging road authorities, safety, customer services, designers (engineers, architects, urban planners, …), individual project representatives and disability policy groups to determine where benefit from consistency, and at what level it was best applied. This approach ensured that a multi-disciplinary perspective was achieved and ensured buy in from all relevant areas of the agency.

Results

We determined the benefits of consistency in design for public transport were focused around recognition, familiarity and predictability. Figure 1 shows that the latter two can lead to a system that is safer through fewer injuries and errors.

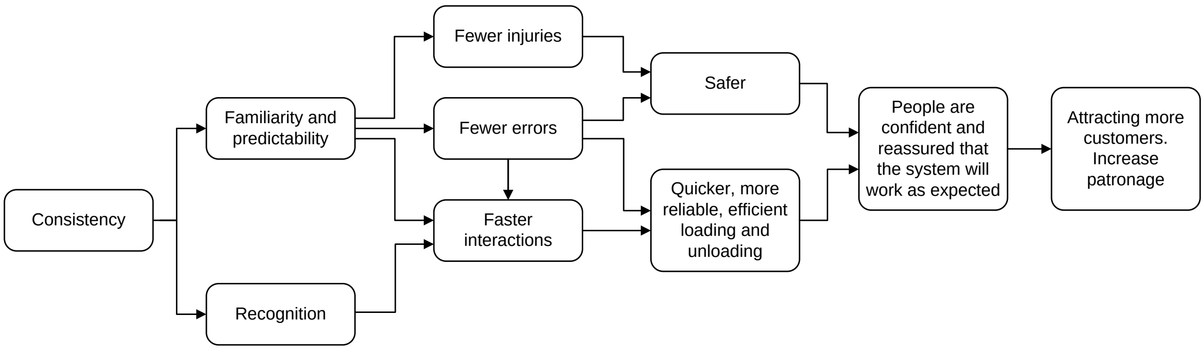

Figure 1. The benefits of consistency for public transport (From TfNSW, 2017)

The benefits of difference we identified included making places distinctive and attractive, local identity, geography, corridor context, competition between suppliers, improvements and innovations in technology and improved design over time.

The result was a set of tables that provided the level of consistency, the key driver for that level of consistency (recognition, safety, error and interaction speed) and notes providing more specific information for that element. Using the framework enabled the benefits of both consistency and difference to be realised and their dis-benefits to be minimised.

At the projects request, the working document was published as a guidance document (TfNSW, 2017).

Conclusion

Using a collaborative approach we were able to develop and publish a practical guide for consistent look and feel for customers and road users on light rail systems. This publication allows NSW transport projects to better integrate and deliver an appropriate consistent look and feel for customers and road users on and around the light rail network.

References

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Evaluation of the performance of Alcohol and Drug Awareness Courses currently provided in the ACT

James Thompson[a], Lisa Wundersitz[a], Simon Raftery[a]

[a]Centre for Automotive Safety Research, University of Adelaide

Abstract

This study evaluates the performance of Alcohol and Drug Awareness Courses (ADAC) provided in the Australian Capital Territory. The following were examined: key performance indicators on the provision of ADACs, their efficacy in changing the attitudes and knowledge of attendees, and their effect on drink driving rates in the ACT. Completion rates for individuals enrolled in the courses have been increasing. Surveys of attendees suggested that the courses improved their attitudes towards drink driving. Also, ADACs may have contributed to reductions in drink driving detections. Based on these findings, the ADAC program has been performing well since its inception.

Background

Driving while impaired by alcohol or other drugs is a significant road safety issue. In Australia, driving while impaired by alcohol is the leading contributing factor in around 30% of fatal crashes (Australian Transport Council, 2011). As of the 25 November 2011, drivers in the ACT who have been found guilty of a drink or drug driving offence are required to undertake an Alcohol and Drug Awareness Course (ADAC) before being issued with a restricted or probationary licence. The aim is to raise awareness about the effects of alcohol and drugs on driving and health, and to change the behaviour of offenders.

The present study evaluated the ADAC program in terms of: key performance indicators on the provision of the courses (e.g. attendance), their efficacy in changing the attitudes and knowledge of attendees, and their effect on drink driving detections in the ACT.

Method

Key performance indicators were obtained from ADAC providers for the period that the program has been running (December 2011–August 2017). Surveys were given to attendees immediately before and after the courses (June 2015–November 2017), with 244 individuals completing them. The purpose was to measure the baseline (pre-course) and post-course attitudes (e.g. there are no excuses for drink driving) and knowledge (e.g. what is the BAC limit for a fully licensed driver) towards drink and drug driving. Data on persons charged with drink driving (proxy measure for drink driving in general) in the ACT (2002–2016) were obtained from the ACT Justice and Community Safety Directorate Criminal Justice Statistical Profiles.

Results

Table 1 shows increases between 2012 and 2014 in: courses delivered (11.7%), participants enrolled (67.3%), attendance (73.8%), participants completed (51.5%), and the percentage of participants completed (8.9%). Despite declines between 2015 and 2016, these performance indicators remained higher in 2016 than in 2012.

Table 1. Key performance indicators for the ADAC courses (2012 to 2017)

	2012[a]	2013	2014	2015	2016	2017[b]	Total
Courses delivered	94	107	105	101	99	51	557
Participants enrolled	710	1001	1188	1189	1138	532	5758
Participants in attendance	634	934	1102	1093	988	445	5196
Participants completed course	596	901	1082	1073	970	441	5063
% completed (of total enrolled)	83.9	90.0	91.1	90.2	85.2	82.9	87.9

[a] Includes December 2011, when ADAC commenced
[b] Only includes January to June 2017

Mean correct responses to the 15 attitude survey items significantly increased from 11.1(SD=2.1) pre-course to 11.8(SD=2.3) post-course (paired samples t-test, $t(80)=3.7$; $p<0.001$). Mean correct responses to the knowledge items (out of 19) did not significantly differ (pre-course=13.1(SD=2.7), post-course=13.5(SD=2.5), paired samples t-test, $t(84)=1.5$; $p=0.130$).

In Figure 1, drink driving detections in the ACT decreased since 2011, when ADACs were introduced. This contrasts the projected increase since 2011 (based on 2002 to 2011 trends).

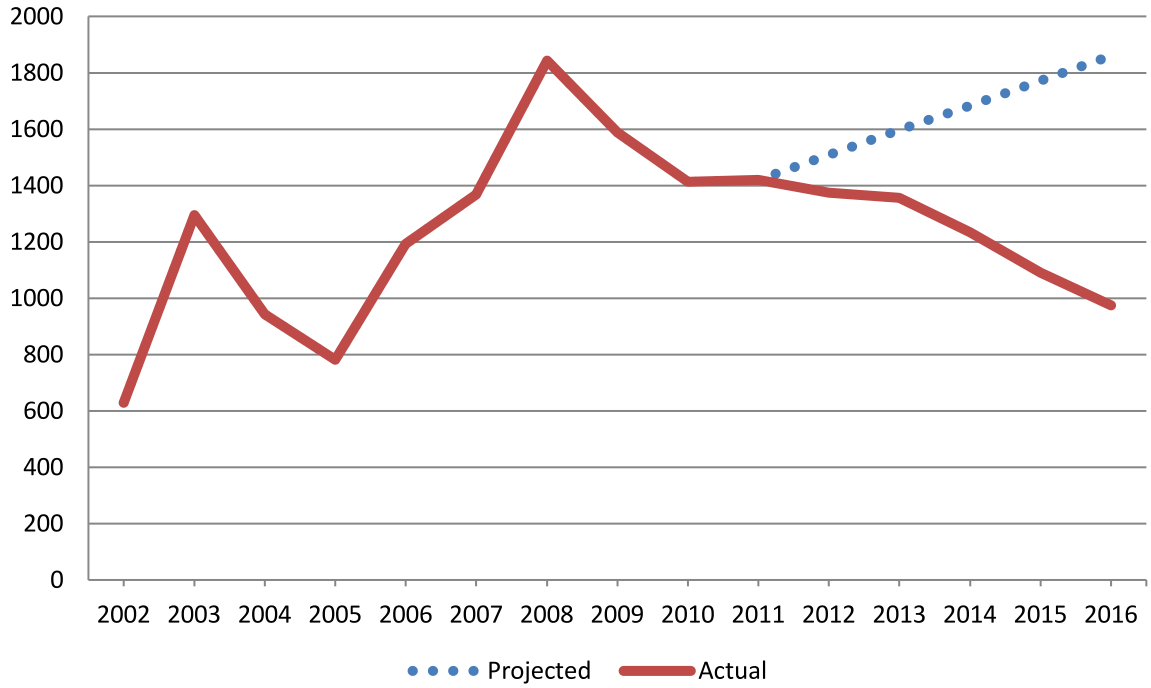

Figure 1. Actual compared to projected (based on 2002 to 2011 trends) drink driving detections in the ACT, 2002-2016

Conclusions

Course completion rates increased to 90% in 2013, 2014 and 2015. Attitudes of attendees towards drink driving improved following course completion. Knowledge of drink and drug driving information did not change, but this may result from high existing knowledge or survey limitations (questions may not have adequately reflected all information in the course). Also, ADACs may have contributed to reducing drink driving detections (and possibly overall drink driving behaviour) in the ACT. However, the reductions could be due to other factors, such as other drink driving countermeasures (e.g. the Alcohol Ignition Interlock Program that was introduced in the ACT in June 2014) or economic factors. Overall, these findings suggest that the ADAC program has been performing well since its inception.

References

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Are young adults' licensing rates still declining?

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Abstract

Declines in young adult driver licensing have been reported in several countries. This study provides an important update of such trends in Victoria and includes new data by gender and location. Across 2001-2016, there was an 18% decrease in young adults aged 18-24 holding a driver licence with over a third not holding a licence in 2016. Females were less likely than males to be licensed at all ages. Those living in the Greater Melbourne area or regional centres were less likely to be licensed than those dwelling in the remainder of Victoria. The findings have implications for road safety.

Background

Declines in young adult driver licensing have been noted in the United States, Canada, Sweden, Norway, United Kingdom, Japan, France and Germany (e.g. Delbosc & Currie, 2013; Sivak & Schoettle, 2012; van Dender & Clever, 2013). In Australia, Bailey et al. (2015) found that driver licensing rates among Victorians aged 18-30 years have declined since 2001. This study provides an update to gauge whether the overall licensing rates among young Victorians are continuing to decline and whether the trends are the result of different patterns of licensing according to gender and urban versus rural residence.

Method

The total numbers of licence holders for individual ages 18-90 by gender from 2011-2016 were obtained from VicRoads in addition to those for individual ages 18-24 by postcode of residence. The number of driver licences at each age were tabulated against Australian Bureau of Statistics population data by postcode and gender. The percentages of licensed drivers per population were then calculated for each category and examined to ascertain any trends over time in driver licensing rates. Chi-square analyses were performed to determine statistically significant differences.

Results

Figure 1 shows that from 2001-2016, there was a decreasing trend for young Victorian adults to hold a driver licence. Licensing rates for young adults aged 18-24 have decreased by 18% since 2001, with over a third (37%) of them not holding a driver licence in 2016. In 2016, 18 year olds had the lowest licensing rate on record (39.6%). Licensing rates among adults aged 25-29 have also declined since 2001, but not as substantially (by 12%). Looking at more recent years, since 2014, there has been a slight downward trend in licensing rates for those aged 18-24 while for older age groups (i.e. age 30-65) licensing rates have remained relatively stable.

With respect to gender, across 2014-2016, females were less likely than males to be licensed, for ages 18-24 (63% vs 66%, $\chi 2$=1777.8, df=1, p<.001) and also in all other age groups.

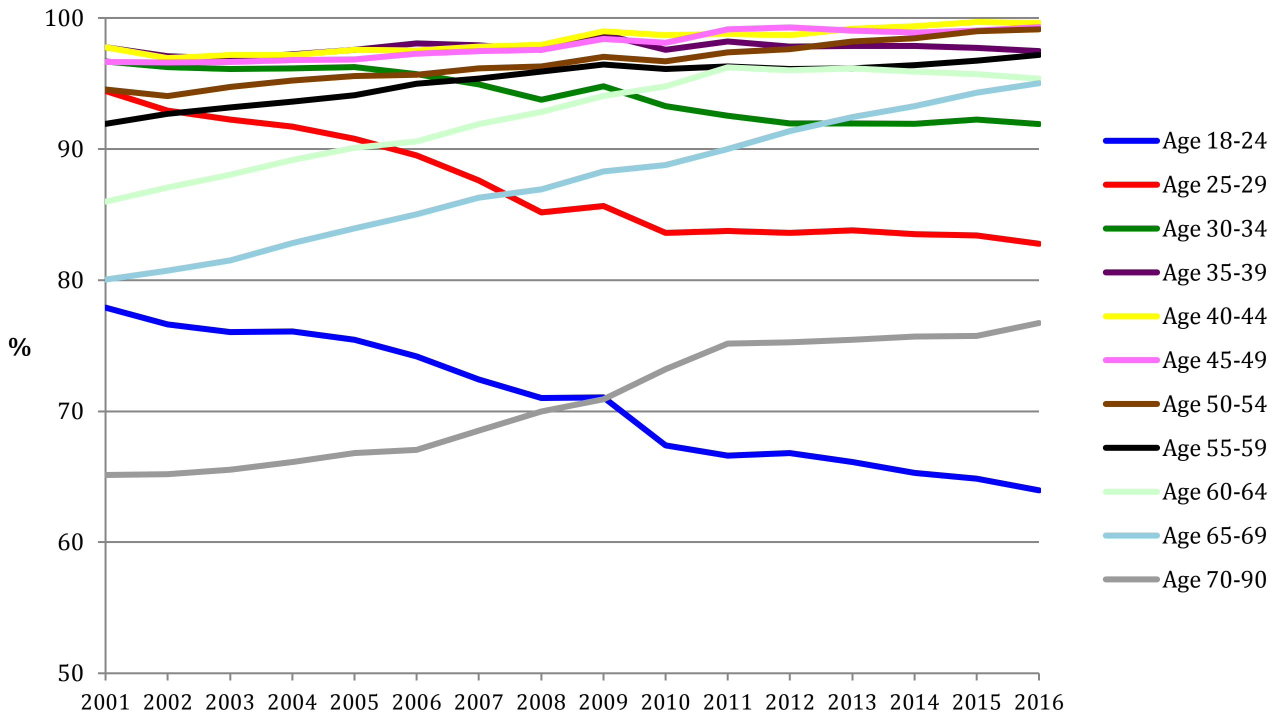

Figure 1: Driver licensing rates (percentage of Victorian population) by age groups, 2001-2016

For those aged 18-24, from 2011-2016 licensing rates in the Greater Melbourne area declined slightly (4%) while licensing rates increased by 4.7% for the rest of rural Victoria. When the Victorian rural area was further divided into two categories, we found licensing rates for the regional centres (Geelong, Ballarat and Bendigo) remained relatively stable while there was increased licensing over time for the rural areas excluding regional centres (6.3%). However, looking at the age trends from 2011 to 2016 in more detail, in regional centres, those aged 21-24 became increasingly more likely to be licensed and those aged 18-20 became less likely. Overall, those living in the Greater Melbourne area or regional centres were less likely to be licensed than those living in other rural areas.

Conclusions

A pattern of delaying or forgoing licensure among young adults is persisting. This trend is more evident among females and those living in urbanised environments. It is important to continue to monitor trends in licensing rates among young adults in the future as licensing levels have significant implications for transport planning and road safety. The continuing trend for fewer young adults being licensed may mean reduced overall exposure to the road, which potentially could result in fewer crashes involving young drivers and their passengers.

Acknowledgements

This study was funded by the Royal Automobile Club of Victoria (RACV) through a Project Grant to the Centre for Automotive Safety Research.

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USING LIDAR DATA TO ENRICH THE DIAGNOSIS OF SAFETY PROBLEMS AND COLLISION CAUSES

Amr Shalkamy[a], Karim El-Basyouny[a], Suliman Gargoum[a]

[a]University of Alberta

Abstract

The current practices of diagnosing safety problems are associated with many challenges such as the reliance on manual observations, intra- and inter-observer variability, time consumption, and the great effort required to conduct a large-scale diagnosis of an entire road network. This research advocates using LiDAR data to create an accurate 3D model of crash-prone locations which would help identify potential safety problems in a robust and efficient manner. To diagnosis safety issues, different algorithms are used to extract and evaluate roadway features such as available sight distance, horizontal and vertical curves characteristics, cross-section elements, and lateral placement of roadway signs.

Introduction

It is globally accepted that road collisions are a major cause of death and they exert a huge economic burden on both individuals and governments. Consequently, efficient methods to identify causes of road collisions before making recommendations for remedies and mitigations plans are required. The key to selecting an effective countermeasure, for an underlying road safety problem, relies extensively on the ability to accurately identify the factors that might have contributed to a particular location being classified as a crash-prone location. This brings the issue of ‘proper diagnosis’ to the forefront of any safety mitigation strategy.

Current practice of diagnosing safety-related issues is centered on field visits by trained professionals. Consequently, several challenges arise. For example, intra- and inter-observer variability are introduced due to the reliance on human observers. Inter-observer variation occurs when two or more observers examine the same material with varying results. Conversely, intra-observer variation occurs when a single observer experiences varying results while observing the same material more than once. Obviously, such variations can have profound effects on the overall results of the diagnosis.

Moreover, current methods of measuring road characteristics are subject to human errors which could undermine the diagnosis process or lead to misjudgment. These conventional methods are both time-consuming and labor-intensive, thereby, limiting the implementation of a large-scale diagnosis effort of the entire roadway network.

This research introduces a new technique that could potentially minimize human errors, eliminate variability due to manual observations, collect huge amounts of data on collision-prone sites, and be less disruptive to traffic. This is achieved through the use of Light Detection and Ranging (LiDAR) datasets in the diagnosis of collision-prone locations. Using LiDAR data, information about roadway features including cross-slopes, characteristics of horizontal curves, and roadway profiles could be obtained without the need for long site visits. Having access to a 3D model of a collision-prone location is considered a paradigm shift in the way data could be transformed into information to assist safety professionals in identifying the causes of collisions and the means by which they could be improved.

Methodology

To demonstrate the value of LiDAR in enriching the safety diagnosis process, several locations in Alberta, Canada were analyzed using LiDAR data. The goal was to identify potential safety problems that might have been a cause for a site being classified as a crash-prone location. Different algorithms were used to extract and assess highway features which include, available sight distances, horizontal curve attributes, road profile characteristics, longitudinal slopes, cross-sectional elements, and roadway sign placement.

Conclusions

Diagnosis of collision-prone locations is a routine task for safety professionals, which is tedious, time-consuming, and prone to human error. This paper demonstrates the value of adopting LiDAR technology to perform such tasks. The paper proposes a method which could represent a new epoch for conducting road safety audits. Compared to traditional practice, diagnosing safety-related issues using LiDAR data increases the efficiency and robustness of the process. It also helps alleviate hurdles associated with the conventional diagnosis of road safety problems.

RAC Motorcycling Survey 2017

Anna Sawyer, Nurcan Catan, Anne Still, & Garreth Young
RAC WA

Abstract

The rate at which motorcyclists are being killed or seriously injured on Western Australian roads is growing. To better understand how the safety of motorcyclists can be supported, RAC conducted a survey of Western Australian drivers and motorcyclists, which was exploratory in nature with the overall aim of understanding usage, riding behavior, attitude and perceptions of road users about motorcycling behavior and challenges. As well as showing that there are differences related to rider age, type of vehicle and usage, the survey results identified a number of initiatives which could improve the safety of motorcyclists.

Background

With growing number of Western Australians riding motorcycles for transport the rate of serious motorcyclist crashes is increasing and in 2016, 20% of people killed (Bureau of Infrastructure, Transport, and Regional Economics, 2017) and 25% of people seriously injured in traffic crashes were riding motorcycles (Road Safety Commission, 2017).

In June 2017 RAC conducted a survey with the overall aim of better understanding motorcycle use and riding behaviour; attitudes and perceptions of WA road users about motorcycling behaviours and challenges; awareness of motorcycle safety technology and related products; level of compliance to road rules; and interaction on the road between drivers and riders.

Method

The online survey was completed by 2,731 male and female motorcyclists (n=2,317) and drivers (n=424) aged over 18 from across WA. Age, gender and location sampling quotas were applied and data has been weighted to be representative of the WA population.

Results and Discussion

A number of initiatives to improve the safety of motorcyclists were identified from responses on the topic of type of vehicle, usage, protective gear and equipment, vehicle safety features, crash and near miss history and post-license training.

Clarification of laws and sharing the road

Clarification of the law in relation to motorcyclist’s lane splitting and lane filtering was identified by both motorcyclists (72%) and drivers (63%) as an important initiative in improving the safety of motorcyclists.

Approximately 6 per cent of surveyed motorcyclists reported having been involved in at least one crash and more than half (55 per cent) reported having had at least one “near miss” in the previous 12 months.

Motorcycle safety features

The absence of safety features on many motorcycles in WA may be an obstacle to improving the safety of motorcyclists; ABS and Traction Control are fitted to only 43% and 18% respectively and 20% of WA motorcycles have no safety features fitted at all.

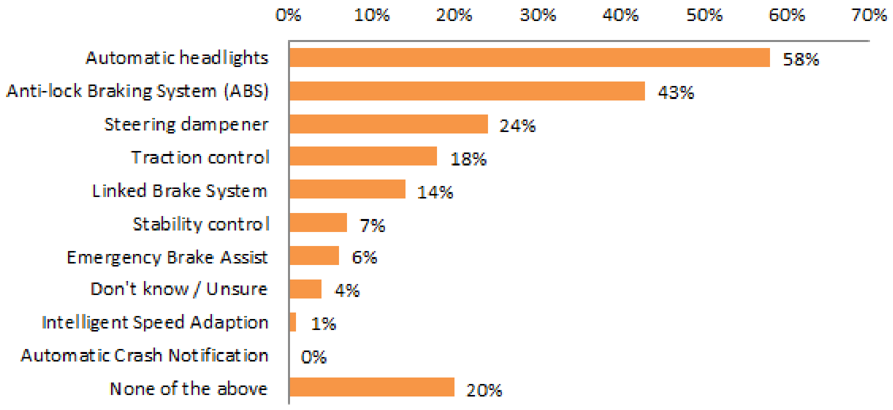

Figure 1. Proportion of WA motorcycles fitted with safety features

Star rating system for motorcycle specific clothing

Most riders indicated that their purchases of motorcycle specific clothing would be governed by a safety rating system. The introduction of a star rating system for helmets and protective clothing would allow motorcyclists to make the safest possible choices.

Road maintenance and design

Almost half of motorcyclists surveyed (47%) consider the design and condition of the roads they use to be the single greatest threat to their safety. Other road infrastructure related challenges included the presence of road debris (27%) and intersection design (19%). Consideration of motorcyclists in the design and maintenance of roads, intersections and surrounding infrastructure could reduce the risk of motorcyclist crashes occurring and their severity where they do occur (Austroads, 2016).

References

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PUTTING SAFE SYSTEM INTO PRACTICE – SAFE SYSTEM ROADSIDE DESIGN PRINCIPLES

Evan Coulson[a] and Daniel Cassar[a],

[a]VicRoads, Australia

Abstract

To support the rollout of Victoria's Towards Zero Strategy which looks to address lane departure accidents on 20 of its highest risk roads, VicRoads Network Design Services – Safe System Design Team, developed a design guideline for practitioners on the application of continuous barrier treatments based on existing hazard treatment principles with a number of evolutionally learnings along the way. Practitioner/Policy Focused.

Background

"Towards Zero - Safe System Roadside Design Principles for High Speed Divided Roads" May 2017 was developed to support a massive program in Victoria to install approximately 2,000km of flexible barrier (comprising of Wire Rope Safety Barrier and Flexible Weak Post Guard Fence) to reduce lane departure crashes resulting in fatal and serious injury accidents.

The purpose of the document is to ensure an effective and consistent approach towards the application of continuous safety barrier on selected M-Class and A-Class roads, as part of the *Towards Zero – Continuous Safety Barrier* program. This document incorporates current guidelines & practices, in conjunction with the Safe System principles and Towards Zero vision, to provide design principles that are cost effective and prioritise life & health to minimise fatal and serious injuries as far as practicable.

These design principles will assist practitioners with:

• ensuring our roadside transitions towards a Safe System and vision of zero deaths and serious injuries.

• designing safety barriers to maximise safety benefits and achieve a safe system solution in consideration of current guidelines and practices.

• ensuring that the design and application of continuous safety barrier is consistent and effective across the entire program.

This document is currently intended for M-Class and A-Class roads as these roads often serve the function of connecting capital cities and major provincial centres, and linking major centres of production with Victoria's export terminals; hence a typical road function and characteristic can be assumed, such as the road stereotype, high operating speed, sealed shoulders and minimal access points, etc.

While continuous roadside barrier is considered an effective treatment for all high speed roadsides, including B-Class and C-Class, it is recognised that these road types/functions often have unique features or are more constrained, and will require solutions that address context and may be different.

The document is currently undergoing its second revision, with a number of learning's prevalent including emergency service access to the roadside, maintenance and changing the use of the road being treated such that provision can be made for those wishing to pull over adjacent to the barrier and traffic.

The document also challenges previous standard practices as we look to reduce costs in order to protect more roadsides and spread both our available funding and coverage of these types of crashes further.

If successful this abstract is proposed to be a presentation, where copies of the document will be made available to attendees.

Figure 1. VicRoads - Safe System Roadside Design Principles for High Speed Divided

References

Towards Zero
Safe System Roadside Design Principles for High Speed Divided Roads
Version: Draft 1.4 Tue, 23 May 2017

PUTTING SAFE SYSTEM INTO PRACTICE – RAISED SAFETY PLATFORM GUIDELINES

Evan Coulson[a] and Daniel Cassar[a]

[a]VicRoads, Australia

Abstract

To support the rollout of Victoria's Towards Zero Strategy which looks to address intersection and midblock crashes, VicRoads – Network Design Services – Safe System Design team developed a technical guideline for design practitioners on the application of these treatments. We took learnings from sites both within Australia and abroad and considered the limited research available to formulate criteria and design guidance and considerations for practitioners around various aspects of the treatments. The plan is to take the audience via presentation through the development experience and evolution of the guideline document as well as some of the learnings and amendments currently underway to improve it. Practitioner/Policy Focused.

Background

"Road Design Note 03-07 – Raised Safety Platforms" July 2017 aim is to provide practitioners with the information they need to translate the principles behind these treatments into practice and design appropriate treatments.

Raised Safety Platforms (RSPs) are speed management treatments used at intersections of midb lock and are capable of reducing the maximum comfortable operating speed for a vehicle, and lowering the overall speed of vehicles closer to a Safe System collision speed.

RSPs may be designed for a range of vehicle speeds and types. Design speeds ≤ 50km/h are encouraged to reduce the side-impact severity for a vehicle to a survivable level, i.e. a Safe System collision speed. Design speeds ≤ 30km/h are encouraged to reduce the severity of any pedestrian related crashes to a survivable level.

The implementation of RSPs should include supporting treatments to achieve the desired outcome.

When installing RSPs at intersections, the entire intersection can be raised with approach and departure ramps. RSPs can also be placed on the approach to an intersection (sometimes referred to as raised stop bars) in order to achieve a similar outcome.

On local roads and low speed arterial roads, RSPs can be installed in mid block locations as a traffic calming device or to improve safety at pedestrian crossings.

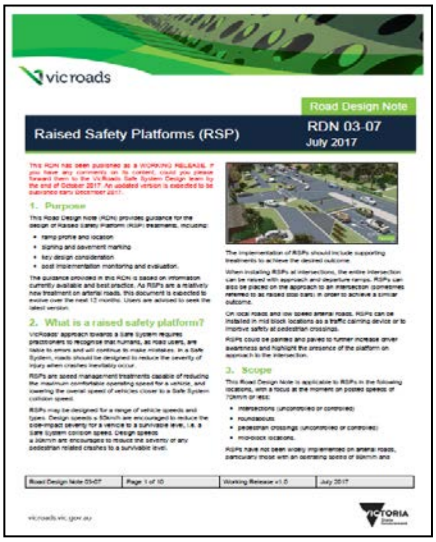
RSPs could be painted and paved to further increase driver awareness and highlight the presence of the platform on approach to the intersection.

This Road Design Note (RDN) provides guidance for the design of Raised Safety Platform (RSP) treatments, including:

- ramp profile and location
- signing and pavement marking
- key design considerations
- post implementation monitoring and evaluation.

The guidance provided in this RDN is based on information currently available and best practice. As RSPs are a relatively new treatment on arterial roads, this document is expected to evolve over the next 12 months. Users are advised to seek the latest version.

If successful this abstract is proposed to be a presentation, where copies of the document will be made available to attendees.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Road Design Note

Raised Safety Platforms (RSP)

RDN 03-07

July 2017

1. Purpose

2. What is a raised safety platform?

3. Scope

Figure 1. VicRoads – Road Design Note 03-07 – Raised Safety Platforms

References

Road Design Note 03-07 Raised Safety Platforms
Version1.0 : July 2017

Understanding And Improving The Performance Of A Public Domain Guard Fence System

Evan Coulson[a] and Daniel Cassar[a],

[a]VicRoads, Australia

Abstract

For over 30 years Australian State Road Authorities have been using public domain guard fence systems as the primary roadside barrier on their networks. As crash testing standards have evolved and improved over time very little has been done to understand the performance of these systems and to look for improvements, particularly as we all have 1000s of kms already installed on our network and as better systems have been developed by industry. This abstract proposes to take those interested through the journey VicRoads has taken to understand the performance of its public domain guard fence system and look to improve it. Research Focused.

Background

The development of Public Domain Guard Fence systems in Australia was undertaken well over 40 years ago to emulate work done in the United States. The Victorian public domain guard fence system known as ”Type B”, was developed through engineering analysis based on the G4 US system at the time and modified to reflect manufacturing practices here in Australia. Up until 2015 and in accordance with AS3845:1999 the system was ”deemed to comply” with the American crash test standard NCHRP350 meaning it didn’t need full scale crash testing to verify its performance and could rely on both engineering analysis and infield service performance. Over almost 30 years, minor changes have been made to some of the componentry to reflect practice in the US, with a major change being made 3 years ago to increase the height of the rail from 706mm to 740mm to improve its capacity for a growing vehicle fleet.

In 2015, AS3845 was revised where ”deemed to comply” systems were no longer recognised and road safety barriers could be crash tested against NCHRP350 or MASH to demonstrate their fitness for purpose, with a preference towards MASH - 2016, the more recent test standard.

VicRoads in 2018 undertook both R&D and Compliance Crash testing to MASH to understand whether the system developed over 40 years ago met with current standard AS3845:2015.

The main objective of this project was to understand the performance of the Type B system given the 1000s of legacy kms of Type B guard fence on our network and to understand if any low cost retrofit improvements in both performance and resultant occupant injury could be made to the system for a future retrofit program.

A low cost retrofit solution would not only mean upgrading existing Type B was economically viable for a future retrofit program, as opposed to complete removal and replacement, but that the crash performance (Crash Reduction Factor) could be improved reducing the severity of injuries for occupants whose vehicles depart the road and impact the barrier, ie making it more forgiving

If successful this abstract is proposed to be a presentation with crash test videos shown to attendees.

Child Road Safety in Bangkok: implementing local measures whilst advancing international awareness and collaboration

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[a]Rotary Club Matilda Bay (Australia), [b]Rotary Club Srapathum (Thailand),

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Abstract

If child road accidents are to be eliminated, opportunities for collective local actions need to be greatly increased. This paper reports on the preparation and development of the first Road Safety project benefiting from a Rotary Global Grant. Data for the exercise was collected in-situ and analyses were carried out to assess the impact of the measures. The study aimed at providing helmets for children in two schools in Bangkok and contributing to reshaping road users' behaviours. Furthermore, this (mostly) Australasian multi-partner collaboration changed policies at international level which have the potential to improve Road Safety worldwide.

Introduction

Thailand has the second highest road traffic fatality rate in the world (36.2 deaths per 100,000 population[1]) of which over 70%[1] are motorcycle riders. Of the 1.3 million daily child motorcycle passengers only 7%[2] wear helmets.

Rotary[3] is a global network of 1.2 million people who take local, regional and global action to create lasting change. Rotary has vast experience in tackling persistent world issues but Road Safety (RS) has not yet been a systematic priority. In 2015, Rotary Clubs of Matilda Bay (Australia) and Srapathum (Thailand) chose to look for opportunities to improve child RS in Bangkok, ultimately leading to change in Rotary International (RI) policies.

School based Child Helmet Program

Rotary Clubs (RCs) of Matilda Bay and Srapathum selected a school based Child Helmet Program. This methodology, designed and implemented by AIPFoundation, has various phases: (1) RS training, (2) helmets provision, (3) monitoring and reporting and (4) dissemination of results. Schools are chosen based on criteria of risk exposure and lack of RS awareness. Further surveys are performed for assessment purposes.

Prathom Taveetha Pisek School

In 2015, the Australian Road Research Board (ARRB) in partnership with both RCs (benefitting from a Rotary District Grant) supported the Child Helmet Program. It was carried out at Prathom School which has 729 children and 49 teachers. Rotary participation consisted of funding (roughly 30% of USD13,300 project), attendance at the Helmet Provision Ceremony and dissemination of the project. This smaller yet successful collaboration paved the way for a subsequent project.

Wat Rachasingkorn School

Building upon the previous collaboration, Rotary and ARRB are funding the Wat Rachasingkorn School project (2018), expanding its scope by:

- increasing the number of partners to 17, and their geographical coverage; for a $44,000USD project (70% are Rotary contributions);
- successful application to a Rotary Global Grant, leading to the establishment of RS as a new Focus Area within RI; and
- complementing data analysis, by University NOVA (Portugal).

Conclusions

This Abstract summarises the approach adopted by RCs of Matilda Bay and Srapathum to help increasing child helmet usage in Bangkok. It outlines the Child Helmet Program's most relevant characteristics and describes project implementation in two primary schools. Analyses show: (1) around 60% increase in helmet usage, (2) several potentially fatal accidents were avoided and (3) 100% of teachers stated confidence to explain RS thereafter. Results indicate it will be helpful to replicate RS child educational programs in other regions, increase parents training and refine assessments.

The Rotary strategy impacted international policy much beyond initial expectations because attracted widespread international partnerships and led to the inclusion of RS within RI Focus Areas.

This work demonstrates the potential of broadening (international and community) participation to pursue defined international RS policies[4,6] through the implementation of local projects benefiting from established knowledge, leveraging tested methodologies and using limited resources. The work exemplifies how new paths can, in turn, lead to a change in global policies (in this case RI) potentially impacting a multitude of communities across the world.

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The Relevance of Australasian Road Safety Strategies in a Future Context

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Abstract

The improvements to road safety since the 1970's are becoming increasingly difficult to sustain in many developed countries. This paper analyses ten Australasian Government road safety strategies against three key criteria: 1. a comprehensive framework for road safety, 2. anticipated changes to transport and the economy, and 3. the changing and variable nature of future transport and its context. The analysis concludes that current Australasian road safety strategies are weak in some areas of content and do not address future challenges. Improvements are suggested to the strategies' thoroughness and robustness.

Background

Road deaths in Australasia have reduced since the peak in the early 1970's. Yet, over the last few years, the long term declines have lessened, and become increasingly difficult to maintain (OECD/ITF, 2016). This phenomena is not isolated, but is being observed in many developed countries and raises many questions; firstly, as to why it is occurring. Secondly, how can road safety management continue to improve road safety, especially in times of rapid contextual change? In addition, road safety in Australia has not improved at the same rate as the most successful countries internationally. The 'Safe Systems' basis of current Australasian road safety strategies is more than 10 years old, but the underlying policy tools and parts of the system they are applied to are at least 80 years old. Thorough application of systems approaches is not yet realized (Peden etal., 2004).

Methods

This paper describes the assessment of current road safety strategies in Australia against three key criteria. The first is against the seven elements of a newly developed comprehensive framework for road safety management based on systems theory and practice (Chapanis, 1996; Hughes, 2017). The second criterion is the main changes to transport and the economy that are likely to affect the context of road safety (EU, 2016;NTC, 2016). The third criterion is the changing and variable nature of future transport and the economy (Rasmussen, 1997; Bennett & Lemoine, 2014; Hughes, 2017). A five point scale is used for assessment of the extent to which the strategies reflect the three key criteria.

Results

The analysis found that current road safety strategies were strong on some elements of best practice but weak on many, while some elements were missing almost entirely. The strategies did not reflect the anticipated future changes to transport and the economy, or the changing and variable nature of future conditions.

Conclusions

The study concludes that Australasian road safety strategies should be developed more thoroughly and could be designed to more robustly respond to future changes in transport and economic contexts. Suggestions are made to improve Australasian road safety strategies so that they are more likely to be successful and more applicable to the future than the current versions.

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Driving Ability and Transportation Needs of Elderly Drivers: A Prospective from Emergency Department Elderly Patients

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Abstract

The number of Canadians over 65 is growing faster than anticipated. Since older adults live independently longer and stay more active, many will continue to depend on driving to meet their transportation needs. Older drivers are mostly safe drivers; however, with advancing age, many older adults develop medical conditions that affect their driving ability and often lead to driving cessation. Often these medical conditions are first recognized in emergency department (ED) when patients present with an acute illness or injury. We proposed to interview elderly drivers who attend the ED to examine their driving ability and transportation needs.

Background

For most healthy older adults, driving is important to meet their mobility needs and quality of life. Driving however is a complex task requiring a combination of perceptual, cognitive and motor skills (Mathias & Lucas, 2009; Reger, Welsh, Watson, Cholerton, Baker & Craft, 2004). As people age, many will experience some decline in these skills due to medical conditions. When this decline reaches a critical point, the individual is deemed unfit to drive. Most elderly drivers are safe drivers despite some functional decline because of self-regulation such as avoiding nighttime driving. However, as these medical conditions progress, driving fitness should be evaluated. The emergency department (ED) is often the first place that older patients visit when they develop acute manifestation of underlining medical conditions. In this study we examined the driving status and transportation needs of ED elderly drivers.

Methods

In this prospective cohort study, we collected data on a convenience sample of 92 patients aged ≥ 70 years who were treated in the Vancouver General Hospital ED, an urban tertiary centre in Vancouver, Canada, between August and September 2017. We included patients who live independently and are current drivers defined as those who drove at least once in past 4 weeks. Data came from questionnaires which asked about driving status and transportation needs, medical record review, and driving fitness screening tests including Trail Making Test B (TMTB), Mini-Mental State Examination (MMSE), and ruler drop reaction time (Dickerson 2014; Wilson & Pinner 2013).

Results

A total of 132 elderly patients met the inclusion criteria and 92 (70% response rate; 57 males and 35 females) agreed to participate. The average age was 79.1 ranging from 70 to 95 years old. The majority (n=86, 93.5%) own a vehicle and 55 (60%) drove daily or almost daily. Twenty drivers (22 %) had considered giving up driving but few had discussed their driving with family members (15/92, 16.3%) or family doctor (6/92, 6.5%). When asked about public transportation, 31 respondents had never taken public transit in past year. Most (89%) knew about transportation services for seniors but only 11 had used those services in past year. Many cited convenience as the main reason for their preference of transportation.

Sixty eight drivers also agreed to take the driving fitness screening tests. Approximately 10 drivers failed the TMTB test (requiring >181 seconds), none scored below 17 (indicting severe cognitive impairment) in MMSE and 14 drivers had a reaction time over 0.248 second (indicating reaction time deficiency) in ruler drop test.

Medical chart review showed that at least 16 patients were diagnosed at discharge with medical conditions such as cardiac diseases which are known to be associated with higher crash risk. Fifteen drivers were prescribed with medications such as sleep aids and antidepressants that may affect their driving skill.

Conclusions

Many current elderly drivers drive and will continue to drive despite having medical conditions that potentially affect their driving fitness. Simple screening tools may be helpful to target potentially unfit drivers for interventions in the ED.

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Victorian Road Safety Pilot Data Linkage: Match Rates and Serious Injury Metrics sustained in on road transport crashes

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Abstract

A Victorian pilot project merging hospital, police and TAC data for one year was established. The dataset includes 68,639 cases of transport/road-related injury; 62% of which were from an on-road crash. Dataset linkage rates of cases showed 33% were police-reported crashes with no hospital data link; 10% were police-reported with a hospital admission; 10% were police-reported linked to an emergency only presentation and 45% had hospital data with no link to a police report. 14% of cases had MAIS2+ injury levels accounting for more than 81% of the total burden of injury.

Background

Following the Victorian Parliamentary Road Safety Committee Inquiry into Serious Injury, a Technical Working Group was established to investigate how injuries can be better understood and injury data can be better used in Victoria.

A part of this work was to pilot the creation of a data file that merged hospital, police and Transport Accident Commission (TAC) data. One main aim of the linkage project was to understand what hospital data can add to the picture of road trauma in Victoria.

Linkage rates and injury metrics were investigated. Linkage rates are vital to identify gaps in the scope of current road safety data used for policy setting and crash prevention measures. The linkage rate section focuses on police-reported records.

Method

The Victorian Data Linkages Unit linked a file of police-reported crash data (already linked where possible to TAC claims) for 2014/2015 to hospital admission and emergency presentation cases identified as transport or road-related[1]. In total 68,639 cases were found where a person was injured in a transport or road-related incident. Of these, 42,588 were classified as emerging from an on-road crash.

Monash University Accident Research Centre calculated injury metrics for hospital admissions:

- MAIS (Maximum Abbreviated Injury Score) - calculated by mapping ICD-10-AM
- ICISS (International Classification of Disease Injury Severity Score) - calculated from ICD-10-AM codes
- YLD (Years Lived with a Disability) - a burden of injury measure

Results

There were 34,858 police-reported cases, 5,141 were by police definition, serious (reported by police to be admitted to hospital), 12,701 as other injury and 16,756 as non-injury (Table 1).

Of the police-reported serious injury cases, 75.7% were linked to a hospital admission. Of the 24% police-reported serious injury cases, 10.7% were linked to an emergency only presentation and 13.6%

[1] The specific datasets linked were the DHHS Victorian Admitted Episodes Dataset and Victorian Emergency Minimum Dataset; Victoria Police Traffic Incident System data and the Transport Accident Commission claims data.

not linking to an admission or emergency presentation. Also, an additional 2,579 admissions were linked to police cases reported as not admitted (other or non-injury) [2]. By police definition, the number of serious injuries was therefore under reported by 1,330 serious injuries and was actually 6,471 for this period. The linked dataset showed that cyclists and motorcyclists were the road users most under-reported in police data.

Table 1. Relationship between Police-reported hospital admissions and DHHS admissions

Police Injury	On VAED	Not on VAED, On VEMD	Not on VEAD or VEMD	Total
Serious	3,892	698*	551*	5,141
Other	2,172	4,663	5,866	12,701
Non-injury	407	1,338	15,011	16,756
Grand Total	**6,519**	**6,725**	**21,614**	**34,858**

* Misclassified by Police as serious, as not admitted to hospital, *n=1,249*.

Analysis based on Dutch (Polinder et al. 2015) research investigated the influence of different severity cut off points on the proportion and numbers of corresponding YLD's. Figure 1 shows the proportions of various MAIS cut off points per YLD for admitted cases. Admitted cases with a MAIS2+ injury made up 14% of the dataset and more than 81% of the total YLD. Admitted cases with a MAIS3+ injury made up 3% of the dataset and over 43% of the total YLD.

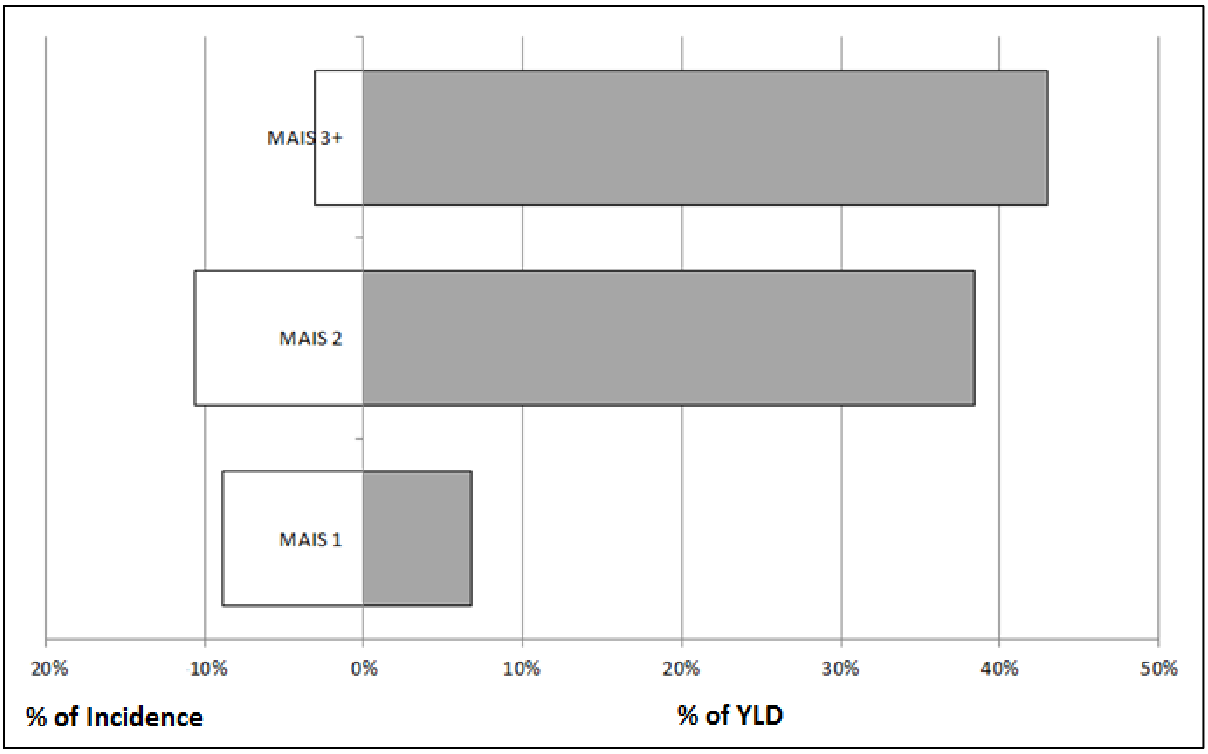

Figure 1. Incidence and YLD of admitted cases

Conclusions

The linked dataset provided valuable insights into current under-reporting. The linked dataset has enabled the development of an alternative definition of serious injury for road accidents in Victoria. This highlights the importance of producing an ongoing linked dataset containing additional injury measures.

[2] These records were misclassified by Police as other or non-injury.

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Cycle-Aware: Preparing novice drivers to interact safely with cyclists

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Abstract

Improving infrastructure and educating drivers and cyclists are two responses to cyclist safety. This paper reports on stage one of *Cycle-Aware*, a three year study targeting novice driver education and training. The content analysis of education and training materials revealed limited and inconsistent advice on interacting with cyclists who are represented in neutral or negative terms while drivers are represented in positive terms. Many stakeholders interviewed were unsure of what advice to offer novice drivers beyond 'sharing the road'. Some recommended education on cyclist vulnerability, the rationale for cyclist-related road rules, contextualizing cyclist behaviours, and specific guidance on common interactions.

Background

Concerns about safety present a major barrier to cycling for transport. Improving infrastructure is one response while educating drivers and cyclists is another. *Cycle-Aware* is a three year project targeting novice driver education and training. This paper reports on stage one which gathered information about current and possible future novice driver education and training. Stage two will compare cyclist crashes involving novice and experienced drivers. The final stage involves developing and testing a cyclist-related module for novice drivers.

Method

Qualitative content analysis was used to interrogate government novice driver education and training materials. It examined the extent and nature of cyclist-related advice and contrasted the representation of drivers and cyclists. Semi-structured interviews were conducted with representatives from departments of transport and/or road safety, motoring and cycling organizations, third party insurers and driver training associations.

Results

Analysis of driver education and training materials found that references to cycling or cyclists was limited. Advice given to novice drivers was inconsistent within jurisdictions and often inconsistent or contradictory across jurisdictions. For example, in New South Wales drivers are advised to sound their car horns to alert cyclists of their presence while in Queensland drivers are advised not to sound their horn because it may startle cyclists and cause them to fall. Jurisdictions vary on explaining cyclist behaviour and providing rationales for laws like minimum passing distances or filtering. Further, cyclists were represented almost exclusively in neutral or negative terms. Negative references included identifying cyclists as unpredictable, untrained, a danger, and a 'hazard'. Drivers were much more likely to be represented in positive terms.

Many stakeholders reported tensions between motorists and cyclists were caused by a lack of knowledge or compliance with the road rules by both drivers and cyclists. Importantly, motor vehicle registration was considered a key issue as some motorists believed cyclists did not have a right to use the roads because they did not pay registration. Many stakeholders were unsure of what advice to include in novice driver education and training beyond 'sharing the road'. Motoring and cycling organizations provided the most extensive and detailed recommendations on cyclist-related driver education and training. This advice included education on the vulnerability of cyclists, explaining the rationale for cyclist-related road rules, and contextualizing cyclist behaviours. They also recommended specific advice on common interactions such as overtaking, opening car doors, scanning appropriate areas of the road.

Conclusion

Lack of appropriate and consistent advice may undermine a driver's ability to interact safely with cyclists. Negative stereotypes of cyclists at the outset of a person's driving career may create or exacerbate on-road tensions between cyclists and drivers. Government authorized driver education and training materials lend the authority of government to the views in those materials. Consequently, the absence of cyclist-related advice and negative stereotypes support drivers who hold the view that cyclists are not important road users or that they are a problem on the road. It is important to ensure that novice driver education and training materials include consistent and neutral (or positive) advice on interacting with cyclists.

A safety assurance system for automated vehicles – addressing safety risks arising over the automated vehicle lifecycle

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Abstract

The presentation describes the National Transport Commission's (NTC) development of a safety assurance system for automated vehicles to ensure the road safety benefits of these vehicles are realised. The NTC is focusing on achieving policy reform to support the safe, commercial deployment and operation of automated vehicles in Australia. The presentation focuses on policy options to address safety risks associated with deploying automated vehicles, including an early indication of the optimal option based on cost benefit analysis. The presentation also considers how safety risks under illustrative scenarios arising over the automated vehicle's lifecycle may be addressed under each option.

Overview of the Safety Assurance System policy reform

The presentation will:

- explain that the safety assurance system is a process that incorporates technical, human performance and environmental elements to ensure automated driving systems operate safely on public roads
- briefly outline the three policy reform phases.

Phase 1 – High-level design (completed)

In November 2017, transport ministers agreed to a high-level direction for government regulation of automated vehicle safety. The development of a safety assurance system based on mandatory self-certification in a transitional period was approved subject to a Regulation Impact Statement (RIS).

The recommendation was made following extensive consultation with stakeholders on four regulatory models: continue current approach; self-certification; pre-market approval; accreditation.

Phase 2 – Detailed consideration of policy and implementation options (currently underway)

The RIS focuses on the cost benefit analysis of policy options to address safety risks associated with deploying automated vehicles. The presentation will provide an overview of the baseline counterfactual without a safety assurance system, and three reform options. All three reform options focus on mandatory self-certification, with different levels of regulatory oversight: administrative (option 2); legislative (option 3); legislative with a primary safety duty (option 4).

Phase 3 – Implementation (next steps)

It is not proposed that the presentation will discuss the reform implementation phase as detailed consideration of policy and implementation options will not have been completed.

Overview of the cost benefit analysis in the RIS

The presentation will outline the cost benefit analysis methodology and how the cost benefit analysis has been undertaken for each policy option in the consultation RIS. Analysis of the costs and benefits of automated vehicle regulation has not previously been conducted in Australia and little work in this area has been done internationally.

Stakeholder feedback on the consultation RIS will be described.

Assessing the RIS policy options against illustrative scenarios

The presentation will consider a number of illustrative scenarios to highlight a broad range of safety risks that could arise over the lifecycle of an automated vehicle. The presentation will focus on four key stages: importation/manufacturing, modification/roadworthiness, on-road operation and vehicle disposal/end of life. The ability of each policy option to address the risk raised by each scenario will be considered and explained.

The presentation does not propose to cover every scenario and safety risk that could arise following the deployment of automated vehicles. Rather, the presentation will illustrate the safety gaps that are filled (or that remain) depending on the particular policy option chosen. In doing so, the presentation will highlight the safety benefit element of the cost benefit analysis.

Conclusion

The presentation will conclude that each additional level of regulatory oversight (moving from the baseline counterfactual to a legislative approach with a primary safety duty) fills a particular safety gap that a previous option is unable to address. However, the cost benefit analysis highlights that an incremental increase in safety could be associated with an increase in cost. The presentation will provide an early indication of the optimal policy option that provides the greatest safety benefit commensurate to cost.

The final RIS will provide the settled view on which option most appropriately balances costs and benefits, and should be adopted moving into the reform implementation phase.

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Designing Road Tunnels to Optimise User Experience and Safety: A User-Centred Approach

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Abstract

User-centred design puts user needs and requirements at the center of product design and development. This paper outlines an approach used to define road user needs to optimise the customer experience and safety in Sydney road tunnels. This involved a literature review, focus groups and a self-reported online survey to obtain information regarding what drivers/riders do and do not like about driving in tunnels, and what they perceive they need and would like to see in future tunnels. Six focus group discussions, and three separate interviews, were conducted with Sydney tunnel users. Five hundred respondents completed the survey. This paper describes the study aims, methods and findings.

Background

The Sydney Orbital Network includes over 160 kilometres of surface roads, tunnels, bridges and underpasses. The Sydney Orbital Network currently includes five main tunnels along the network and additional tunnels are being planned or are under construction. The customer experience and safety as users drive through tunnels are becoming increasingly important, as the future tunnel system will become longer and more inter-connected, and users will spend more time travelling within the tunnel network. The aim of this study is to undertake human factors research activities that will, collectively, provide a scientific framework for the collection of data on user behaviour and requirements that supports user-centred design and evaluation of Sydney tunnels to optimise customer experience and safety in tunnels. The project is being overseen by a project stakeholder group which includes members from government and industry with expertise in project development and delivery, human factors, road safety and road tunnel operations.

Methodology

The methodology used to identify user requirements for tunnel design is described in Table 1.

Table 1. Methodology for the identification of user requirements for tunnel design

Step no.	Description	Tasks
1	Literature review and expert consultation	i. A targeted review of local and international literature was conducted. ii. Targeted consultations with four international road tunnel human factors experts were conducted.
2	Qualitative study	Six focus group discussions, and three separate interviews, with Sydney tunnel users were conducted. A discussion guide was used to structure the discussions. Participants provided relevant demographic details and were asked 19 questions relating to tunnel use, requirements, driving/riding behaviour, likes and dislikes, design features (in Sydney and overseas tunnels), difficulties, and safety.

		The focus groups included car/SUV drivers, motorcycle riders and a seperate group of elderly car/SUV drivers. The three interviews involved truck drivers. Focus group and interview participants (n = 47; 18 females, 29 males) were aged 18 to 73 years, travelled through Sydney tunnels on a regular or irregular basis, and resided in Sydney.
3	Quantitative study	Data from a large-scale survey (n=500; equal numbers of males and females; aged 18 – 80 years) are currently being collected. The survey contained 24 questions relating to the same issues explored in the focus groups.

Results and Discussion

Literature review

A thorough literature search revealed 49 relevant documents. Driver behaviour in, or adjacent to, a tunnel has been investigated in previous studies (Calvi & De Blasiis, 2011) and findings from them are discussed in the paper. Literature was also found and was reviewed on the impact of different tunnel design features on driver behaviour including entry/exit (Patten & Ceci, 2015), lighting (Domenichini, La Torre, Vangi, Virga & Branzi, 2017; Patten and Mårdh, 2013), tunnel walls (Kircher & Lundkvist, 2011), signs and markings (Upchurch, Fisher, Carpenter & Dutta, 2002), tunnel length (Amundsen, 1994) and communication with tunnel users (Mühlberger et al., 2015). The literature search revealed a number of documents that provide design guidance for optimising tunnel safety (Austroads, 2016; World Road Association, n.d.). These were reviewed, and recommendations made for optimising safety. The paper documents also the outcomes of consultations with four international experts in human factors and tunnel design.

Focus groups

The focus group discussions were audio recorded and transcribed. The findings were divided into three categories (customer experience, feedback on tunnel design features, and safety) which encompassed responses to all of the questions asked in each focus group. The following are some key findings relating to user perceptions of safety in tunnels:

- Most participants from all groups reported that they feel less safe while driving through tunnels and one of the most commonly reported reasons was no or limited room for error.
- Many focus group participants reported tunnel illuminance levels to be either too bright or too dark. While elderly drivers felt lighting in tunnels was too bright, participants of other groups felt that tunnels were too dark and required brighter lighting.
- Participants from all groups reported that they had no clear idea about what to do if there was an emergency incident in a tunnel.

Other key findings relating to user safety, experience in tunnels and feedback on some novel tunnel design features implemented overseas will be reported in the paper.

Survey

At the time this abstract was written 353 participants, aged 18 – 80 years, had completed the survey. The survey will yield a much larger database of information than the focus groups about what tunnel users think they might need and would like to see in future tunnels. Statistical analyses will be undertaken to explore whether there are significant differences in responses between different tunnel users, by user group (e.g. car/SUV, motorcycle riders), age, gender and regularity of tunnel use. The findings will be reported in the paper.

Conclusions

User-centred design of the road transport system puts user needs and requirements at the center of the product design and development process, ensuring that the design of the system takes into account human capabilities, limitations and needs. To our knowledge, consultation with end users to inform tunnel design to enhance customer experience and safety in road tunnels is novel in the road safety space. The research findings presented in this paper will also inform development of a Human Factors Integration Framework (HFIF). The framework can be used to audit, from a user-centred perspective, new tunnel designs – before and after implementation – to ensure that they optimise the customer experience and safety. It can also be used to inform tunnel-related community education programs.

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Exploring Local Government Challenges in Effective Road Safety Delivery

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Abstract

Half of all vehicle kilometres travelled and 62% of all deaths and serious injuries in New Zealand occur on local government roads. The upward trend in road trauma has revealed a growing disparity in safety performance between locally and centrally managed roads. The increasing gap, which is mirrored by differing levels of investment, was the stimulus behind a national project to understand the dynamics of local government road safety delivery and investment. Engagement workshops with local councils throughout New Zealand uncovered an array of common challenges – some of which were not anticipated when the project commenced.

Background

While the vehicle kilometres travelled on the State Highway network is similar to local government roads; the number of people being fatally and seriously injured on local government roads is much higher (62%). The trend is one of growing disparity, with safety performance on local government roads deteriorating faster than on State Highways. In part this can be explained by the growing gap between road safety expenditure on State Highways compared to local government roads.

To understand why safety performance on local government roads is lagging behind and why investment is static or falling, the New Zealand Transport Agency (the Agency) developed an indicative nationwide programme of works highlighting locations where infrastructure investment could significantly reduce DSi on local government roads. That project showed an $800 million investment could yield an annual reduction of 169 DSi per year.

The Agency then commissioned a follow-up study to understand the alignment between proposed local government investment and the $800 million programme. That study included a series of workshops with a range of local councils to understand any differences between local programmes and the $800 million programme, and also to identify any internal and external factors that are challenges to the effective delivery of road safety and ultimately better road safety outcomes.

Key Workshop Themes

The workshops revealed that local government staff tasked with delivering improved road safety outcomes are not only highly motivated and committed, but also have a strong appreciation of internal and external factors that are inhibiting them from being more effective. The challenges faced by local government were discussed openly and frankly, and covered a broad spectrum of operational, funding, policy, political, legislative and industry matters. The key themes arising from the workshops are presented in Table 1.

Next Steps

Having collated the key themes, the Agency is now identifying how it can assist local government overcome the key challenges they face. The paper covers the steps the Agency is taking to break down the barriers to effective local government road safety delivery. The lessons learnt from this exercise are expected to be applicable throughout Australasia and therefore be of interest to everyone involved in the delivery of local government road safety programmes.

Table 1. Key Themes Raised during Local Government Workshops

Issue	Description
Funding	Increasing the Funding Assistance Rate (FAR) would encourage local government to do more.
Capacity	Most local governments are not adequately resourced to deliver effective road safety programmes.
Stakeholder Support	National leadership is required to support local government with the implementation of measures that can be seen as unpopular.
Access to Information	Local government noted gaps in data required for decision-making and also lacked awareness about where to access information.
Industry Training	Local government noted a lack of ongoing training and development of people in the road safety area.
Programme Development	Local government struggle with aspects of programme development, including composition, internal priorities and justification.
Enforcement	Local government want a widescale rollout of red-light and speed camera enforcement technology to support road safety efforts.

An evaluation of the roadworthiness of Victorian buses

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Abstract

As part of a project investigating the relationship between bus roadworthiness and safety outcomes, this study examined annual inspection results to identify the incidence and characteristics of mechanical failures. The findings showed that about one in five buses had issues that may have compromised safety, with Body & Chassis and Steering & Suspension comprising the highest incidence of defects. Registered buses were much less roadworthy than accredited ones. Vehicle age was found to be an important influential factor, with the effect varying across operation type. The implications of the findings in enhancing bus roadworthiness and safety were discussed.

Background

During the past three years in Victoria, there have been about 100 mechanical failure-induced incidents, including bus fire, brake failure, wheel dislodgment, etc., bringing about not only injuries and property loss, but also concerns about the roadworthiness of the Victorian bus fleet. Victorian buses, like those in other Australian states, are mandated to undergo safety inspections at least on an annual basis. This paper aims to achieve a comprehensive understanding of the roadworthy characteristics of Victorian buses by examining the annual inspection results.

Method

Annual inspection results of Victorian buses for the period from 1 Jul 2014 to 30 Jun 2017 were examined. Each observation assessed operational, vehicle characteristics, the inspection result (pass or fail) for each of the fourteen vehicle components and overall roadworthiness. Only first inspections were included to ensure accuracy (Peck, Scott Matthews, Fischbeck, & Hendrickson, 2015) and the finalised dataset comprised 21,675 observations involving 9,265 vehicles.

Results

Table 1 illustrates overall roadworthiness and the contribution that each component made to bus unroadworthiness with the similarities and differences between accredited and registered buses being outlined.

During the three years, nearly one-quarter (22.6%) of buses failed their first inspections, among which about four fifths (81.0%=18.3%/22.6%) failed on at least one safety critical component (as defined by Transport Safety Victoria), implying that about one in five buses was operating with issues that might compromise safety.

A further distinction was made between accredited (vehicles with more than 12 seats (driver included) and providing commercial/local service) and registered (vehicles with between 10 and 12 seats or not providing commercial/local service) buses and there was an obvious contrast with the latter being more than twice more likely to fail the annual inspection than the former.

Among safety critical components, Body & Chassis and Steering & Suspension were most defective for both while registered buses had a much higher failure rate on Wheels & Tyres and Seats & Seatbelts.

Table 1. Inspection failure rate* by operation type and vehicle component

		Overall	**Accredited**	**Registered**
Roadworthiness	Failure rate**	22.6	15.7	38.7
	Fail with at least one safety critical component**	18.3	13.7	29.0
Components of high safety risk (safety critical)	**Body Chassis**	7.3	**5.3**	**12.2**
	Steering Suspension	6.2	**5.6**	**7.5**
	Engine Driveline	4.5	3.9	5.9
	Seats & Seatbelts	5.1	**2.5**	***10.9***
	Wheels Tyres	3.0	**1.4**	***6.8***
	Brakes	3.7	3.1	4.9
	Brake performance	1.9	1.4	3.0
Components of medium safety risk	Lamps, signals, reflectors	6.6	4.9	10.5
	Windscreen Windows	2.0	1.5	3.0
	Windscreen Wipers Washers	2.1	1.1	4.4
	Parking brake	1.1	0.5	2.5
Components of low safety risk	Exhaust emission controls	1.5	1.2	2.1
	Other items	8.9	4.2	19.7
	Modifications	0.6	0.1	1.8

**All failure rates in the table were calculated based on the formula: number of inspections that fail the item/ number of inspections.*

***The sum of the failure rates of 14 components don't add up to the failure rate at the top and that of seven components of high safety risk don't add up to the top second because a vehicle may fail multiple components.*

Figure 1 demonstrates how inspection failure rates changed with vehicle age for accredited and registered buses, highlighting the different patterns of the two operation types. Generalised estimation equations confirmed that there was a significant effect of vehicle age on inspection outcome ($p<0.001$). For accredited vehicles, the failure rate increased gradually before vehicle reached 30, with vehicles over 30 years having a substantially higher failure rate than newer vehicles. However, for registered vehicles, there was a gap between vehicles younger and older than 10 years, with the roadworthy condition of vehicles older than 10 years deteriorating significantly.

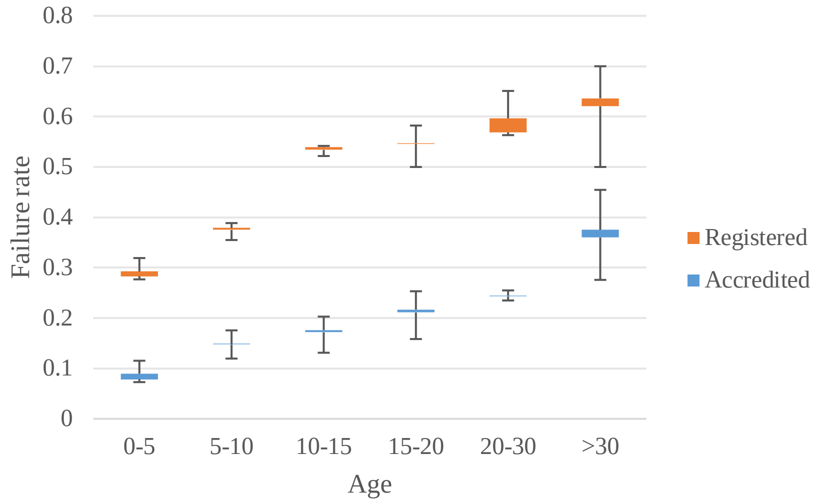

Figure 1. Failure rate by vehicle age and operation type (the values making the bars are min, mean, median and max failure rate over the three-year period)

Conclusions

This study illustrates the roadworthy characteristics of Victorian buses, identifies the influential factors of roadworthiness and revealed issues in need of urgent improvement, including rectifying the operation of registered buses, examining the maintenance of Body & Chassis and Steering & Suspension and targeting registered buses over 10 years and accredited buses over 30 years. In combination with a future case control study which compares the roadworthy characteristics of buses with and without mechanical failure-induced incidents, this study will provide safety regulators with opportunities to enhance bus roadworthiness and public safety.

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Zero 2050 in Victoria

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Abstract

Several countries and overseas jurisdictions have formulated ambitious road safety targets by setting a date for achieving Vision Zero. By targeting zero with a date for Victoria, much can be done in the next few years to prepare for the major challenges faced in moving close to zero. The aim of this paper is to map a road trauma elimination agenda to 2050 by outlining step changes and requirements of roads, vehicles and road users. A plausible zero scenario can be developed, but it will bring some major challenges including a clearer safety philosophy than what exists today.

Background

Several countries and overseas jurisdictions have formulated ambitious road safety targets by setting a date for achieving Vision Zero. The European Commission and the US have adopted a target, and a road map to achieve close to zero fatalities and severe injuries by 2050 (EC, 2011). There are several reasons for adopting these targets:

- **Intermediate targets placed in context.** Close to zero by 2050 translates into an approximate 50% reduction per decade.
- **Understanding what's at stake.** By setting zero with a date, we can estimate future trauma and hence quantify how many lives and severe injuries can be prevented.
- **A focus on the ultimate target.** While intermediate targets are helpful, they sometimes favour cost-effective, short-term solutions, leaving a substantial residual problem and, hence, the need for additional treatments in future.
- **The Safe System.** Something that was initially seen as utopia is today possible to envisage, at least on a conceptual level (Stigson, 2009). Our existing knowledge shows how roads, vehicles, speed limits and users can interact to form a safe system.
- **Ambitious targets drive policy, programs and innovation.** Targeting zero with a date enables a gap-analysis to be undertaken, based on the current state of the network, to identify the additional programs and innovation needed.

By targeting zero with a date for Victoria, much can be done in the next few years to prepare for the major challenges faced in moving close to zero. The aim of this paper is, therefore, to outline step changes required to achieve close to zero deaths and severe injuries by 2050. It maps the way forward, describing the predicted zero scenario in terms of vehicle safety development, road infrastructure upgrades, speed limit revisions and what is expected from the road user in a safe system.

Method

A back casting approach was used to: (1) develop a baseline with a 'business as usual' scenario, (2) define a safe system for Victoria in terms of requirements for roads, vehicles and road users, (3) investigate the gap between the current state and the safe system state and (4) quantify the contributions from infrastructure projects and speed limit revisions to achieve zero in 2050.

Results and conclusions

This paper maps the requirements of roads, vehicles and road users, and some necessary step changes to achieve close to zero fatalities and severe injuries by 2050 in Victoria. A plausible zero scenario can be developed, but it will bring some major challenges. Moving towards zero will require a clear safety philosophy where: (1) every new infrastructure project must align with safe system design principles, while also contribute to Victoria's economic and social prosperity, (2) movement will become a function of safety, whereby travel speed depends on how well energy can be managed and (3) innovation will be essential in overcoming problems with inadequate solutions today. Moving towards zero will require effective community engagement, and new economic models and planning frameworks, where safety is a fundamental, integrated element in the processes for achieving a sustainable transport system.

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The crash performance of seagull intersections and intersections with left turn slip lanes

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Abstract

Alternative intersection layouts may reduce traffic delays and/or improve road safety. Two alternatives are reviewed in this research: 'priority controlled Seagull intersections' and 'intersections with a Left Turn Slip Lane'. Seagull intersections are used on roads to reduce traffic delays. However, some do experience high crash rates. Left Turn Slip Lanes allow turning traffic to move clear of the through traffic before decelerating thereby reducing the risk for rear end crashes. Although there is debate about the safety problems that occur at Seagull intersections and Left Turn Slip Lanes there has been very little research to quantify the safety impact of different layouts. In this study, crash prediction models have been developed to quantify the effect of various Seagull intersection and Left Turn Slip Lane designs on the key crash types that occur at priority intersections.

Key Findings

- Larger rural and urban seagull intersections, especially those on four-lane roads and those with wide medians, have higher crash rates (per vehicle) than smaller seagull intersections;
- Distraction to the left of side-roads resulting from road features like parking and movement from nearby accesses/side-roads, and the operation of right turn bays, does increase right turn out versus through vehicle crashes at T-intersections;
- The design of left turn slip lanes, and especially where this restricts visibility to through vehicles, does increase the risk of right turn out versus through vehicle crashes at rural seagulls.

Note: The information in this Abstract is being presented at this 2018 Australasian Road Safety Conference (ACRS2018) being held in Sydney, NSW, Australia. The Abstract and Key Findings are being published in these ARSC2018 Proceedings. However, a full paper was submitted by the Authors, which underwent a peer-review process by three independent experts in the field. The full paper will only available be available in the Journal of the Australasian College of Road Safety.

How much space to vehicles provide when passing cyclists? The impact of vehicle type and road infrastructure

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Abstract

To reduce cyclist crashes and related injury, and improve the infrastructure provided to cyclists, there is a need to greater understand the distance vehicles provide when passing cyclists. To address this, we conducted an on-road observational study using a purpose-built device mounted on participants' bicycles. Sixty-three participants recorded 18,246 passing events, of which 6% were closer than one metre. Compared to roads with no marked bicycle lane and no parked cars, passing events in which the cyclist was riding in a marked bicycle lane next to parked cars resulted in passing distances that were 0.41m closer.

Background

Cycling-related injury rates are on the rise, with a more than doubling of the number of seriously injured cyclists in Victoria over a 9-year period (Beck et al. 2017). A large number of these on-road crashes involve interactions with motor vehicles (Teschke et al. 2012, Boufous et al. 2013, Yilmaz et al. 2013, Beck et al. 2016). In addition, motor vehicles driving too close to cyclists heightens subjective risk and creates a barrier to cycling participation (Heesch et al. 2011). In order to reduce cyclist crashes and related injury and inform the development of infrastructure that provides a safe environment for cyclists, there is a need to greater understand distances that vehicles provide when passing cyclists and the impact that road infrastructure has on this passing distance. This study aimed to quantify passing distance and assess whether passing distance is affected by specific types of road infrastructure.

Methods

An on-road observational study was conducted in Victoria. Victoria and the Northern Territory are the only Australian jurisdictions yet to amend the road rules to legislate a minimum passing distance. Volunteer participants, recruited using a convenience sample, recorded all cycling trips over a one to two-week period. Participants' bicycles were fitted with a purpose-built and independently calibrated device to measure lateral passing distance of all motor vehicles, a video camera and a GPS datalogger. For each passing event, road infrastructure (presence of marked on-road bicycle lane, intersection-related, etc) was classified using the Cycling Aspects of Austroads Guides (Austroads 2017) and the vehicle type was noted. Multi-level mixed-effects regression was used to investigate the effect of these factors on passing distance.

Results

Sixty-three participants recorded 18,246 passing events. Of these, 6% (n=1,084) were close passing events (closer than one metre). Results from the mixed-effects model demonstrated that factors associated with reduced passing distance included: the vehicle type being a taxi, four-wheel drive, or bus, relative to a sedan; passing events occurring in intersections, relative to mid-block; and the presence of a marked bicycle lane, relative to no bicycle lane. Specifically, compared to roads with no marked bicycle lane and no parked cars, passing events in which the cyclist was riding in a marked bicycle lane next to parked cars resulted in passing distances that were 0.41m closer.

Conclusions

These findings demonstrate that road infrastructure and design can have significant effects on passing distances. Globally, these data can be used to inform the selection and design of cycling-related infrastructure with the aim of improving safety for cyclists.

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Potentially preventable road trauma deaths in Victoria

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Abstract

The majority of road trauma deaths will occur in the prehospital setting. However, these deaths have not been subject to the same scrutiny as in-hospital deaths. This study aimed to provide an overview of road trauma deaths and identify situations in which these deaths may have been prevented. Between 2008 and 2014, there were 1,374 deaths resulting from road traffic events in Victoria. Of the deaths that had a full autopsy and had attempted resuscitation from paramedics, 55 had ‘potentially survivable’ injuries. Of these, 45 were considered not preventable and 10 considered potentially preventable or preventable road trauma deaths.

Background

In Australia, road traffic crashes are the second leading cause of hospitalised injury and injury-related deaths (Henley and Harrison 2015). The majority of these deaths will occur either at the scene or on the way to hospital (European Transport Safety Council 1999, Beck *et al.* 2017), highlighting the importance of rapidly providing high-quality critical care (Jurkovich 2012). However, when compared to patients that survive to hospital, relatively little is known about patients that die at the scene.

This project focused on the acute treatment of road trauma patients. Firstly, we aimed to provide an epidemiological profile of road trauma deaths in Victoria, Australia, identifying specific causes of death in these patients. From this, we aimed to identify situations in which targeted interventions may improve survival through expert panel reviews of individual cases. We also aimed to evaluate whether any of these deaths may have been prevented.

Methods

We performed a retrospective review of prehospital and early in-hospital (<24 hours) road trauma deaths following a traumatic out-of-hospital cardiac arrest (OHCA) that were attended by Ambulance Victoria during the period of 2008 to 2014. Patients were identified from the Victorian Ambulance Cardiac Arrest Registry (VACAR) (Nehme *et al.* 2015) and these data were linked with coronial data from the National Coronial Information System (NCIS) and, for those patients who were transported to hospital, to the Victorian State Trauma Registry (VSTR) (Cameron *et al.* 2004).

A detailed review of each case was conducted to evaluate whether a proportion of these deaths were potentially preventable or preventable. This was conducted in a two phase review, where the first phase aimed to determine whether the anatomical injuries were ‘potentially survivable’ and the second phase used a multidisciplinary expert panel review methodology to identify opportunities for improvement in the system of care provided to road trauma patients.

Results

Over the 7 year study period, there were 1,374 deaths resulting from road traffic events that were included in the study. This comprised 858 (62%) vehicle occupant deaths, 251 (19%) motorcyclist deaths, 221 (16%) pedestrian deaths, 34 (2%) pedal cyclist fatalities and 10 (1%) deaths occurred when the occupant was outside of their vehicle. Of the 1,374 road trauma deaths, 589 (45%) had a full autopsy. Overall, the most common medical causes of death were head injury (29%), multiple injuries (28%) and haemorrhage (20%).

Of the 169 deaths with full autopsies that underwent detailed review, 55 (33%) were considered to be ‘potentially survivable’ based on the anatomical injuries. These 55 cases underwent expert panel review. Of these, 45 were considered not preventable and 10 considered potentially preventable (n=8) or preventable (n=2) road trauma deaths. Potentially preventable or preventable deaths represented 18% of those cases that had ‘survivable’ injuries (10 of 55 deaths), and 6% of all cases that had attempted resuscitation from paramedics (10 of 169 deaths).

Conclusions

No systematic problems were identified. Rather, we identified a number of specific circumstances in which the system of care provided to the patient was suboptimal. The identification of these issues highlights opportunities to make incremental improvements to reduce road trauma mortality.

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For whom didn't it click? A study of the non-use of seat belts in motor vehicle fatalities in New Zealand

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Abstract

The aim of this research was to determine profiles of a representative sample of seat belt non-users who were killed in motor vehicle crashes in New Zealand between 2011-2015. A Safe System analysis of 186 vehicle occupant fatality reports (n=200 fatalities) was conducted and 63 variables were coded for each case. A Multiple Correspondence Analysis explored relationships between the variables and identified five clusters of individuals with similar characteristics. The profiles were: 'young and risky'; 'driving for work'; 'elderly and retired'; 'passengers from overseas'; and 'people driving in rural settings'. Initiatives to reduce seat belt non-use road deaths should consider what will most likely influence these various groups, acknowledging that each profile may need to be targeted with a different approach.

Background

There is an increased risk of death or serious injury for occupants who did not wear a seat belt in a crash (Høye 2016). Common factors associated with seat belt non-users include: night-time crashes; younger drivers; males; marginalized or minority ethnic groups; low levels of education; and a history of previous driving offences (Begg and Langley 2000, Eluru and Bhat 2007, Raftery and Wundersitz 2011, Alattar, Yates et al. 2016).

In New Zealand, seat-belt wearing rates are high (over 96% for front and rear occupants), yet between 2006 and 2016, non-seat belt fatalities annually accounted for 19-30% of overall motor vehicle occupant road deaths. The trend in these potentially preventable deaths is not decreasing and therefore there is a need to better understand how the contextual factors associated with these situations may be understood. Therefore, the aim of this research was to determine profiles for seat belt non-users who were killed in motor vehicle crashes.

Method

In addition to a review of the literature, the method involved two key parts. Firstly, an analysis of a representative sample of 186 NZ Police-generated Serious Crash Unit (SCU) reports of fatal seat belt non-use crashes (n=200 fatalities) between 2011-2015 was conducted. The analysis followed a Safe System (Larsson and Tingvall 2013) framework, and 63 variables were coded from each crash. In the second stage, a Multiple Correspondence Analysis explored relationships between these variables, which then clustered individuals with similar characteristics into one of five 'occupant profiles'. Every one of the 200 individuals were part of one and only one occupant profile, and some individuals fitted the profile better than others. However, all individuals fitted their allocated occupant profile more strongly than any other profile.

Results

The cluster analysis identified five seat belt non-user profiles. Contrary to the literature, seat belt non-users were not solely associated with the commonly identified factors described in the literature. Rather, these factors were specifically analogous with 26.5% of the fatality cohort (n=53) and were captured in the 'young and risky' profile. The four additional profiles were: people driving for work (n=20); elderly and retired people (n=12); passengers from overseas (n=7); and people in rural settings (n=108). An infographic summary of some of the components of these profiles is presented in Figure 1. This enhanced understanding of ‘occupant profiles’ indicates that there is a wide variety of people who are killed in crashes where seat belts are not worn.

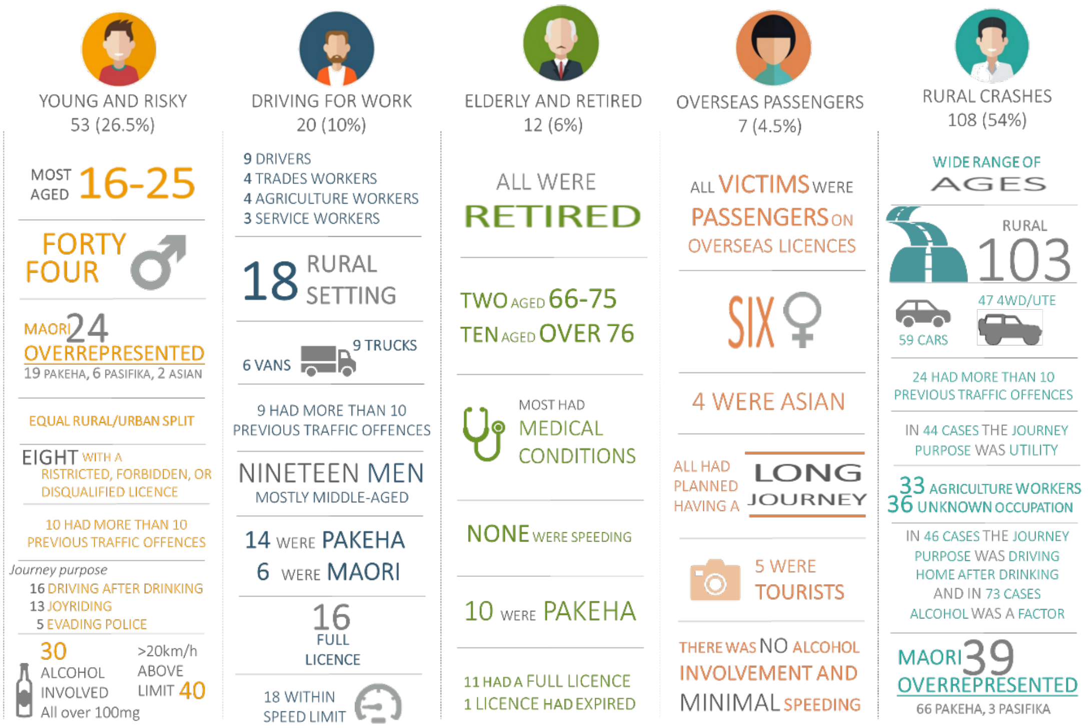

Figure 1. Profiles for seat belt non-use fatalities

Conclusions

A concerningly high number of people are still being killed in crashes where seat belts are not worn and urgency to address this issue is warranted. If it is assumed that those most at risk of being killed in seat belt non-use crashes match the profiles developed in this study, then a range of intervention approaches will be needed to effectively target each group. Some of these interventions may be outside the direct jurisdiction of the New Zealand Transport Agency, but are likely to be part of the wider road safety sociotechnical system. For example, for ‘passengers from overseas’, hire car companies could be more prescriptive about the legal requirement of wearing a seat belt in New Zealand. However, for those ‘driving for work’, WorkSafe, or the relevant industry, may encourage an ergonomic assessment of work tasks to understand how tasks could be altered to better align with seat belt use. Finally, NZ Police and the Ministry of Education could work together in schools to target behaviours associated with the ‘young and risky’ group. In addition, further work to understand why the range of people within each profile do not wear seat belts would be beneficial for better-targeted interventions.

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Comparing crashes: A Safe System analysis of serious injury and fatal crashes in New Zealand

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Abstract

Serious injuries account for the greatest proportion of the social costs of New Zealand's road trauma, yet there is limited understanding of the differences in system failures between fatal crashes and those that result in serious injuries. Using a Safe System analysis framework, this research compared the circumstances of 200 serious injury crashes and 100 fatal crashes involving light vehicle occupants. This framework included criteria for 'triggering' each system pillar. The research shows that serious injury crashes are less likely than fatal crashes to involve complete system failure and that all pillars of the Safe System require attention if tangible road safety improvements are to be expected.

Background

Previous research suggests that there could be considerable differences in the nature of fatal and serious crashes (Stigson, Kullgren et al. 2011, Wundersitz and Baldock 2011). However, there is a limited understanding about the circumstantial differences between fatal crashes and those that result in serious injuries in New Zealand. This is of interest as serious injuries account for the greatest proportion of the social costs from New Zealand's road trauma. The aims for this paper are to establish 1) are there differences in the circumstances that lead to fatalities or serious injuries in New Zealand's light vehicle crashes? and 2) what proportion of crashes result predominantly from system failures as opposed to reckless behaviours?

Method

Data were obtained from the New Zealand Transport Agency's Crash Analysis System (CAS) in the form of Traffic Crash Reports (TCR), which are prepared by the Police Officer who attended the scene. Using random selection over the period 1/7/2015 – 30/6/2016, 100 fatal, and 200 serious injury crashes were selected for analysis. More serious injury crashes were analysed due to the higher proportion of cases that occur. It was established that this quantity of cases would capture a representative emerging pattern of factors associated with the broader crash cases.

Information from each crash report was categorized by one analyst into the four Safe System pillars - User, Vehicle, Speed, and Roads and Roadsides (Larsson and Tingvall 2013). By doing this, the involvement of each pillar in the crash could be 'triggered' so that the predominant factors implicated in fatal and serious injury crashes on New Zealand's roads could be better understood. In addition, the analysis applied an approach to understand the proportion of crashes which predominantly resulted from system failures (i.e. the condition of the road, the speed limit, drivers' errors or lapses, or the vehicle's safety system) as opposed to reckless behaviours (i.e. the actions of drivers who, either unusually or regularly, operate outside of the system that is deemed to be safe, such as a blood alcohol level above license conditions). Reckless behaviour also sat under the User Pillar, but was treated separately within the pillar. This approach was modified from similar work by Wundersitz and Baldock (2011).

Results

Across all 300 serious injury and fatal crashes, there was significant involvement by all four pillars of the Safe System (see Figure 1). However, serious injury crashes were less likely to involve all four pillars of the Safe System.

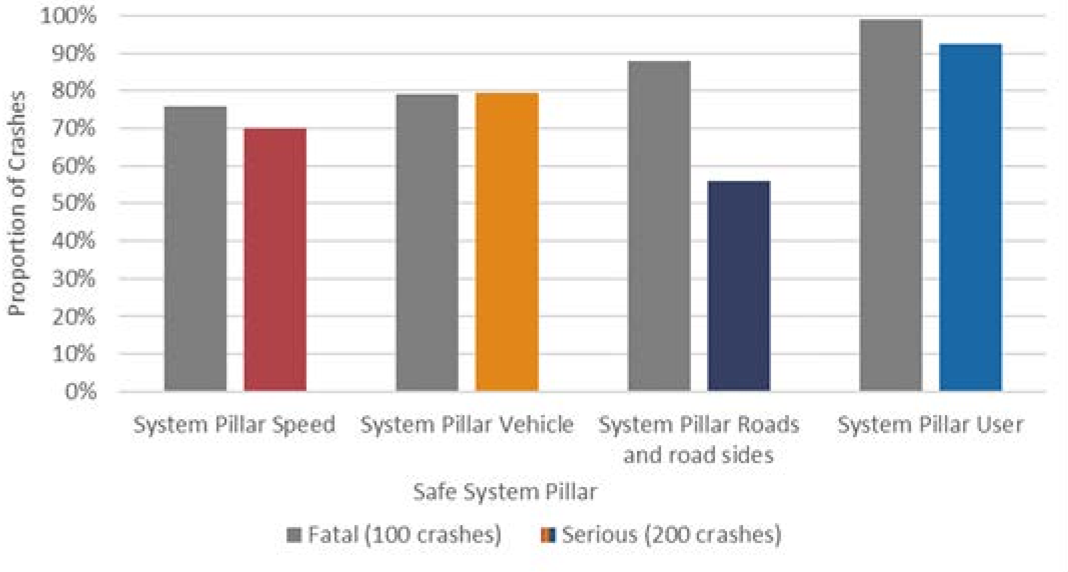

Figure 1. Involvement of Safe System pillars

Compared to serious injury crashes, fatal crashes had a higher proportion of roadside objects and other vehicles struck, more frequently involved narrow shoulders for run-off road crashes, were more often involved crashes where the centre line was crossed on 100 km/h roads, and typically happened in higher speed environments. In two-vehicle crashes, the occupants of the newer vehicle typically had less severe injuries than the older vehicle. Proportionally, SUV's, 4WD's and utes were involved in roll-over crashes 32% more than passenger cars due to the higher centre of gravity. Multiple user factors were more apparent in fatal crashes. Consistent with overseas literature, reckless behaviour was less common in serious injury crashes (30% in serious injury crashes and 47% in fatal crashes). Finally, across fatal and serious crashes, in 99% of the cases, the crash involved more than one Safe System pillar, rather than reckless behaviour being the only contributing factor.

Conclusions

A key finding from this analysis is that crashes often happen as a result of multiple system failures, further supporting the importance of the Safe System approach in road safety. Given that a large proportion of fatal crashes, more so than serious injury crashes exhibited failures by all pillars of the safe system, all pillars of the Safe System require attention if tangible road safety improvements are to be expected.

Acknowledgements

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Identifying road safety knowledge gaps in Tasmanian Grade 3 and 4 students

Will Oakley

Royal Automobile Club of Tasmania

Abstract

Due to a gap in coordinated, innovative road safety education tools in Tasmania, RACT RoadSafe was developed and launched in 2017 and piloted in five Tasmanian primary schools in Term 4. The resource is designed for students to better explore road safety independently, in small groups and/or in a classroom. Students have access to videos, games, activities and a comprehensive quiz set which all explore pedestrian safety, passenger safety, safety on wheels and basic street sign knowledge. Importantly, student performance in the quiz component generates background data to identify gaps in road safety knowledge.

Background, Method, Results and Conclusions (NOTE: suggested headers only for research focused papers – practitioner/other paper context can choose other headers to suit).

RACT RoadSafe allows knowledge gaps to be identified through reporting on success rates for questions answered within the four core competencies and 36 learning areas. Students are required to reattempt until the question for each learning area has been answered correctly – thereby identifying how many attempts students require. While more detailed data can be generated, the best indicator for knowledge gaps is the percentage of students answering questions incorrectly on the first attempt.

Once identified, educators can conduct additional learning activities and/or utilise data for advocacy/funding purposes.

Pilot stage

Questions relating to the following learning areas encouraged the highest percentage of incorrect first attempts during the pilot stage, which included over 250 students:

Learning area	**Percentage wrong on 1st attempt**
I know the difference between stop and give way signs and what I must do	56.41%
I can get in and out of cars safely	55.62%
I know about most other signs and what drivers must do	45.22%
I know how to share the road and footpath	43.58%
I know what most road signs mean and what drivers and riders must do	43.23%
I know which is the Safety Door	42.50%
I know how to cross a road where there are no crossings available	42.38%
I know that there are signs for bike riders that I must follow	41.94%

These high percentages represent insights into student knowledge that have previously not been available, at least in Tasmania. It offers educators with opportunities to understand the specific road safety areas requiring attention and tailor programs accordingly.

Preliminary outcomes from Pilot

Based on the usage data from participating schools, further work has been undertaken independently. An example of which was provided by St Aloysius Catholic College:

"Our Grade 4 team has even developed an assessment for the students based on bike safety - which hits our Aus Curriculum targets for Health this term."

- Megan Hickey – Grade 4 Teacher at St Aloysius Catholic College

Road Safety Week 2018

During Road Safety Week 2018, RACT partnered with University of Tasmania to deliver RACT RoadSafe to over 200 students throughout Tasmania. It was identified that the learning areas most likely to encourage incorrect answers from students during the pilot stage were consistent during Road Safety Week. This demonstrates a high level of reliability, given there have been over 500 users at the time of writing.

Cressy District High School (K12) had over 60 students use the resource throughout Road Safety Week with the following outcomes:

"The impact RACT RoadSafe has had on our students has been quite noticeable. The ability for teachers to identify areas in which students require attention has allowed for more targeted conversations, not only with the students but parents as well. It has opened up honest lines of communication between the students and their parents also and made the whole concept of safety on our roads a little more real and transparent, which has been great to see."

- Elle Faulkner – Acting K-6 AST at Cressy District High School

Priorities for improving the safety of the Victorian taxi fleet

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[a]Monash University Accident Research Centre

Abstract

This study aimed to assess the relative merits of age based limits as a tool for governing taxi safety in comparison to other potential policy options including mandating minimum vehicle secondary safety performance, mandating various crash avoidance technologies and behavioural measures to reduce crash risk such as driver training and monitoring. Results showed that age limit restrictions were a weak mechanism by which to govern taxi safety with other options such as improved secondary safety standards, mandating vehicle crash avoidance technologies and introducing effective driver focused measures such as training, licensing and behavioural monitoring, predicted to have much greater safety benefits.

Background

The Victorian taxi fleet is currently involved in over 300 casualty crashes per year representing a total cost to the community of over $33M. The safety of the taxi fleet in Victoria was governed through setting operational age limits on vehicles in terms of the maximum age they can both enter and remain in service as a taxi (TSC, 2012). This study aimed to assess the relative merits of age based limits as a tool for governing taxi safety in comparison to other potential policy options including mandating minimum secondary safety performance of vehicles, mandating the fitment of various crash avoidance technologies and non-vehicle based measures to reduce crash risk such as driver training and monitoring.

Methods and Data

Crash savings for each scenario was assessed through the application of an analysis model describing the exposure, primary (crash risk) and secondary (injury mitigation) safety performance of the current taxi fleet to which each of the different policy options was applied using methodology described in Budd et al (2013). Crash risk was derived from Victorian police reported crash and vehicle registration records over the years 2000-2012. Vehicle secondary safety estimates were taken from Newstead et al (2013) and applied using methods described in Newstead and Scully (2009). Estimates of vehicle crash avoidance technologies were taken from Anderson et al (2011). Taxis were categorised acording to license type being Metropolitan (M), Suburban and Peak Service (ST & PS), Country (C), Urban (U) and Hire Cars.

Results

Annual casualty crash savings estimated through application of the analysis model broken down by taxi type and scenario considered are presented in Table 1. Taxi age limits of between 1 and 6.5 years were considered (Scenarios A1-A4) along with mandating best possible secondary safety based on the best rated vehicles in Newstead et al (2013) (S), mandating Autonomous Emergency Braking alone or with active lane keep assistance (T1 & T2) and behavioural measures to reduce Taxi crash risk to that of Hire Cars (Taxi crash risk being 2.3 times that of hire cars per km travelled).

Table 1: Expected annual casualty crashes saved through implementing each scenario on the taxi and hire car fleets

	Taxi and Hire Car Type					
Scenario	**M taxis**	**ST and PS taxis**	**C Taxis**	**U taxis**	**Hire Cars**	**Total**
A1- Max Age 6.5 Years	2.01	0.35	0.60	0.13	0.48	3.58
A2 – Max Age 5 Years	3.93	0.74	0.87	0.28	0.42	6.23
A3 - Max Age 3 Years	8.21	1.27	1.32	0.45	0.70	11.96
A4 – Max Age 1 Years	13.83	2.06	2.00	0.71	1.06	19.67
S - Best Possible Secondary Safety	50.26	7.13	5.98	2.42	4.35	70.13
T1 – Mandate AEB	21.85	3.1	2.6	1.05	1.50	30.10
T2 – Mandate AEB and Lane Departure Assist	32.78	4.65	3.9	1.58	2.25	45.15
D – Reduce crash risk of Taxis to = Hire car Risk	122.85	14.141	11.11	4.64	0	152.75

Conclusions

Age limit restrictions are a weak mechanism by which to govern taxi safety. All other scenarios produced much higher crash reductions. Mandating vehicles with best possible secondary safety performance offered the potential to reduce taxi related road trauma by up to 25%. Measures to reduce taxi crash risk, potentially including mandating crash avoidance technologies and introducing effective driver focused measures such as training, licensing and behavioural monitoring, offered by far the greatest potential to reduce trauma.

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Evidence for the 'safety in density' effect for cyclists; validation of agent-based modelling results

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Abstract

Time-gap analysis of cyclists passing through an intersection was conducted using five hours of video-observation of a single intersection in Melbourne, Australia, where motorists were required to 'yield' to oncoming cyclists. Results demonstrated that potential collisions between motor-vehicles and cyclists reduced with increasing cyclists per minute in a manner analogous to the SiN effect. These results successfully validate 'synthetic' data gathered using agent-based models, supporting evidence of a proposed causal mechanism related to safety in density (SiD) rather than safety in numbers, per se. Results suggest that increased cyclist safety may be achieved through creating high-density strategic cycling corridors.

Background, Method, Results and Conclusions

The safety in numbers (SiN) effect for cyclists is a widely referenced and observed, but poorly understood phenomenon(Bhatia & Wier, 2011; Christie & Pike, 2015; Elvik & Bjørnskau, 2017). Although a wide range of academic and applied studies cite SiN as a potential solution to car vs cyclist crashes (Elvik & Bjørnskau, 2017; Fyhri, Sundfor, Bjornskau, & Laureshyn, 2016; Jacobsen, 2003; Robinson, 2005; Tin, Woodward, Thornley, & Ameratunga, 2011), there is little definitive evidence to guide policy-makers or transport planners in how to use SiN to create a safer cycling environment beyond simply encouraging 'more cyclists' into the system.

Results of agent-based models (ABMs) have shown the SiN effect can be replicated in simulated systems that lead to the formation of higher-density cyclist groups, indicating that the safety effect is a simple spatial mechanism rather than a result of learned behaviour by drivers. While acknowledged as a potential mechanism (Jacobsen, Ragland, & Komanoff, 2015), this 'safety in density' hypothesis has been criticised from the perspective that no in-situ empirical evidence exists that cyclists 'cluster' in the real world. The focus of this study was therefore to observe micro-level interactions of cyclists and vehicles at an intersection mirroring that created in prior ABMs to determine how cyclist density is associated with potential crash risk.

Method

Data collection occurred through recording 5 hours of video naturalistic traffic behaviour at an inner-city Melbourne cross-intersection. Coding of time-stamped video footage of car and cyclist interactions enabled the calculation of variables, including:

- the time gap of approaching cyclists to the intersection at the instant when drivers arrived at the intersection (sec);
- number of cyclists each driver gave way to before moving away from the intersection (n);

- time gap between each cyclist passing through the intersection (sec); and
- frequency of cyclists passing through the intersection (cyclists / min).

Results

The frequency of potential collisions (y) was modelled using the number of cyclists per minute (x) as a single explanatory variable. Potential collisions and the number of cyclists were counted each minute across the total five hours of captured video footage, resulting in an appropriate sample of cyclist density and potential collision counts (n = 385). The potential collision count was modelled using Poisson regression.

Parameter estimates are presented in Table 1 indicating that the number of cyclists per minute was strongly associated with potential collision risk for cyclists. Figure 6 shows this relationship in more detail, demonstrating that as the number of cyclists per minute moving through the intersection increased, the risk of collision per cyclist decreased dramatically up to the point of 8-10 cyclists per minute. This effect of cyclist density on collision risk was independent of behavioural adaptation by drivers.

Table 1. Parameter estimates of Poisson regression.

	Estimate	Std. error	*z* value	P(>|*z*|)
(Intercept)	0.57	0.07	8.11	.000
Number of cyclists	0.04	0.01	5.02	.000

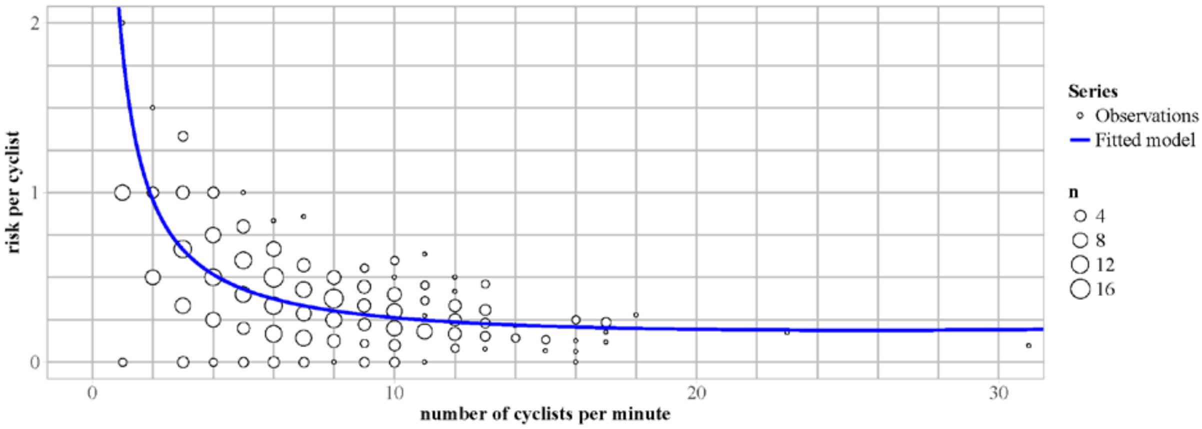

Figure 6. Potential crash risk with increasing count of cyclists per minute.

Conclusions

This study provided empirical validation of the 'Safety in Density' hypothesis' operation in a real-world situation. It demonstrated that reduced crash risk was associated with reduced time-gaps between cyclists passing through intersections, which prevent motor-vehicles from attempting to move between on-coming cyclists (gap rejection). Using a methodology based on prior theoretical experimentation using ABMs, this work has provided further support for a candidate causal mechanism underlying the widely observed general relationship between cycling volumes and safety; one that has thus far eluded comprehensive explanation in the cycling safety literature.

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Recommendations to Reduce Speeding-Related Crashes in the United States

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Abstract

The National Transportation Safety Board (NTSB) is a United States government agency charged with investigating transportation accidents, studying transportation safety issues, and issuing recommendations to prevent future accidents. The NTSB recently completed a study of countermeasures to reduce speeding-related crashes, focusing on five areas: (1) speed limits, (2) data-driven enforcement, (3) automated speed enforcement (ASE), (4) intelligent speed adaptation (ISA), and (5) national leadership. This paper summarizes the study findings, details how the NTSB leveraged research and countermeasures from the Australasian region to develop safety recommendations, and highlights differences in speed management approaches between the United States and other countries.

Background

Speeding—exceeding a speed limit or driving too fast for conditions—is one of the most common crash factors in the United States. From 2007 through 2016, speeding-related crashes resulted in 105,222 fatalities, representing 30% of all road fatalities (National Center for Statistics and Analysis, 2018). Speeding is likewise a prevalent crash factor in Australasia; for example, from 2012 through 2016, 30% of road user fatalities in New Zealand involved speeding (Ministry of Transport, 2017). In 2017, the NTSB completed a study of countermeasures to reduce speeding-related crashes in the United States. Several of the study's recommendations were informed by research from Australasian countries.

Method

To summarize the risks of speeding, describe the scope of the speeding problem, and promote the use of proven and emerging countermeasures, the NTSB: (1) reviewed literature from the United States and other countries; (2) analyzed speeding-related fatal and non-fatal crash data; and (3) conducted interviews with approximately 50 national, state, and local traffic safety stakeholders, including representatives from highway safety agencies, law enforcement agencies, automobile manufacturers, research institutions, advocacy groups, equipment vendors, insurance providers, and professional associations.

Results

In the United States, speed limit adjustments are generally based on the 85th percentile speed of free-flowing traffic. However, the NTSB did not find strong evidence that this equates to the speed with the lowest crash rate. Overemphasizing the 85th percentile can result in unintended consequences, including higher operating speeds.

Inconsistent crash reporting hinders the effective implementation of data-driven speed enforcement programs. Although voluntary federal guidelines exist for crash reporting, police crash forms are developed at the state and local levels. This results in significant crash data discrepancies among the 50 states.

The NTSB found that ASE is an effective speeding countermeasure. However, many jurisdictions prohibit or place operational restrictions on ASE, and federal guidelines for ASE are outdated and not well known. Based on its success in other countries, including Australia, point to point (or average) automated speed enforcement is a promising technology.

ISA, a vehicle technology using a global positioning system database or sign-detecting camera to help drivers comply with speed limits, is an effective speeding countermeasure. However, most ISA systems available in the United States are only advisory. Unlike Australia and Europe, ISA is not included in the United States' New Car Assessment Program.

Finally, the NTSB found that the level of emphasis on speeding as a national safety issue is lower than warranted. Although the federal government coordinates several road safety campaigns each year, none of these focus on speeding. Some cities have adopted Vision Zero goals and the Safe System approach, but these initiatives are not widespread.

Conclusions

As a result of the study, the NTSB issued 19 safety recommendations to federal government agencies, the 50 states, and road safety and law enforcement associations. The NTSB requests that recommendation recipients provide an initial written response within 90 days. These responses are beginning to arrive, and the final paper will include a discussion of the safety recommendation responses.

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The power of partnership: lessons from Road Safety Week

Caroline Perry

Brake, the road safety charity

Abstract

Partnering with other organisations can help to develop effective, successful road safety initiatives. This presentation will explore how initiatives such as Road Safety Week can be used to engage communities and organisations at a grassroots level, whilst also raising awareness of key messages on a larger, national scale. It will discuss how partnerships between statutory agencies and NGOs can benefit such initiatives, and how giving ownership of activities to communities can empower them to start campaigns that run beyond the week and engender tangible change to road safety in their area. Case studies will be presented from New Zealand and the UK, along with key points for organizing a successful week and developing effective partnerships in your organisation, region or country.

Presentation components

Background

This section of the presentation will provide a brief background on Brake, the road safety charity and the work the organisation does to prevent road deaths and injuries and support families who have been bereaved in road crashes.

Road Safety Week background

The aim of Road Safety Week is to raise awareness of the part we all play in making our roads safer, through a national media campaign, and by supporting communities, schools and organisations to run road safety activities at a grassroots level, by providing resources and activity ideas. Road Safety Week is an umbrella project, designed to attract involvement from a wide range of stakeholders to stimulate the promotion of road safety awareness year-round.

Brake developed Road Safety Week UK in 1997, and Road Safety Week New Zealand in 2012. Brake also developed the roadsafetyweek.org website, to provide other individuals and organisations with ideas and resources for developing their own Road Safety Week, whether at local or national level.

Partnership working

Though Brake coordinates Road Safety Week, the organisation works in partnership with a number of other agencies and organisations to promote the week, encourage people to sign up and take part, and deliver a media campaign. This section of the presentation will look at the benefits and challenges of such partnerships and how effective relationships can help to build a successful initiative.

Grassroots activists

A key element of Road Safety Week is engaging communities at a grassroots level, and giving them ownership of their activities. This enables them to focus their attention on the issues that matter to them, to raise awareness and campaign for change, whether those issues are within their own organisation or the wider community. It also encourages communities to extend their activities and campaigns beyond Road Safety Week and work to achieve meaningful change in their area, whether that is campaigning for a lower speed limit, encouraging more families to walk and cycle to school, or addressing road risk with at-work drivers.

This section of the presentation will explore how Brake and others engage individuals and organisations, and how that has encouraged grassroots activism, using information from Brake surveys and feedback evaluations, and case studies from further afield.

Case studies

Case studies will be presented throughout, primarily from New Zealand activities, with additional examples from the UK. These include how Brake works with national government agencies, the emergency services and other NGOs in NZ for a coordinated national Road Safety Week media campaign, and how Brake partners with local agencies in Auckland to engage schools and companies in Road Safety Week and to deliver grassroots road safety activities.

Setting up an initiative such as Road Safety Week

The presentation will conclude by providing information and links to resources to assist with coordinating a Road Safety Week or similar activity.

Bringing The Streets Into The Classroom: Using Augmented Reality In Primary Schools To Teach Road Safety Awareness

David Gribble

Constable Care Child Safety Foundation, Maylands, Western Australia

Abstract

Constable Care Child Safety Foundation, in partnership with augmented reality design company DSBS, have developed a world-first road safety learning application for primary schools. The curriculum-linked app lets teachers run engaging augmented reality road safety lessons in the classroom on their school tablets, delivering real-time pre-post measurement and post analysis of students change in knowledge in pedestrian, cyclist and public transport learning areas.

Students engage in interactive decision-making in relation to portrayed risks such as road crossing, school zones, bus stops etc. A gamification reward approach motivates students to correctly identify answers. Two separate experiences tailored to younger (4-7 years) and older (8-11 years) children have been developed, providing different age-appropriate experiences.

Teachers control the experience in class, starting it and stopping it through a master app, seeing student progress in the learning scenarios in real time, and accessing additional road safety teaching material to further enhance their experience.

Safer cycling for women: an evaluation of a cycling skills training program

Sarah Smith[a], Tina McCarthy[b], Sarah Dalton[a] and Marilyn Johnson[a,c]

[a]Amy Gillett Foundation; [b]Wheel Women [c]Monash University Institute of Transport Studies

Abstract

In Australia, the most frequently reported barriers to cycling for females are safety concerns and lack of knowledge. In this initiative, a cycling skills training program was made available to women aged 50 years and older who are not regular cyclists. Comparison of cycling behaviour pre-and-post program show that skills training, supported rides and an environment to discuss safe cycling practices to increased cycling among the women. Importantly, participants report increased feelings of safety when riding.

Background

In Australia, the primary barriers to cycling for many people, particularly females, are concerns about safety and lack of knowledge (Garrard et al., 2012; Bonham & Wilson, 2012). Further, for females cycling is not a socially normative behaviour that is, their friends don't ride (Zander et al., 2013). This social reality, coupled with a lack of knowledge about safe bicycle handling skills, safe riding practices when riding close to motor vehicles and where to ride to stay on connected bicycle lanes, results in fewer females regularly cycling.

Across Australia, governments' policies identify increasing participation as an important lever to pull to achieve targets for improved health, transport and environmental outcomes (Austroads, 2010). However, increased participation cannot be achieved solely through more males cycling. To achieve broad social wellbeing goals, females are an essential part of the solution, so concerns, including about safety, must be addressed.

The aim of this study was to evaluate a safe cycling skills training program for women aged over 50 years.

Method

This study is an evaluation of a cycling skills training program delivered in Melbourne. Two courses were planned to run simultaneously, one with a group of adult women over 50 years. Women were recruited via Wheel Women, promotion through the City of Yarra, and the Amy Gillett Foundation website and social media channels. A second program with girls aged 15-18 years was promoted heavily but failed to attract uptake. This result revealed previously unanticipated additional barriers to facilitating cycling participation of young women.

Safe cycling skills program

The four week program, run by AustCycle qualified trainers, coached participants to develop skills in safe bicycle handling, riding in traffic and basic bicycle maintenance (e.g. fix flat tyre). Participants completed four group rides that taught them to navigate routes in a range of road types, speed zones and traffic conditions.

Evaluation

All participants completed a baseline survey of cycling experience, current travel modes, attitudes towards cycling and expectations of the program. Participants also completed a post-program survey which tracked any differences from baseline in attitudes and actual cycling activity. Analysis is currently underway.

Results and Conclusions

In total, 17 women completed the four week course. While women identified the importance of learning skills, greater value was given to the peer-support and instructor. Women appreciated a supportive, judgement-free space to discuss their concerns, somewhere to 'ask stupid questions'. Most women indicated the importance of feeling 'safe' and 'encouraged' to develop confidence in their cycling skills.

They also report feeling more confident and safer on the roads compared to pre-program. All participants indicated they either rode 'about the same' or 'more' after participating in the program. A combination of practical and social barriers exist for this group. Practical barriers to participation included the logistics of fitting another activity into already busy school and sport schedules. Social barriers and potentially a lack of self-identification with cycling culture contribute to a reluctance to engage with cycling.

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NSW Police Force – Traffic and Highway Patrol. A response to serious road trauma and non-compliance in the Heavy Vehicle Industry

Inspector Robert Toynton

NSW Police Force, Traffic and Highway Patrol

Abstract

The Traffic Taskforce (Formally known as the Joint Traffic Taskforce) was formed in 2014 after a string of Heavy Vehicle incidents on the NSW road network. The Taskforce's main role is to provide the NSW Police Force an ability to rapidly respond to high risk incidents/non compliance involving Heavy Vehicles and investigate these incidents against the requirements of Heavy Vehicle legislation. In the past four years the Taskforce has conducted numerous reactive and pro active interactions with Operators within industry, with very positive outcomes.

Background

The Traffic Taskforce was formed by the NSW Government in 2014 after a heavy vehicle collision on the Hume Hwy, Menangle south of Sydney. This crash claimed the lives of three innocent family members. The investigation into this tragedy revealed that the driver of the offending truck was under the influence of illicit drugs and had an extremely adverse driving history. Another incident involved a petrol tanker rolling on Mona Vale road, Mona Vale which also claimed two lives and a subsequent audit of the fleet involved revealed a litany of serious mechanical problems. The NSW Police and Road and Maritime took the unprecedented action of grounding that fleet effectively reducing the flow of petrol to NSW motorists. The Traffic Taskforce has over 35 fulltime specialist Highway Patrol Officers operating throughout NSW under the control of an Operations Manager (Inspector). The Taskforce has the ability to rapidly deploy to any incident in NSW and work with the Crash Investigation Unit involving Heavy Vehicle collisions. The Taskforce has extremely close ties with the NSW Road and Maritime Heavy Vehicle Compliance area and many of our Operations are assisted by RMS Inspectors.

Aim of the Traffic Taskforce

The main focus of the Taskforce is to assist Industry to self regulate and self improve. Due to the size of the entire Heavy Vehicle fleet operating in NSW and the number of heavy vehicle movements throughout NSW the Traffic and Highway Patrol cannot stop and inspect every vehicle. Due to this the Taskforce needs to look at prioritising its focus. There are two main factors which alert the Taskforce to particular operators. The first is if the operator is involved in a serious incident. This could be an operator's involvement in a fatality or serious crash. Normally this involves the Taskforce working in conjunction with the Crash Investigation Unit. The second area is when an operator comes under the notice of the Taskforce through an individual interaction with Police, reported poor driving from Community Sources or through intelligence received. When an operator comes under notice from either area the Taskforce will complete an analysis process to determine what action is required.

Analysis of Information

Once an operator comes under the notice of the Taskforce a number of internal processes are undertaken. A full history of the operator is reviewed for from a variety of sources. The Taskforce are not in a position in this abstract to divulge police methodology however most of the records are publically available. Records which are also reviewed include a full compliance history from the RMS database and NSW Police Force COPS database. The analysis is conducted by the Operations Manager, Operations Supervisor and allocated Officer In Charge. At times the Crash Investigation Unit Manager is invited to participate and provide insight. Factors which are considered in this analysis are the severity of the incident which has brought the operator under notice, the compliance history, size of the operator's fleet and locations.

Traffic Taskforce Action

Once a full analysis is completed by the management team and the decision has been made to audit the operator the Taskforce considers a number of ways to review the operator. The action can depend on the on the operators fleet size, location and type of vehicle used. The action taken can be by way of Distribution Inspection, operator served with a production notice, RMS Alert System through Heavily Vehicle Inspection Station and use of the NSW Police Force Mobile Automatic Number Plate Recognition Technology (MANPR) and Compliance Operations.

Distribution Centre (DC) Inspection – Taskforce Officer's operating under Heavy Vehicle National Law (HVNL) will enter a premise and conduct an inspection of the DC including vehicles, loading, unloading, storage systems (Dangerous Goods) and WH&S practices.

Production Notice – A notice under the HVNL will be served on the operator directing all vehicles be presented for inspection at a particular time and date.

RMS Alert and MANPR – Vehicles registered to a particular operator will be loaded into these two systems and stopped on the road network and inspected by RMS and/or Police.

Compliance Operations – Static Inspection locations can be set up in and around major projects, dumping sites and Regional locations within NSW to allow police and RMS to direct vehicles to be inspected and weighed. This has been extremely successful during the Operation Catapult (1-6) series at Sydney Olympic Park targeting the Truck and Dog Industry. The Traffic Taskforce has undertaken Operation Impact which has seen them deployed to remote regional areas such as Broken Hill, Hay and Boggabilla to conduct compliance operations. This was with the assistance of Centre for Road Safety who funded the operation.

Industry/Operator Engagement

Once the Taskforce has completed an audit of the operator an extremely important function must be completed. That function is the de-brief with the operator. In line with the aim of the Taskforce to assist industry to improve, the operator is given advice on areas in which it needs that improvement. At times legal action is taken when offences are detected however this is not always the case. The main areas historically where industry have had issues, have been in servicing schedules, loading/weights, drugs detected in drivers, unlicensed driver, inability to effectively manage sub-contracting. One common theme amongst smaller operators is they have a lack of understanding with their responsibilities under chain of responsibilities requirements. This has been at all levels. In most instances operators have been receptive to this advice and the Taskforce has several examples where operators have greatly improved their compliance after an audit with the Taskforce.

The Future

The Taskforce will continue to work with the RMS and the ever evolving National Heavy Vehicle Regulator to engage with industry to improve standards. The continued goal of the Taskforce is in line with the theme of the 2018 conference in that we want to move towards zero in road related deaths involving Heavy Vehicles.

Road safety education: Improving outcomes through community collaboration

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Abstract

Transport-related injuries are a leading cause of death in children under 14 in Australia. The NSW Road Safety Plan 2021 commits to ongoing road safety education from early childhood through schooling. An enduring partnership with Transport for NSW (TfNSW) enables *Kids and Traffic* to work with early childhood organisations to support children, families and communities to improve safety outcomes. An online resource, *Safe Journeys Safe Communities,* showcases *Kids and Traffic* community-focused road safety collaborations. *Kids and Traffic* resources and professional learning workshops inspire early childhood organisations to address local road safety issues to reduce road trauma.

Background

In Australia, more children under 14 die from transport related injuries than from any other cause (Australian Institute of Health and Welfare, 2017). The *Kids and Traffic* Program partners with early childhood organisations and other stakeholders to improve safety outcomes for children, families and communities with the aim of moving Towards Zero road trauma.

Kids and Traffic is part of an enduring shared governance partnership with Transport for NSW, NSW Department of Education, Association of Independent Schools NSW and Catholic Schools NSW.

Road safety education is integral to a Safe System. *Kids and Traffic* promotes TfNSW endorsed Key Road Safety Messages which engage children in road safety learning while emphasising adult responsibility for holding children's hands to protect them as pedestrians, using appropriate child car seats correctly and ensuring children wear correctly fitted helmets when riding.

Collaborations

The *Kids and Traffic* Program is evidence-informed and founded on a philosophy of joint consultation, engagement and evaluation. The Program assists organisations to identify local road safety issues and to collaboratively develop effective community-specific strategies and solutions. Through a suite of professional learning workshops, resources and tailored consultations, the Program supports grassroots action at a local level.

The Program aims for universal coverage of all NSW early childhood education services while specifically supporting vulnerable road users. These include Aboriginal and Torres Strait Islander and culturally and linguistically diverse children and families as well as those from rural and remote and lower socio-economic communities.

The Program empowers early childhood educators to champion road safety and drive change in their communities. Genuine, respectful relationships between *Kids and Traffic* consultants, early childhood educators, children, families and communities increase shared capacity to respond creatively to community road safety needs. Authentic relationships are integral to connected, meaningful, locally-focused road safety education.

Featured on the *Kids and Traffic* website, *Safe Journeys Safe Communities* documents examples of road safety collaborations with early childhood organisations. *Safe Journeys Safe Communities* showcases high quality road safety education strategies. These are also explored via *Kids and Traffic* professional learning workshops and educational resources to inform educators and inspire them to act.

Core principles that underpin *Safe Journeys Safe Communities* include: respecting each other's experience, knowledge and context; learning from each other to create shared understandings and meaning; supporting each other to keep children safe; nurturing relationships and processes that continue beyond any project and fostering outcomes that honour process as much as product.

Conclusion

Kids and Traffic facilitates local solutions to community-identified road safety issues in ways that strengthen educator capacity and increase positive outcomes for children and families. Project strategies and resources inspire adaptation and use by early childhood educators across diverse settings. *Kids and Traffic* collaborative projects address risk, foster resilience, are highly sustainable and readily adaptable for use in all Australian education and care contexts.

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Safety benefits of connected and automated driving technologies in Australia and New Zealand

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Abstract

Two rapidly developing technology areas, Cooperative Intelligent Transport Systems (C-ITS) and Automated Driving (AD) applications, are likely to have a substantial impact on road trauma through assisting drivers with the driving task and providing enhanced crash avoidance capabilities. This study aimed to identify emerging C-ITS and AD applications and assess their potential safety benefits for Australia and New Zealand.

Using an analysis of a sample of Australian serious injury real-world crashes, expert estimates were made of the potential effectiveness of several light passenger vehicle applications in preventing each crash. Following this, the outcomes from the crash sample were scaled using aggregate serious injury crash data to project annual savings across Australia and New Zealand.

Study Aims and Method

This study aimed to identify emerging C-ITS and AD applications and assess the safety benefits of a selection of those judged to have the greatest potential for Australia and New Zealand. A review of the literature was conducted and a range of C-ITS and AD research and policy experts contacted for information about recent research activities, their thoughts on the likely deployment timelines and the key challenges to widespread adoption. Based on the literature review, four C-ITS and two AD applications were selected, with the potential to address major road trauma problems including carriageway departure crashes and intersection crashes, as well as being feasible for deployment in the Australasian vehicle market.

A sample of real-world crashes from the ANCIS database (Logan et al, 2006) was extracted and the relevant technology retrospectively applied to each. Based on comprehensive information from a driver interview, vehicle and crash site inspections, expert judgement was used to assign a combined likelihood of successful technology triggering, driver intervention and avoidance of the crash, as appropriate. It was assumed that all participating vehicles were equipped with the necessary in-vehicle and supporting technology.

The final stage of the project was to extrapolate the individual crash benefits to the current Australian and New Zealand serious injury pool, to estimate the annual benefits of each application if fitted to all light passenger vehicles.

Findings – Cooperative ITS applications

The analysis of Australian real-world crash types demonstrated the following reductions in targeted crash types, and serious injuries based on four C-ITS applications:

C-ITS Application	Type	Crash types	Reduction in targeted crash type	Projected annual savings in FSI crashes (Australia)	Projected annual savings in FSI crashes (NZ)
Cooperative Forward Collision Warning	V2V	Same direction	20-30%	515-805	15-25
Curve Speed Warning	V2I	Run-off-road, head-on	20-30%	75-115	10-20
Intersection Movement Assist	V2V	Adjacent direction	35-50%	940-1470	70-110
Right Turn Assist	V2V	Right turn against	25-40%	525-825	25-55

A range of limitations for C-ITS were identified, primarily related to the level of digital infrastructure required for them to operate as predicted, along with potential security and privacy concerns. It was also noted that C-ITS applications only provide driver alerts or warnings at this stage, requiring a driver to intervene.

Findings – Automated driving applications

Automated driving applications perform one or more aspects of vehicle control without driver intervention and are expected to confer significant safety benefits (Kockelman et al, 2016).

The analysis of Australian real-world crash types demonstrated the following reductions in targeted crash types, and serious injuries based on two key automated driving applications:

Automated Driving Application	Crash types	Reduction in targeted crash type	Projected annual savings in FSI crashes (Australia)	Projected annual savings in FSI crashes (NZ)
Lane Keeping Assist	Run-off-road, head-on	25-40%	1415-2210	160-245
Auto Emergency Braking	Same direction	35-50%	1195-1865	35-55

Discussion/conclusions

This study undertook a detailed analysis of several key C-ITS and automated driving technologies, using an expert analysis of real-world crash outcomes to estimate the benefits at a per-crash level, then extrapolating these results to the entire light vehicle fleet.

For the warning-only connected vehicle technologies, Intersection Movement Assist was estimated to be the most effective, preventing up to half the serious injuries among its targeted crash type of adjacent direction crashes at intersections. Right Turn Assist was estimated to prevent between 25% and 40% of serious crashes, while Cooperative Forward Collision Warning could allow drivers to avoid 20-30% of same direction crashes.

Of the AD applications, Automated Emergency Braking (AEB) was estimated to eliminate approximately 45-70% of same direction serious injuries and active Lane Keep Assist (LKA) around 25-40%.

Among the whole light vehicle fleet, LKA was predicted to reduce annual fatal and serious injury crashes by 1560-2450 annually throughout Australia and New Zealand, with AEB following with 1240-1900 same direction FSI crashes annually. Of the connected vehicle warning technologies, IMA showed the potential to eliminate 1020-1560 FSI crashes.

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Is There Evidence to Support the Risk Compensation Hypothesis for Bicycle Helmet Use?

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Abstract

A long-standing argument against bicycle helmet use is the risk compensation hypothesis. Multiple studies have examined the effect of bicycle helmet use on risky behaviour showing mixed findings. There have been no systematic reviews on bicycle helmet use and risky compensation to date. The current systematic review includes peer-reviewed literature studies conducted across eight countries. The findings of this study shed light on the potential association between bicycle helmet wearing and risky behaviour.

Background, Method, Results and Conclusions

To date, 272 jurisdictions worldwide have enacted bicycle helmet legislation to increase helmet wearing, and consequently decrease bicycle-related head injury and fatality (Esmaeilikia et al., 2017). Critics of bicycle helmet use, however, argue that increase feelings of safety caused by wearing a helmet results in cyclists exhibiting more risky behaviour (Walker, 2007; Phillips, Fyhri & Sagberg, 2011; Messiah et al., 2012; Gamble & Walker, 2016).

On the other hand, a large body of research has shown that bicycle helmet wearing is not associated with riskier behaviour. For example, some studies found that committing a traffic violation was positively associated with a lower frequency of helmet use (e.g., Lardelli-Claret et al., 2003; Fyhri et al., 2012; Martinez-Ruis et al., 2013). Other studies have found that alcohol use is negatively correlated with helmet use (e.g., Crocker et al., 2012; Orsi et al., 2014).

There is a lack of consensus in the research literature regarding bicycle helmet use and the risk compensation hypothesis, and this gap in knowledge was identified at least 17 years ago (Thompson, Thompson & Rivara, 2001). This study aims to shed light on the potential association between bicycle helmet and risk compensation by systematically reviewing the peer-reviewed literature on bicycle helmet wearing and risky behaviour. The review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009).

A systematic review of the peer-reviewed literature using five research databases (EMBASE, MEDLINE, COMPENDEX, SCOPUS, and WEB OF SCIENCE) was performed on 17 May 2017. The search criteria used identified articles with bicycle helmet content.

A search of the peer-reviewed literature resulted in 190 articles, out of which 49 were duplicates and were removed from the list. Three other articles from other sources were added into the list resulting in 144 unique records. After a title and abstract screening, and performing a full-length assessment, 22 studies were included in the current systematic review. In compliance with PRISMA, two reviewers independently searched and assessed documents against inclusion criteria as well as information extracted from articles included for a full length read.

This systematic review found little to no support for hypothesis bicycle helmet use is associated with engaging in risky behaviour. Sixteen studies found no supportive evidence while four studies provided mixed findings, i.e., results for and against the hypothesis. For many of these studies, bicycle helmet wearing was associated with safer cycling behaviour. Only two studies conducted in the

United Kingdom provided evidence to support the risk compensation hypothesis. These two studies reported motor vehicles passing at closer distance when a researcher wore a helmet on his commute to work (Walker, 2007) and the other found participants had higher risk-taking scores when wearing a helmet versus a baseball cap

in a laboratory environment (Gamble & Walker, 2016). However, the external validity of both studies is questionable due to one participant in the former study and a non-cycling environment for the latter.

There are several limitations to this systematic review. First, risk compensation has not been directly measured in the literature which may provide inaccurate results. Second, most articles identified in our search were commentaries regarding other studies without providing any data on the association between bicycle helmet wearing and risky behaviour. Third, due to ethical issues, the causal relationship between helmet use and risky behaviour is difficult to establish since participants cannot be randomised to wear or not wear a helmet.

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Prevalence of drugged driving in New Zealand

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Abstract

In 2014 the New Zealand Transport Agency commissioned a research project designed, in part, to establish a quantitative picture of the type and the extent of drugged driving in New Zealand, by both legal and illegal drugs. A stratified telephone survey (n=2000) and internet survey (n=546) were conducted to explore the extent of drugged driving. Other than alcohol, the drugs most commonly taken prior to driving were strong opioid-based painkillers, antidepressant medication, anti-nausea medication, cannabis and anti-anxiety medication. A large proportion of drivers also reported taking combinations of different drugs prior to driving.

Background

New Zealand's Road Safety Strategy 2010-2020, *Safer Journeys* (Ministry of Transport 2010), aims to significantly reduce road crashes involving alcohol or drug impaired drivers, which contribute a stubbornly large proportion, around 20%, of serious road trauma. Although the incidence and adverse consequences of alcohol impaired driving are well understood and documented, the incidence of drugged driving (legal and illegal) in New Zealand had not been unequivocally established.

A research project was conducted in 2014 and 2015 to establish the extent of drugged driving in New Zealand, by both legal and illegal drugs, and the levels of impairment produced by the more commonly used drugs (Starkey & Charlton, 2015). This paper reports on the surveys to establish the prevalence of drugged driving.

Methodology

An initial telephone survey was conducted on a stratified sample of drivers, representative of the age, gender and regional distribution of licensed drivers across New Zealand (n=2,000; mean age = 47.6 years; 59.3% female; see Table below). Participants were asked about their general driving habits and to indicate if they took or used any prescription medications, over-the-counter medication, or drugs for recreational purposes.

Age group (years)	% licensed drivers	Survey sample
16-24	13.8%	200-250
25-39	27.6%	430-480
40-64	44.1%	440-490
65+	14.5%	380-430

A follow-up phone survey focused on those participants (n = 450, mean age = 48.1 years, 57.1% female) in the initial survey who reported taking strong painkillers (e.g. codeine, tramadol, methadone, morphine), selective serotonin reuptake inhibitors (SSRIs – fluoxetine, citalopram, paroxetine and sertraline), benzodiazepines (diazepam, lorazepam, alprazolam), cannabis and stimulants (amphetamine, methamphetamine, methylphenidate).

Information regarding the incidence of drugged driving was also obtained from a subsequent internet survey (n = 546; mean age = 34.5 years; 50.55% females), conducted primarily to provide insights into New Zealand drivers' attitudes and perceptions toward drugged driving.

Results

For participants in the surveys, the drugs most commonly taken within three hours prior to driving were strong painkillers, antidepressants, anti-nausea medication, cannabis and anti-anxiety medication. Participants completing the online survey were younger compared to the telephone survey participants and the percentage of those driving within three hours of taking drugs was generally higher.

Drugs taken within 3 hours of driving	Telephone surveys	Online survey
strong painkillers	9.8%	18.7%
antidepressant medication	6.1%	15.8%
anti-nausea medication	3.5%	6.4%
cannabis	2.5%	14.2%
anti-anxiety medication	2.9%	6.1%

A significant proportion of the phone (16.6%) and internet survey participants (9.9%) reported taking combinations of different drugs prior to driving. The drug combinations frequently involved alcohol (43.0% overall), and different types of strong painkillers were often combined.

The surveys revealed that drugged driving in New Zealand is widespread, with over 50% of the participants who took SSRIs, benzodiazepines or stimulants reporting "drugged driving" once a week or more in the last 12 months. Smaller proportions reported driving once a week or more after taking cannabis (42.6%), illegal stimulants (28.2%) and strong painkillers (25.5%). These proportions were similar to those indicating that it was "very likely" that they would drive within three hours of taking the drugs in the future.

Conclusion

This study was designed, in part, to establish the prevalence of drugged driving in New Zealand, by both legal and illegal drugs. Drugged driving appears to be widespread, with 3%–19% of all drivers surveyed driving within 3 hours of taking prescription medications or drugs, and 25%–50% of these users reporting "drugged driving" once a week or more.

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An Evaluation Framework for Pedestrian Safety in Victoria

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Abstract

Walking is undergoing a marked revival; urban living, health considerations and the need for sustainable transport are key reasons. However, more walking can mean increases in severe trauma. This paper describes a practical, scientifically-based evaluation framework to assess a program of thirty projects designed for Safe System performance. Victoria's Safe System Road Infrastructure Program includes $100 million for a variety of pedestrian (and cyclist) safety measures, only some of which have been reliably evaluated. Given the program's financial and geographic scale, early, comprehensive indications of effectiveness of individual treatments and of combinations of treatments will enhance future targeting of investment.

Background

Walking as a mode of transport is undergoing a marked revival. Rapid growth in urban living, the proven health benefits of walking and its strong alignment with the goal of creating a sustainable of transport system are key reasons. However, with more walking comes increasing exposure to the risks of severe trauma where pedestrians need to mix with traffic. Great gains have been made over recent decades in reducing severe trauma involving pedestrians. In Victoria, an average of 150 pedestrians died each year during the 1980s[1], while today's annual figure lies between 30 and 40 deaths[2]. For every pedestrian killed, there are around ten serious injuries reported to police, with a substantial but unknown number of major falls and less severe injuries not reaching official records[3].

In an effort to maintain the momentum of past successes, and drive pedestrian deaths substantially closer to zero, the Safe System Road Infrastructure Program (SSRIP) is investing around $100 million in improving the safety of pedestrians and cyclists. This involves treating around 25 areas of high risk to pedestrians, in metropolitan Melbourne and regional Victoria, with combinations of speed, infrastructure and operational measures, aligned with the Safe System. Rigorous evaluation is being undertaken to help ensure that future investment in projects of this type is as cost-effective as possible. This paper outlines the overall approach to evaluating this innovative, large-scale program.

Method

The proposed evaluation framework focusses on four broad categories of metric to assess investment at multiple levels, namely, program, project, treatment type and individual treatment levels:

- **serious casualties-based** metrics, to indicate the impact of SSRIP investment on the ultimate measure - serious casualties involving pedestrians;
- **risk-based** metrics, to evaluate innovative treatments, as well as to gain the earliest practical indications on safety, rather than needing to wait until adequate crash data are available;
- **perceptions-based** metrics, to understand more fully the views of road users, residents, business owners and others who may be affected, on qualities such as accessibility, walkability and liveability;
- **direct measurement of other non-safety impacts**, such as traffic displacement, noise, amenity and mobility.

Specific metrics are proposed for each category, and guidance provided on study design and data requirements to help ensure the scientific rigour of these diverse, large-scale evaluations.

Results and conclusions

This paper describes a practical, scientifically-based evaluation framework developed to assess the impact of almost thirty pedestrian safety projects designed to align with Safe System principles. The $100 million pedestrian and cyclist safety component of SSRIP comprises a wide variety of pedestrian measures, such as reductions in speed limit to 40 or 30 km/h, alterations to traffic signal hardware, phasing or other operational parameters, new or modified roundabouts, kerb extensions, safety platforms, wombat crossings and new pedestrian signals. Some of these measures have been previously evaluated, while others have not been subject to robust evaluations. Given the financial and geographic scale of investments, early, comprehensive indications of the effectiveness of both individual and combinations of treatments, are vital to targeting future investment with greater precision and cost-effectiveness.

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Best Practice in Road Safety Infrastructure Programs

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Abstract

Traditionally, investment in road safety infrastructure in Australia and New Zealand has taken a bottom-up approach by targeting locations with an established safety problem. While this approach has served both countries well, it does not fully embrace the Safe System philosophy on which each country's road safety strategies are based.

This paper presents the results of an Austroads research project which identifies best practice recommendations for Road Safety Infrastructure Programs that align with the Safe System approach. When implemented, this best practice approach will effectively contribute towards a safer transport system with fewer fatalities and serious injuries.

Introduction

Investment in road safety infrastructure in Australia and New Zealand traditionally involved a bottom-up approach of targeting safety improvements at locations with an established problem. This is commonly delivered through crash reduction programs, black-spot and black route analyses and treatments. Without a Safe System focus, the ability to achieve safety benefits using this approach will become increasingly difficult in the long-term (ITF, 2008) (Figure 1).

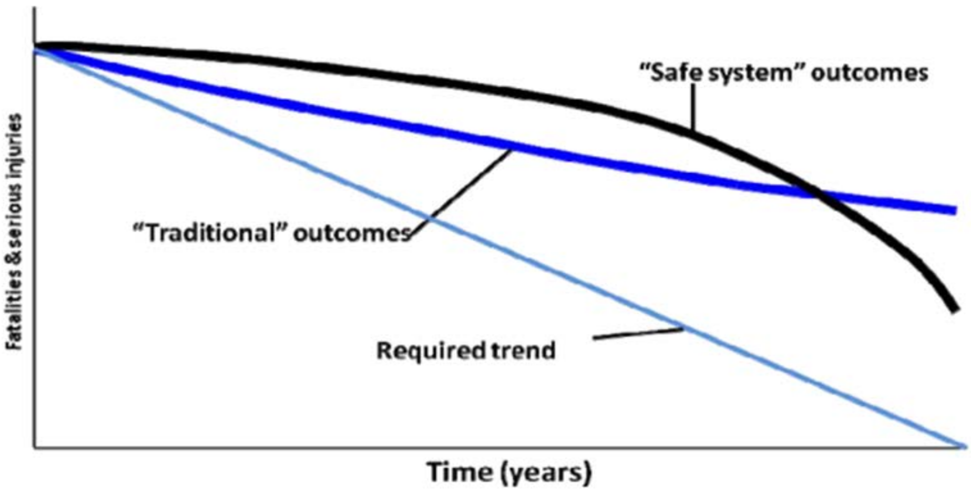

Figure 1. Interim and longer-term performance possibilities (source: ITF 2008)

To achieve enduring longer-term reductions in road trauma, there is a need for Road Safety Infrastructure Programs (RSIPs) to move towards the Safe System approach. This paper presents the results of an Austroads research project to identify the best practice principles for achieving this within RSIPs.

Methodology

The first stage of the research involved consultation with representatives from each Australian and New Zealand state jurisdiction, as well as the Australian federal government. The purpose was to gain an appreciation of how each jurisdiction develops and delivers RSIPs, and to understand the strengths and weaknesses in their approaches.

The second stage of the research involved a literature review targeted at identifying 'best practice' across Australia, New Zealand and internationally.

The final stage involved developing a set of best practice principles which were then refined through two consecutive stakeholder workshops.

Best Practice Guidance

To help understand the RSIP development and delivery process, the best practice recommendations are broken into six stages (Figure 2).

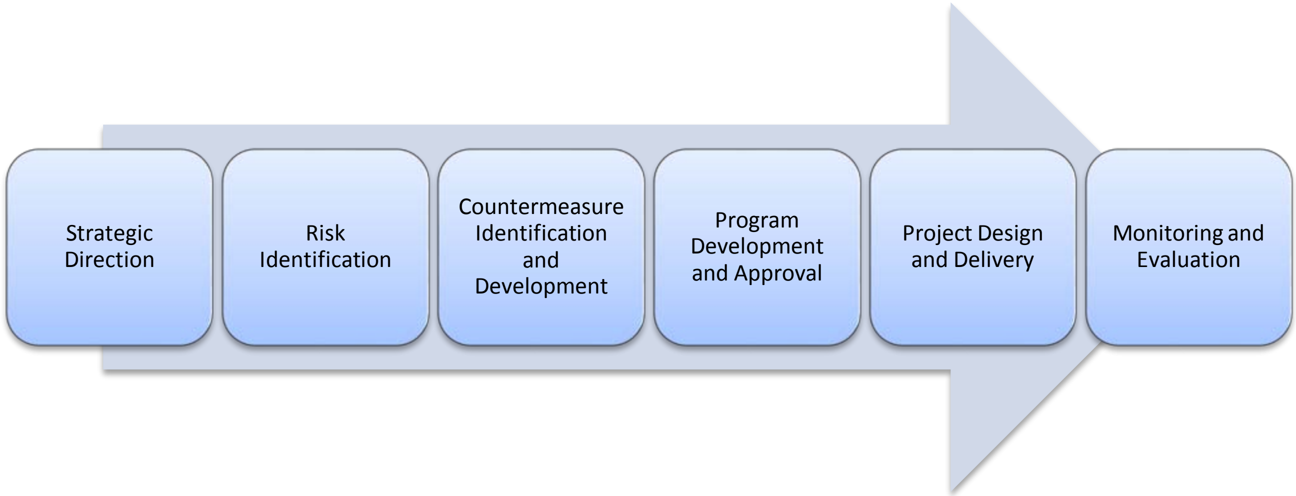

Figure 2. Stages of RSIP development

A total of 34 principles were identified. A sample of these are presented in Table 1.

Table 1. Example RSIP Best Practice Principles

RSIP Stage	Best Practice Principle (example)
Strategic Direction	The highest level strategic documents are based on Safe System principles and set ambitious targets and aspirational outcomes for road safety.
Risk Identification	Risk analysis needs to be completed at a network level, including local roads, for the purposes of prioritising investigation and investment decisions.
Countermeasure Identification and Development	Risk analysis information needs to be shared with those tasked with identifying and developing countermeasures. Direction should also be provided around where to focus efforts.
Program Development and Approval	Funding allocation within the program needs to reflect both the scale of problem and level of investment required to reduce risk. A clear rationale should be provided for the funding of sub-programs.
Project Design and Delivery	Projects should go through a road safety audit at the design stage.
Monitoring and Evaluation	Monitoring and evaluation should be a requirement of all programs, and consider process evaluation, short-term indicators, longer-term risk reduction outcomes and the performance of the wider program.

Recommendations

The following recommendations are suggested in the research:

- Jurisdictions should implement this guidance by evaluating their RSIPs against the best practice guidelines and identifying for improvement.
- A program be set up to regularly review the guidance principles and benchmark jurisdictions against them.
- Undertake further work to embed Safe System principles into strategic Austroads documents.
- Investigate how the best practice principles could be applied in other types of road infrastructure programs.

Reference

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Older drivers may not have a greater risk of intersection crashes than drivers in younger age groups

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Abstract

Crash patterns for older drivers/riders were examined using ten years of crash data from New Zealand and every jurisdiction in Australia. Consistent with the literature, older drivers/riders had a higher proportional rate of intersection-type crashes. However, once population numbers and numbers of licensed drivers were controlled for, older drivers/riders were not found to have a higher rate of intersection crashes than those in younger age groups. Intersections do not pose any greater risk of a crash to older adults. Nonetheless, given their frailty, intersection safety measures are still needed to improve safety for older drivers/riders.

Background

It has been argued previously in the literature that older drivers are over-represented in multiple vehicle collisions at both uncontrolled and sign-controlled intersections and in crashes in which they are undertaking turning manoeuvres, especially when turning across oncoming traffic (e.g. Daigneault, Joly & Frigon 2002; Ryan, Legge & Rosman 1998).

However, it is also known older drivers do not make a large contribution to the road toll, largely due to lower exposure than younger people. Even when population numbers and the number of licensed drivers in different age groups are controlled, the crash rates of older drivers tend to be lower than those for drivers in younger age groups (e.g. Thompson et al. 2010).

This study was designed to assess whether the purported increase in the risk of intersection crashes among older drivers is real, or whether the incidence of such crashes is merely proportionally higher among the older age group but still occurring at a low rate compared to that for younger drivers. This was assessed by comparing older drivers with those in younger age groups for the rate of intersection crashes per head of population and per licensed driver, using data from a number of Australian jurisdictions.

Method

Data were collected from the relevant road agencies in New Zealand and every Australian jurisdiction for all road crashes that resulted in an injury or fatality to any crash participant, and that occurred in the years 2003 to 2012. Population data for each jurisdiction were obtained for the relevant years, while the numbers of licensed drivers and motorcyclists were obtained from two jurisdictions: Victoria and South Australia. Crash type was based on the Definitions for Coding Accidents (DCA) codes or Road User Movements (RUM) codes contained in the jurisdictional crash databases.

Results

There was a total of 16,618 fatal crashes and 734,196 injury crashes, involving 1,149,075 active crash participants who were aged under 60 (87.9%), 113,646 aged 60 to 74 (8.7%), and 43,950 aged 75 or more (3.4%).

Table 1 shows the percentage of crash types for drivers/riders in different age groups. It can be seen that older drivers/riders are over-represented in 'Vehicles adjacent' and 'manoeuvering' crashes.

Table 1. DCA Groups for crash-involved participants in Australia, excluding South Australia, 2003 to 2012, excluding pedestrians and bicyclists, by active participant age (%)*

DCA group	0-59	60-74	75+
Pedestrian	5.32	6.08	5.93
Vehicles Adjacent	16.40	21.92	27.96
Vehicles Opposite	16.53	18.50	19.69
Vehicles Same Direction	37.04	32.73	21.79
Maneouvring	4.03	5.25	8.52
Overtaking	1.14	1.09	0.61
On Path	2.39	2.06	2.36
Off Path - Straight	10.69	8.10	9.13
Off Path - Curve	6.08	3.85	3.72
Passengers and Misc	0.38	0.41	0.29
Total	100.00	100.00	100.00

*no DCA codes available for SA

Table 2 shows the crash rates for 'vehicles adjacent' and 'manoeuvering' crashes in Victoria after adjusting for the number of licensed drivers/riders. It can be seen that, after adjustment, the over-represenation is no longer evident.

Table 2. DCA Groups that increase among those aged 75 or more, expressed as rates per 1,000 licence holders for Victoria, 2003-2012, by age group

DCA group		0-59	60-74	75+
Vehicles Adjacent	Proportion (%) of age group crashes	17.23	22.95	27.86
	Crashes 2003 to 2012	34,457	4,628	2,126
	Average crashes per year	3,445.7	462.8	212.6
	Average annual licence holders	2,798,100	554,390	209,320
	Annual crash rate per 1,000 licence holders	1.23	0.83	1.02
Maneouvring	Proportion (%) of age group crashes	3.75	4.92	6.87
	Crashes 2003 to 2012	7500	993	524
	Average crashes per year	750.0	99.3	52.4
	Average annual licence holders	2,798,100	554,390	209,320
	Annual crash rate per 1,000 licence holders	0.27	0.18	0.25

A similar analysis was undertaken using population data. For both vehicles adjacent and manoeuvering crashes, those aged 75 or more have a lower crash rate per head of population than those aged under 60 in five of the seven jurisdictions.

Conclusions

Older drivers do not have a higher rate of intersection-type crashes than younger drivers. Nonetheless, when they do crash, their likelihood of injury is high, so infrastructure treatments to make intersections safer for older drivers are still important. Some of these will be described in the full paper.

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Crash data – when it's wrong, are we putting more lives at risk?

Graham Orr, Lisa Lovegrove, and Rick Mackenzie

Port Stephens Council

Abstract

Port Stephens Council in NSW, is proactive in road safety and is evident by Council's award winning educational programs & civil projects. Local Government relies on accurate data to review and design treatments that aid in the reduction of casualty crashes on local roads.

Council is increasingly concerned over misreporting of crash locations within our LGA in official records and is questioning how widespread the issue is?

Misreported crashes, unless corrected, can be a domino effect of treatments in the wrong location to treat nonexistent crashes and at worst, misappropriation of Government funding in this critical area of national focus.

Road Safety Issues

Firstly, as a fellow stakeholder in Road Safety, Council is not critical or unaware of the Police task at a crash scene and the stressful situations that have to be faced in the line of duty. Port Stephens is part of two Local Area Commands and issues highlighted are not exclusive to either area. What we are stressing is that the accuracy of information is crucial in prevention of further incidents at or near that location if an engineering solution can contribute to future gains in road safety.

In NSW, crash data is supplied by Police to RMS who then make the information available to stakeholders and the public. Councils use the data and local knowledge to assess locations for road improvement and for applications to Federal and State funding agencies for road safety projects.

Council's own investigation of the serious crash locations is undertaken to check possible road related factors on local roads. In too many cases Council contacts Police or RMS to ensure the data is correct on official fatal crash report or serious injury data. If this is not done, from our experience, data goes on unchanged over many years. As a result, historical crash data for the most recent five years that is used for funding of major projects can remain corrupted.

Port Stephens Council is questioning if the process of official logging of an event by generation of a latitude and longitude location through descriptions such as a RUM code and location descriptions such as '2km west of Pacific Hwy' as an example, has out lived its usefulness? When analyzing crash data, these generic distances from intersections raise accuracy concerns immediately. Stakeholders in road safety may be aware of this issue. Over the years at forums and conferences the discussion of accuracy leads to a story of a 'trial of GPS locator where the crashes were recorded in the police station', this urban myth has run its course when the technology exists on any device to give a latitude / longitude position including the NSW State Government's promoted Emergency + application for mobile phones.

Port Stephens Council has accumulated data and case studies of misreported crashes that we are aware of, to assist accuracy of RMS / Police data official records (example on next page).

Year	Crash Severity	Crash #	Date	Street	Suburb	Road	Distance from FCR crash location to actual location (metres)	PSC Advice on locatio To RMS / Police	Data corrected Yes / No @ 15.2.18
2017									
	Fatal Crash	1144147	1.8.17	Pacific Highway	Kings Hill	State	1600m	Yes - Feb 2018	No
	Fatal Crash	1130397	16.3.17	Clarencetown Rd	Woodville	Local	1700m	Yes - Mar 2017	Yes
2016									
	Fatal Crash	1122704	12.12.16	Newline Rd	Raymond Terrace	Local	450m	Yes - Jan 2017	No
	Fatal Crash	1107987	21.7.16	Nelson Bay Rd	Bobs Farm	State	400m	Yes - July 2016	Yes
	Fatal Crash	1095184	8.3.16	Tomago Rd	Tomago	State	1270m	Yes - Mar 2016	Yes
2014									
	Fatal Crash	857706	13.1.14	Port Stephens Dr	Anna Bay	Local	530m	Yes - Oct 2017	Yes - Police database only
2013									
	Fatal Crash	845739	23.9.13	Paterson Rd	Woodville	Local	RUM incorrect	No	No
	Serious Injury	856381	23.9.13	Clarencetown Rd	Seaham	Regional	510m	Yes - Jul 2017	No
2012									
	Fatal Crash	782399	18.3.12	Richardson Rd	Campvale	State	900m	Yes - Mar 2012	No
	Serious Injury	785303	20.2.12	Port Stephens Dr	Anna Bay	Local	370m	Yes - Aug 2017	Yes - Police database only
2010									
	Serious Injury	734303	9.11.10	Gan Gan Rd	Nelson Bay	Local	900m	Yes - 2014	No
2006									
	Fatal Crash	F06344	3.9.06	Mustons Rd	Karuah	Local	750m	Yes - 2007&2009	No

Port Stephens Council- Serious Crash Location Records: 2006 – 2017

One of these crashes listed had the property address of the fatal crash in the thorough Police narrative, which occurred in front of the driveway, and still was recorded as over 1 km in the wrong direction from the nearest cross street. This example raises questions such as, is the initial reported location by the public becoming the official crash location with a post generated latitude and longitude?

Port Stephens Council is concerned that the issues raised seem to be increasing regardless of available technology and is asking these questions to promote conversation that leads to a process change that benefits road safety for all our communities.

Self-reported response to a licensing point system

Julie Hatfield[a], Teresa Senserrick[a], Soufiane Boufous[a], Ann Williamson[a], Lori Mooren[a], Chika Sakashita[b], R.F. Soames Job[c]

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[b] Global Road Safety Solutions (GRSS) Pty Ltd
[c] World bank

Abstract

An online survey of New Zealand car license holders was conducted to advance understanding of how individuals respond to licensing points. Results suggest that there are that the majority of drivers aim to drive in a manner that avoids demerit points. The smaller group of drivers who drive more carefully when they have a few points, are perhaps the primary target of licensing point systems, and may be responsive to system refinements such as increasing the number of points that apply to particular offenses and increasing the points lifetime). A small minority of drivers report that they are not influenced by demerit points, at least in part because they are prepared to drive with a suspended license.

Background

Licensing point systems (LPSs) are used in many countries to reduce repeat offending. Population-level evaluations suggest a moderate (and possibly short-lived effect) of implementing an LPS.

Objective

To extend the small body of research that has considered individuals' response to licensing points.

Methods

Potential participants were randomly selected from a market research company survey panel to achieve a representative sample of New Zealand (NZ) car license holders aged 17 years and above. Of 9,193 invited panel members 999 responded to a 15-minute on-line questionnaire assessing knowledge of, attitudes toward, and experiences with the NZ LPS.

Findings

Around 90% of respondents reported currently having no licensing points, while around 60% reported never having had any. Nearly 90% of respondents who have had licensing points received them for "exceeding the speed limit". Among 19 respondents who had ever had their license suspended due to licensing points, "driving over the legal blood alcohol limit" became a more prominent source of points. Almost half of these respondents reported driving while suspended.

Nearly all respondents indicated that license suspension would be a problem, and 80% of reported driving to avoid receiving licensing points. A further 18% reported changing their driving when they have "a few" points, and 2% reported not being influenced by license points.

Logistic regression analysis was conducted to to examine whether motorists who had ever had licensing points might differ from motorists who had not; both in terms of factors that may contribute to receiving licensing points or factors that may be influenced by having had licensing points (sex, age, ethnicity, rurality of residence, highest education, household income, motoring experience, license type, motoring for work, knowledge of the LPS, perceived likelihood of detection, perceived severity of suspension, attitude to points). Ever having points was more likely for respondents who held a motorcycle license, were male, were in the middle age bracket (compared to the highest age bracket), and who change their driving when they have a few points (compared to respondents who reported driving to avoid getting any).

Conclusion and policy implications.

Notwithstanding issues associated with self-report, this survey suggests that most NZ drivers drive to avoid getting any license points, while about 20% drive more carefully when they have a few points. The latter may be most influenced by changes to increase the impact of speeding on their license point balance; such as increasing the number of points that apply particularly to low level speeding, and increasing the points lifetime. The most serious recidivist offenders may be beyond the reach of the licensing point system because their driving is influenced by issues beyond its scope (such as problem drinking) and because they are prepared to drive while suspended.

Partnering for Road Safety at Level Crossings: New South Wales Traffic and Highway Patrol Command

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Traffic and Highway Patrol Command
New South Wales Police Force

Abstract

Between April 2012 and January 2018, three vehicle occupants died in crashes with trains at level crossings (LX's) in NSW. Some 2,000 lives were lost in all road crashes over the same period.

LX crashes may be low likelihood, but the consequences are extreme. On 4 January 2018, 19 people were killed when a truck ploughed into a passenger train in South Africa.

How then can authorities apply safe systems thinking to drive behavioural change?

Working with an expanding range of partners, NSW Police Traffic and Highway Patrol Command leads LX programs and initiatives that go well beyond enforcement.

Towards Zero and Level Crossings

New South Wales Police Force (NSWPF) is responsible for enforcing level crossing road rules. The development of the following strategies represent a departure from the siloed E's approach to road safety.

Level Crossing Awareness and Enforcement Campaign (LXAEC)

Since 2011, Traffic and Highway Patrol Command (THPC) has partnered with Transport for New South Wales (TfNSW) to deliver the LXAEC. Until it began, an average of one person each year died in crashes between road vehicles and trains in NSW which has 1,400 public road LX's.

The LXAEC delivers 3-4 localised campaigns each year. Site selection criteria includes crashes, offence data (disobey LX controls) and "near miss" reports. Local Councils, regional RMS and rail infrastructure managers also assist.

TfNSW and NSWPF generate local public awareness using media releases, radio interviews with police, variable message signs at target sites and letterbox drops. Messaging is aimed squarely at local drivers who are most likely to disobey level crossing controls near where they live.

The hashtag, #TrainYourselfToStop, was devised by an Albury Highway Patrol officer who won an internal competition.

Public awareness is reinforced by two weeks of highly visible TfNSW-funded enforcement where Highway Patrol and generalist police detect and deter offences at target LX's. Since 2017, the commencement of the enforcement phase of the campaign has been publicly annonounced via a media/press conference that is held in local towns adacent to a targeted level crossing. Speakers include police and local high-profile officials such as the Mayor.

NSWPF and TfNSW have learned a lot about driver behaviour at LX's since 2011. For example, the new target behaviour for 2017-18 is speeding near LX's. This is a particular road safety issue where there is an “S” bend at the LX and follows cases in 2016-17 where vehicles crashed negotiating these bends including a fatality. Distracted drivers using hand-held phones are also targeted.

In 2015, Deloitte reviewed the engineering, educational and enforcement interventions carried out in NSW and determined the benefit to cost ratio of the LXAEC to be 7:1.2.

NSWPF Social Media

As of 23 January 2018, the THPC Facebook page had 352,000 “likes”, a figure increasing by 500 each week. The monthly reach of the page is over 2.7 million. In addition, the NSWPF Facebook page has over one million “likes”. These metrics are capitalised on through regular posts on LX safety. The Centre for Road Safety has also used social media to promote LX safety initiatives.

There is a public appetite for the strategic use of social media promoting LX safety.

Pacific National

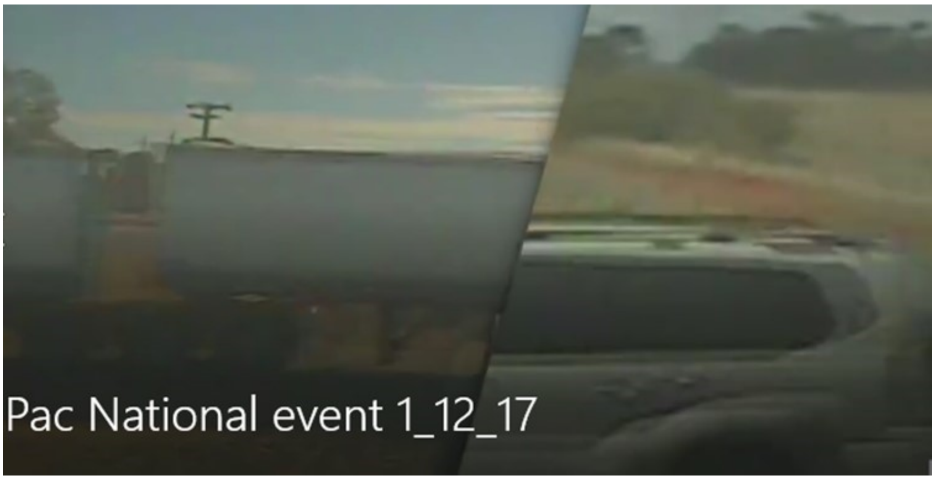
During 2017, a series of LX crashes impacted Pacific National trains. THPC approached the company who partnered to deliver a joint media event, highlighting the risks faced by their train drivers at LX’s. This is the first time that THPC had engaged with a private train operator.

Pacific National released video from forward-facing cameras fitted to locomotives, featuring vision of two crashes involving the same driver, that occurred only weeks apart. It was dramatic footage of LX crashes which has unavailable from government rail operators or infrastructure managers.

The event on 1 December 2017 received national coverage and an estimated social media reach into the millions.

THPC and Pacific National continue to explore partnership opportunities. On 18 May 2018, police organised a *safe systems* site inspection at Mitchell Avenue Kurri Kurri that had been the site of two crashes in a short space of time. As a result of that inspection, stakeholders agreed to a short-term program of works at the site including signage and road markings with a view to incudling the site in the 2018-19 LXAEC.

Figure 1. Seeing double: Vision from the Locomotive from Pacific National.



Conclusion

These initiatives are global best practice and have brought Safe Systems thinking to this often overlooked area of road safety.

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Adults' experience of safety issues when riding with children

Julie Hatfield [a], Roslyn Poulos [b], Susanne Murphy [b], Chris Rissel [c]

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Abstract

Supporting children to develop a habit of bicycle riding helps to protect them against a range of diseases associated with inactivity. An online survey of adult bicycle riders was conducted to advance understanding about safety issues of riding with children. A large majority of respondents who reported riding with children specified risks particular to riding carrying, or riding with, children. Many respondents highlighted risks associated with riding on footpaths but reported that they avoid riding on roads with children. Among crashes with a child on the bicycle, most were falls, and "tagalong" carriers appeared to be overrepresented. Findings suggest the importance of communicating with parents about safety issues that they may encounter when riding with children, and highlight the importance of providing environments which can safely accommodate the characteristics of bicycles carrying children (in terms of stability and handling) and bicycles ridden by children (with their developing capacities).

Background:

Supporting children to develop a habit of bicycle riding helps to protect them against a range of diseases associated with inactivity (including obesity and cardiovascular disease). Children often begin by riding with their parents - in a carrier on the adults' bicycle (e.g. child carrier seat, trailer, tagalong, cargo box) and/or, later, on their own bicycle accompanied by an adult.

Objective:

To extend the relatively small body of information about safety issues of riding with children.

Methods:

The Safer Cycling Study involved 2038 adult bicycle riders from New South Wales Australia reporting on aspects of their riding over one year. One of their on-line surveys included questions about riding with children.

Findings:

Among the 184 participants who had ridden with children on their bicycle, 80% specified risks particular to riding carrying children; including instability associated with child seats, changed handling due to increased weight, and reduced manouvreability due to increased width and/or length. Among crashes with a child on the bicycle, most were falls, and "tagalong" carriers appeared to be overrepresented. Among the 345 participants who had ridden to accompany a child on a bicycle, 75% specified risks particular to accompanying children, such as managing the child's limited skill, awareness, and predictability. Many respondents reported that they avoid riding on roads with children (including carried on the adult bicycle), but also highlighted risks associated with riding on footpaths (e.g. driveways, poor surface condition).

Conclusion and policy implications:

Findings highlight safety issues that parents may encounter when riding with children, and suggest that communication about these issues and strategies to address them may improve safety. Findings also highlight the importance of providing environments which can safely accommodate the characteristics of bicycles carrying children (in terms of stability and handling) and bicycles ridden by children (with their developing capacities).

Road Safety Benefits of Level 3 and Level 4 Connected and Automated Vehicles and Fleet Transition

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[a]Transport Accident Commission, [b] VicRoads SSRIP, [c] Monash University Accident Reserach Centre

Abstract

The road safety benefits of Connected and Automated Vehicles (CAVs) will likely be significant. However, there is much debate around the risk of trauma during the transition to this future. A topic that is the subject of the most divided opinion is if there is a need to transition through all the levels of automation. Some experts suggest that there is a need to 'skip' some levels (Noy, Shinar, & Horrey, 2018) while others have suggested all levels are required for the best outcome (Ma & Kaber, 2005). This research examines these two views using real world data.

Background

Since the first Connected and Automated Vehicles (CAVs) began testing there has been debate around the potential benefits or dis-benefits of their introduction (Marçal et al., 2017; Milakis, van Arem, & van Wee, 2017; Noy et al., 2018). One of the most debated subjects of the road safety impacts of CAVs is around road trauma during the transition to a 'fully' automated fleet.

The Society of Automotive Engineers (SAE) definitions for the levels of automation (SAEInternational, 2016) are the most widely used. The figure below is an illustrative example of these.

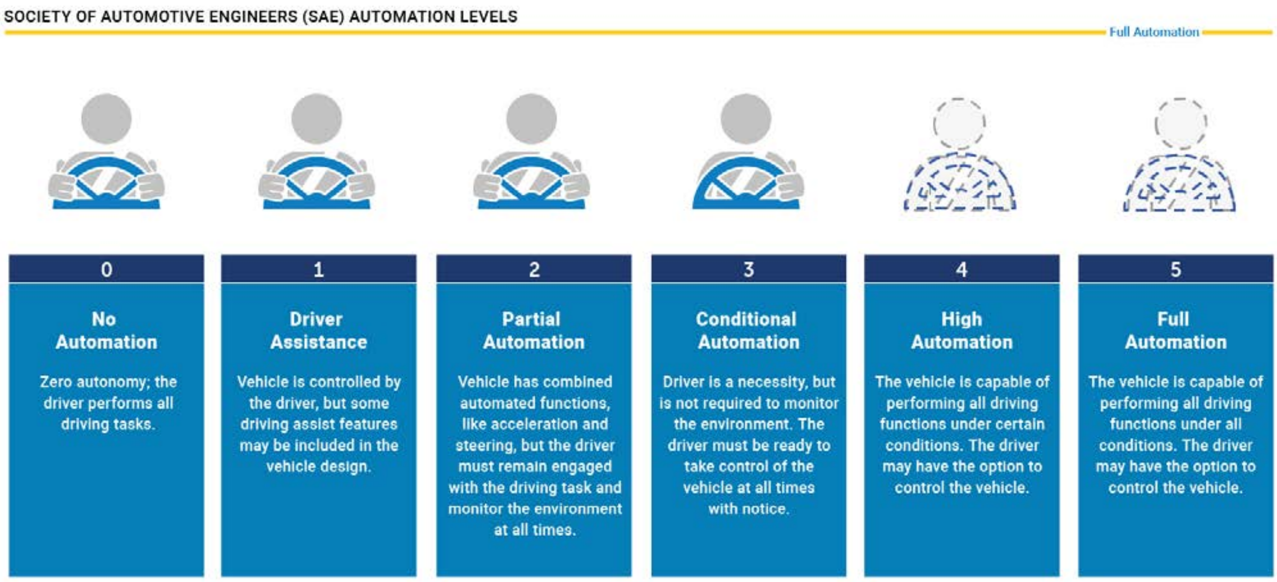

Figure 1. SAE Levels of Automation (NHTSA, 2018)

The Level 3, or conditional automation, stage of vehicle technology is the stage of most concern. At this level there is a need for drivers to intervene or take control of a vehicle in order to avoid or reduce the severity of some crashes (Noy et al., 2018). This research focusses on the question as to *whether we should allow Level 3 vehicles onto the road network or if restrictions should be put in place on the use of these vehicles?* The consequence of such an action being that the public would have to wait for Level 4 vehicles to realise road safety benefits. Some Original Equipment Manufacturers, including Volvo, have already publicly stated they will skip Level 3 automation while others including Audi and BMW have announced the release or impending release of their Level 3 vehicles.

Currently little evidence based research has been presented. Researchers have instead presented subjective views as to what the likely road trauma benefits and dis-benefits of each path will be. This study aims to provide an evidence based estimate of road trauma outcomes of these two case. This is needed to inform the decision of vehicle safety advocates. The objective of this study is to be the first detailed assessment of road trauma which addresses this need.

Method

The TAC has access to a comprehensive database of crashes. This study makes use of this data to hypothesize the potential road safety outcomes for the two scenarios introduced above. The methodology for quantifying outcomes is as follows:

Qualitative review of crashes

A panel of road safety experts review crashes in the proposed data set using their understanding of crash causality and the likely systems present at Level 4 and Level 3. This review will identify which fatalities could have been prevented by the introduction of technology.

Comparison against research evidence

The outcomes of this assessment is compared against real world evidence of crash rates associated with automated vehicles.

Forecasting of scenarios

Timelines for the two transition cases are defined which include consideration of:

- Likely timeframe for introduction of level 3 and 4 technologies;
- Impact of vehicle turnover on introduction of vehicles into the fleet; and
- Potential sensitivity testing around the above factors;

Forecasting of benefits for each scenario

The outcomes of the assessments are overlaid to produce a theoretical estimate of the road trauma for the case where Level 3 is skipped or permitted.

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Road traffic infringements and crash risk: Is there evidence of a deterring influence?

Hayley McDonald[a], Janneke Berecki-Gisolf[a], Karen Stephan[a] and Stuart Newstead[a]

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Abstract

This paper presents the results of a case-case-time-control study that aimed to determine whether infringements for traffic offences have a deterring influence on driver behaviour, measured by crash involvement. Licensing, infringements and crash data from Victorian drivers aged 40+ was used. The risk of receiving an infringement in the period prior to a crash was higher than in a comparable period. Infringements may not be effectively changing driver behaviour, and thus reducing the risk of crash involvement. Other approaches to changing driver behaviour may be necessary in order to enhance safety on the roads.

Background

If identified, a person who performs an illegal driving behavior, such as speeding, may receive a traffic infringement. These infringements have a specific deterrence aim, meaning they seek to change the individual's patterns of behavior (McLaughlin, 2006; Muncie, 2004). Whilst looking at whether drivers receive further infringements can be used as an indicator of deterrence, research has also used subsequent crash involvement as an indicator, given risky driving can contribute to crashes (Penmetsa & Pulugurtha, 2016).

Previous studies have used a case-crossover approach to examine crash risk in the period that follows a traffic infringement (Redelmeier, Tibshirani, & Evans, 2003; Walter & Studdert, 2015). These studies revealed differing results, thus, it remains unclear whether traffic infringements are effective in reducing crash risk.

Methods

Using driver licence number, we linked VicRoads licensing, crash and infringements data for drivers aged 40+, to examine the association between infringements and crashes.

We used a case-case-time-control design, an extension of the case-crossover approach. The case-case-time-control design uses a case group who experience an outcome of interest, and a control group who experience the same event in the future (Wang et al., 2011). The odds of being exposed to a risk factor in two time periods are calculated for each group, before comparisons are drawn (Wang et al., 2011). By including future cases as controls, we are able to deal with reverse causation and differences in trends between the groups (Hallas & Pottegard, 2014).

Our event of interest was a crash. Exposure to an infringement was the risk factor. The case group were drivers who crashed between 2010-2012 and received an infringement in either the 30 days prior to their crash (event period), or the same 30 day period the year prior (reference period). The control group were drivers who crashed between 2013-2015. For consistency, the event and reference periods for the control group were the same as those for the case group. Once again, drivers had received an infringement in either period, but not both. Figure 1 provides a visual representation of the study design.

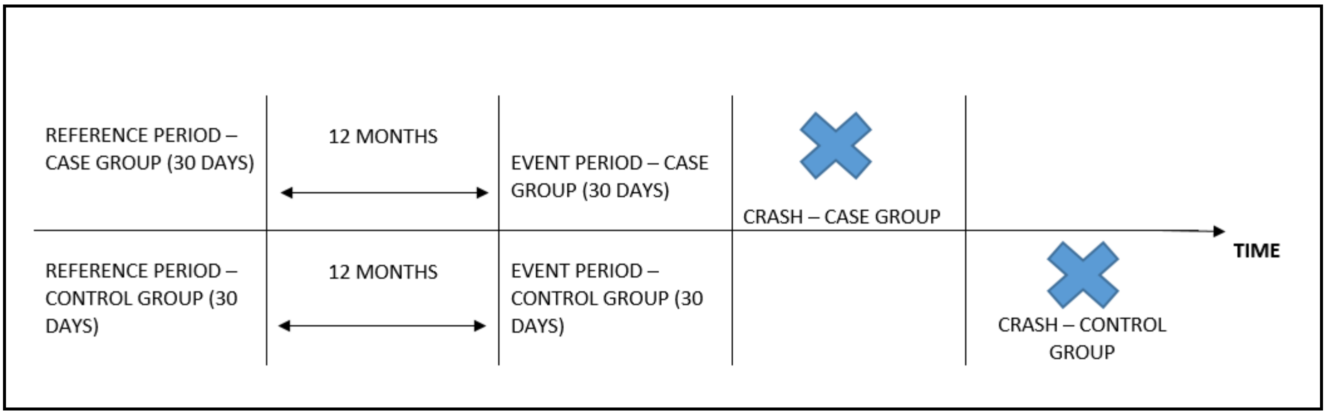

Figure 1 Visual representation of the case and control groups and study periods

Results

The case and control groups were compared on a number of key indicators, as shown in table 1. Chi-Squared tests were carried out on the age and gender variables, with no significant differences found. Results on other key indicators were also consistent between the groups (Table 1).

Table 1 also shows the period in which drivers in the case and control groups received their traffic infringement/s. The odds of receiving an infringement during the event period was 35% higher than in the reference period for the case group, adjusted for the change over time in the control group (Odds Ratio = 1.35, 95% CI 1.17-1.56, $p<0.0001$).

Table 1 Characteristics of case and control group drivers

	Case Group (n=1647)	**Control Group (n=1328)**
Gender		
Male	1038 (63%)	807 (61%)
Female	605 (377%)	521 (39%)
Unknown	4 (0%)	0 (0%)
Age at end of event period		
40-49	705 (43%)	567 (43%)
50-59	517 (31%)	426 (32%)
60-69	274 (17%)	224 (17%)
70-79	108 (7%)	86 (6%)
80+	43 (3%)	25 (2%)
Infringement Type		
Speeding (<25km/h)	1423 (78%)	1146 (81%)
Traffic light offences	169 (9%)	163 (12%)
Failure to stop/give-way	46 (3%)	4 (<1%)
Mobile phone offence	42 (2%)	40 (3%)
Seat and seatbelt offences	25 (1%)	17 (1%)
Careless driving	19 (1%)	7 (1%)
Overtaking, lane use and u-turn offences	17 (1%	9 (1%)
Speeding (25km/h+)	13 (1%)	8 (1%)
Alcohol offences	5 (<1%)	5 (1%)
Drug offences	4 (<1%)	1 (<1%)
Other	57 (3%)	7 (1%)
Crash Severity		
Fatal injury	6 (<1%)	8 (1%)
Serious injury	203 (12%)	162 (12%)

Other injury	513 (31%)	427 (32%)
Non-injury	925 (56%)	731 (55%)
Crash Type		
Collision with another vehicle	1355 (82%)	1124 (85%)
Struck pedestrian	123 (7%)	70 (5%)
Struck animal	4 (<1%)	4 (<1%)
Collision with fixed object	122 (7%)	98 (7%)
Collision with other object	2 (<1%)	3 (<1%)
Vehicle overturn	17 (1%)	18 (<1%)
Fall from.in moving vehicle	6 (<1%)	1 (<1%)
No collision and no object hit	17 (1%)	10 (1%)
Other accident	1 (<1%)	0 (0%)
Period Received Infringement		
Event	910 (55%)	634 (48%)
Reference	737 (45%)	694 (52%)

Conclusions

Consistent with the result found by Walter and Studdert (2015), we found crashes were more likely following infringements, indicating they may not be having the desired deterrent effect. There may be a need to develop other strategies to respond to drivers who perform illegal driving behaviours, in attempts to reduce the risk of subsequent crashes.

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Exploring the effectiveness of different types of humour in road safety advertising campaigns

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Abstract

Recently, in Australia, road safety advertising campaigns reflect an increased reliance upon messages that incorporate positive emotions including humour. Evidence, however, is lacking regarding the extent to which different types of humour are associated with persuasive (or dissuasive) effects. This study, based on an in-depth qualitative investigation with N = 18 licensed drivers, addressed this gap by exploring the effectiveness of different types of humour. The findings revealed that humour that was clever, incorporated something unexpected and contrasting with the everyday, was a preferred and relevant approach, thus aligning with humour types, such as comic wit and satire.

Background

Recently, in Australia, humorous messaging has been used increasingly in road safety advertising campaigns. This increased use aligns with evidence which has shown that high risk road user groups, such as young males, may be more likely to adopt the recommendations of a humorous message relative to more traditional approaches based on threat and fear (Lewis, Watson, & White, 2008; Lewis, White, Ho, Elliott, & Watson, 2017). Somewhat surprisingly, however, evidence is lacking regarding the extent to which different types of humour are associated with persuasive effects. This gap in knowledge is problematic given that classifications of humour refer to there being different types of humour (Speck, 1991) and that the use of an inappropriate type of humour may be associated with dissuasive effects (Lewis, Watson, White, & Tay, 2007). Similar to threat-based approaches and evidence which suggests that not all messages classified as 'fear appeals' evoke fear in individuals (Dillard et al., 1996), it could be expected that not all messages classified as 'humorous' may elicit amusement. Of the studies which have explored the persuasiveness of humorous messages, often the type of humour being investigated is not defined, thus, rendering conclusions ambiguous regarding the role and effectiveness of different types of humorous messages. This study addressed this gap in knowledge by exploring the effectiveness of different types of humour in accordance with Speck's (1991) classification of humour types in regards to road safety advertising.

Method

A qualitative study was conducted that involved discussions with licensed drivers from Queensland (N = 18; n = 10 males) aged 17 years and over. Participants were offered $AUD40 to thank them for their time.

The discussions were guided by a semi-structured interview schedule which explored individuals' responses about humorous road safety messages in general as well in response to a selection of five pre-existing road safety advertisements which were chosen by the researchers as some examples of different types of humour. All discussions were audio-recorded, professionally transcribed verbatim, and analysed using thematic analysis.

Results and Discussion

Overall, the findings support the need to recognise that there are different types of humour and, thus, that there is value in adopting a conceptualisation of humour, such as Speck's (1991) typology. The findings revealed that, irrespective of an individuals' age and gender, humour that was clever and incorporated something unexpected and contrasting with the everyday was a preferred and relevant approach, thus aligning with incongruity-based theories of humour generation and humour types, such as comic wit and satire. Participants reported that humorous mesages may influence a message's persuasiveness because such messages may be talked about and relatively more so than traditional fear-based approaches. Participants also believed that humour would need to be used cautiously as humour that was considered inappropriate and/or associated with serious occurrences, such as a crash, would be unlikely to persuade.

Conclusions

To the extent that humour is being increasingly used in road safety advertising campaigns, it is essential that more is understood about the role and effectiveness of different types of humour.

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Developing the Motorcycle Clothing Assessment Program

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Abstract

The Motorcycle Clothing Assessment Program (MotoCAP) has been established as an Australian/New Zealand program to provide motorcycle riders with an independent assessment of the relative performance of their garments for thermal comfort and protection. The protection rating is based on the garment's abrasion resistance, impact protection and burst strength. The program will enable consumers to select clothing based on performance, which is expected to drive demand for better-performing garments and result in increased supply and use of such garments on the road, thereby reducing trauma to motorcyclists.

Background

There are no regulations around the performance or design of motorcycling clothing in Australia. Consumers therefore lack independent assurance that the clothing they purchase will afford them appropriate protection, and are unable to compare relative protection when choosing between garments. As a result, industry has found it difficult to invest in better protective clothing while still remaining competitive against cheaper products.

The Motorcycle Clothing Assessment Program (MotoCAP) has been established in response to calls from motorcyclists, industry and safety advocates to provide greater information to consumers about the level of protection provided by motorcycling clothing. The program is overseen by a working group representing a large group of stakeholder organisations, including road agencies, Compulsory Third Party regulators, insurers and motoring clubs across Australia and New Zealand, as well as the Australian Motorcycling Council representing motorcyclists across the two countries.

The purpose of the MotoCAP rating scheme is to reduce trauma to motorcyclists by:

- informing the public of the relative performance of motorcycle protective clothing; which will
- increase demand for effective motorcycle protective clothing; thereby
- improving the supply of effective motorcycle protective clothing.

Details of the scheme

The MotoCAP scheme provides two separate star ratings, one for thermal comfort and one for protection. The protection rating is based on the garment's burst strength, impact protection and abrasion resistance. The thermal comfort rating is based on the garment's ability to prevent riders from overheating.

The working group has committed to testing 10% of the motorcycle protective clothing market. Garments are bought from randomly selected stores, with the most widely distributed stock sold in a store purchased for sampling.

Additional to this testing, industry may commission testing of their own products. Testing is commissioned through the MotoCAP working group and conducted independently, with garments selected randomly from the company's warehouse.

Developments to date

The MotoCAP working group commissioned Deakin University Institute for Frontier Materials (DUIFM) to conduct testing for a 12-month pilot program, which began in May 2017. During this period, testing and rating were carried out following the draft MotoCAP protocols, with results provided to industry stakeholders only. This was to allow industry sufficient lead-in time to prepare for the program by altering their manufacturing processes or selecting better-performing garments for import. To that end, DUIFM provided their services to industry at low cost so they could test their garments for an indication of likely performance once formally tested for MotoCAP.

During this period the draft rating protocols were revised to ensure that final ratings would provide a realistic and reliable indicator of relative safety.

A website is also being established at <motocap.com.au>. The website will provide:

- background to riders about the needs for protective clothing
- detailed information on how the tests are conducted
- star ratings on clothing performance
- more detailed information, such as a breakdown of performance in the tests and advice on water resistance.

Testing for the MotoCAP public launch began in July 2018. The MotoCAP working group anticipates that the MotoCAP website with the first results will be launched in September 2018.

Are Type-G Child Restraints (Large Forward-Facing Restraints with Inbuilt Harnesses) Safer than Booster Seats? A Preliminary Crash Test

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Abstract

Type-G restraints are a new type of child restraint designed for children from six months to approximately eight years of age. These restraints are perceived to be safer than booster seats because they are fitted with six-point harnesses. This paper presents the results of a single preliminary crash test comparing a Type-G restraint and a booster seat. The dummy seated in the Type-G restraint experienced greater forward head excursion, increasing the risk of possible contact between the occupant's head and the front seat or the centre console. Further tests are needed to validate the findings.

Background

Type-G restraints were introduced in the 2013 version of Australian/New Zealand Standard 1754, *Child restraint systems for use in motor vehicles*. These restraints are similar to Type-B forward-facing restraints but cater for older children. Australian child restraint laws require children aged four up to seven years to be secured in an approved forward-facing child restraint or booster seat. Children aged from seven to 16-year-old are strongly recommended to remain in approved booster seats until they are large enough to safely use adult seatbelts. Approved restraints that can accommodate older children are therefore a welcome addition to the market.

Type-G restraints are perceived to be safer than booster seats because they are fitted with six-point harnesses. However, no data on the comparative performance of Type-G restraints and booster seats are available. This test aimed to compare one Type-G restraint and one booster seat using a controlled crash test.

Method

Crash protection performance was examined using a full-frontal impact test. The test specifications are presented in Table 1 and test setup in Figure 1. The restraints selected were those that achieved the highest crash protection rating in their category under the Child Restraint Evaluation Program and with the least forward excursion for Type-G.

Table 1. Test specifications

Test vehicle	Mazda 3
Test velocity	56 km/h
Test dummies	Two P10 child dummies[a] – seated in each child restraint Two Hybrid III 50 th percentile dummies seated in front seats
Child restraints	• Five-star CREP rated booster seat in left-hand side • Three-star CREP rated Type-G restraint seat in right-hand side

[a]The P10 dummy represents an average 10-year-old child, or a large eight-year-old.

Figure 1. Test Setup (above) and head excursion results for dummy in Type-G (bottom right hand side) and dummy in booster seat (bottom left hand side)

Results

During impact, the dummy seated in the Type-G restraint exhibited contact between its head and both thighs. The dummy's knees impacted the rear of the driver's seat. The dummy seated in the booster seat did not show evidence of head contact with its thighs nor the front seat. There was evidence of light knee contact with the rear of the front passenger seat.

The dummy in the Type-G restraint demonstrated greater forward head excursion than the dummy in the booster seat (see Figure 1, two lower images. The maximum forward head excursion from the seat bight (intersection of seat cushion and seat back) was 669 mm for the Type-G and 517 mm for the booster seat.

It is important to point out that there was a difference in the seating positions of the two restraints due to differences in geometry and design. At test setup, the Type-G restraint sat further forward and higher than the booster seat. This contributed to the difference in forward head excursion.

A limitation of this research is that it involved a single test, with one of each type of restraint. Further tests using a wider range of Type-G restraints, vehicles and test protocols are needed to establish the safety implication of the difference in head excursion.

Conclusions

In this preliminary test, the Type-G restraint resulted in greater head excursion than the booster seat, increasing the risk of the occupant's head striking the front seat or vehicle console.

Though further tests are needed to establish whether the increased head excursion measured for the Type-G restraint is a significant safety issue, these results suggest that when using a Type-G restraint, safety may be improved by providing extra space in front, for example by moving the front seat forward. Type-G restraints are new designs, and may be improved through future development.

Using Evaluation to Drive Program Improvement: Permanent 40 km/h Speed Limits in High Pedestrian Activity Areas in NSW

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Abstract

An evaluation of permanent 40 km/h speed limits in NSW aimed to determine their effectiveness in preventing crashes and to guide future program implementation. Close collaboration between independent evaluators, commissioning staff and program managers helped focus the evaluation on important questions for program management, maximising the usefulness of evaluation results. A clear safety benefit was found, along with broad support from the community, practitioners and stakeholders. The evaluation recommended expanding the program to generate further safety benefits and improve urban amenity. Increased implementation of permanent 40 km/h speed limits will be considered in light of the findings.

Background

A central concept of the Safe System is that speed limits are set so that road user mistakes will not result in death or serious injury. The lowest speed limits are for environments where pedestrians and other vulnerable road users interact with motor vehicles. Above 30−40 km/h the risk of death or serious injury in a pedestrian crash increases rapidly.

Permanent (full-time) 40 km/h speed limits have been implemented in High Pedestrian Activity Areas (HPAAs) in NSW since 2003. The HPAA program helps fund traffic calming infrastructure in locations such as shopping strips, beachsides, and near railway stations and other services. Permanent 40 km/h speed limits have also been implemented in some residential areas.

The evaluation of permanent 40 km/h speed limits aimed to determine: their effectiveness in reducing casualty crashes; other impacts such as community amenity; whether they were appropriately located; whether the HPAA program had been designed and implemented effectively; and how future implementation might improve safety outcomes.

Approach

Previous work at the Centre for Road Safety (Wilkinson, Barnes & Walker, 2016) revealed that evaluation results were more likely to be used if the evaluation had a clear focus, if senior stakeholders were actively involved, and if commissioning staff and evaluators worked closely together. A reference group of senior program partners and managers was formed at an early stage to plan and oversee this evaluation. It formulated the evaluation questions, which focused on program improvements, and collaborated with the independent evaluators during all stages of the evaluation.

Evaluation methods included:

- crash data analysis, which looked at permanent 40 km/h speed zones and a comparison group of urban roads with 40−60 km/h speed limits
- workshops and interviews with practitioners and stakeholders

- an online survey with a representative sample of NSW residents
- consultation with other Australasian jurisdictions.

Key Findings

Statistically significant crash reductions occurred after implementation of 40 km/h HPAAs. These areas experienced almost double the reduction in casualty crashes compared to other urban roads between 2002 and 2015 (38% compared to 20%; Table 1). Notably, reduced casualties occurred for road users generally, not just for pedestrians. Analysis of the location of 40 km/h speed limits indicated that expanding coverage would be expected to generate further safety benefits.

There was a broad consensus among practitioners and stakeholders that lower speed limits also achieve other benefits, such as supporting pedestrian activity and urban amenity. The survey of NSW residents showed strong community support, with 78% of respondents at least moderately in favour of the 40 km/h limit on roads where lots of people are walking.

The evaluation recommended integrating speed management with urban planning to improve both road safety and liveability. It also recommended that program guidelines are updated to allow implementation in different road environments, while also providing consistent cues to road users.

Table 1. Crash reductions over time by crash type and area

Crash type (years compared)	**HPAA 40 km/h zones** (% reduction)	**Other permanent 40 km/h zones** (% reduction)	**Other NSW urban 40/50/60 km/h zones**[a] (% reduction)
All crashes (2002−2014)	40%*	35%	28%
Casualty crashes (2002−2015)	38%*	30%	20%
Pedestrian casualty crashes (2002−2015)	49%	46%	46%
Serious casualty crashes (2005−2015)[b]	33%*	11%	4%
Pedestrian serious casualty crashes (2005−2015)[b]	46%*	23%	19%

[a] Crashes identified by Police as occurring in a 40 km/h speed limit, which were not in identified HPAA or permanent 40 km/h zones, were included in this group. This includes school zones and roadwork zones.
[b] Serious injury data were only available from 2005 onwards.
* Reduction is statistically significantly greater than reduction on comparable 40/50/60 km/h roads in the rest of NSW (chi-square test at 5% level).

Program Changes

Expanding implementation of permanent 40 km/h speed limits in NSW will be considered in light of these findings. HPAA program guidelines will be revised to allow flexible implementation in different road environments while also providing clear cues for road users.

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"Driving" vs. Road Safety: A Grass Roots Exploration of the Salience of Road Safety

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Abstract

Road user behaviour and communications research typically interrogates micro-elements of road user attitudes and behaviour, often limited to a specific behavioural issue. Transport for NSW recently undertook research with a more "macro" perspective: a people-centric qualitative study to explore motorists' relationship with driving and how it fits into their lives. Automatic behaviours, mood and other everyday factors were found to influence the salience of road safety on a given journey, while situational factors acted as triggers for more conscious driving behaviours. Ultimately, road safety was not regarded as a "top-of-mind" concern in the complexity of modern life.

Background

Trauma on NSW roads continued to increase in 2017, with 392 lives* lost. Transport for NSW (TfNSW) launched Towards Zero as a goal, strategy and communications campaign in the prior year. While many communications initiatives were undertaken in response to the rising road toll, understanding of the salience and social importance of road safety in the community remained limited.

Previous qualitative research from mid-2016 suggested that there was a level of disengagement with the concept of road trauma and therein the broader, routine task of driving safely. This remained a key challenge in relation to growing community understanding of, and support for, the Towards Zero vision.

Aims and Methodology

TfNSW engaged Ipsos to undertake an exploratory research study to examine the underlying attitudes held by NSW drivers, seeking to identify the broad level of community engagement on road safety. Specific aims included:

- To explore the broader social context surrounding NSW.
- To understand external influences and pressures on driving behaviours in the context of weekly routines.
- To explore awareness, consideration and salience of road safety in daily life:
  - how and when road safety becomes relevant;
  - barriers which limit its prioritization; and
  - perceptions of normative road behaviours.

Ipsos proposed a methodological approach centred on in-depth interviews (n=24) but also incorporated driving journals and elements of observation. Fieldwork was conducted in July - August 2017 in metropolitan and regional NSW. Drivers of all major vehicle types, including motorcycles, were included in the research sample.

Findings and Implications

The study identified a number of key factors affecting the salience of road safety during a given journey. These include automatic behaviours facilitated by "System 1" thinking (see Figure 1), mood and emotional temperature prior to driving, driver multi-tasking, self-adaptation of road rules and previous driving experience.

Most driving situations	***Some driving situations***
"System 1" Thinking	**"System 2" Thinking**
• Fast Processing • Unconscious • Automatic • Simple decisions • Prone to error	• Slow processing • Conscious • Effortful • More complex decisions • More reliable

Figure 1. Characteristics of "System 1" and "System 2" thinking

Triggers to induce more conscious driving behaviours (facilitated by "System 2" thinking) include immediate situational factors such as unfamiliar roads, inclement weather conditions, visible enforcement, roadworks and erratic behaviour by other drivers.

In addition, the relationship between motorists and their vehicles was divergent and often an extension of their personality. For some drivers, their vehicle represented a "retreat" from everyday pressures, while others perceived them to be a space over which they asserted full control.

This research study questions the current social weight and importance around road safety as a community issue – a reality that is overlooked and under-reported in many attitudinal studies. Road safety ends up competing with everyday concerns (e.g. busy routines) and broader social issues (e.g. health and employment) for attention, even when people are undertaking the task of driving. The study provides a realistic understanding of the societal context in which road safety communications must operate – and the critical need to encourage "System 2" thinking every time a driver enters their vehicle.

*Provisional data.

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One-Way to Two-Way: Facilitating Road Safety Conversations on Social Media

Dush Sharma[a], Taylor Hedges[a], Tina Gallagher[a], Ruth Graham[b], Bernard Carlon[b], Susan Everingham[b]

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Abstract

Road safety communications have traditionally relied on one-way advertising campaigns to facilitate social changes. However, the emergence of user-centric digital platforms whereby road users can directly engage with Government has transformed communications from one-way into two-way conversations. The NSW Road Safety Facebook community provides a case study in developing a feedback loop for continuous learning for road safety agencies to communicate with their audiences. Balanced analysis of reach, engagement and sentiment data has led to greater consideration of content-crafting, influencers and community management. The ongoing use of "test and learn" approaches presents an opportunity to evolve road safety conversations.

Introducing Road Safety Conversations onto Social Media

In December 2015, Transport for NSW launched the NSW Road Safety Facebook page (http://facebook.com/nswroadsafety) to spearhead efforts in social media. The initial aims were to contribute to road user safety by engaging, educating and encouraging behaviour change, and to complement other communication channels in a timely manner. As the leading social media platform with the highest number of regular users in both NSW and Australia (Universal McCann, 2017), Facebook offered a large online audience for road safety-related communications in NSW. Content for the social community was intended to be a balance of planned and unplanned materials, ranging from corporate-centric (e.g. the latest Centre for Road Safety research) to customer-centric (e.g. behavioural campaign messaging and sponsorship content). The NSW Road Safety page was also an additional mechanism for paid campaign advertising: "boosted" and "dark" posts which are disseminated to members of particular target audiences.

Initial Community Growth and Measurement

The NSW Road Safety page accumulated a sizeable following (80,000+) in its first year of operation, regularly achieving weekly reach of more than 1 million and engagements of more than 100,000 (Facebook Business Manager, 2018). The community's growth was particularly attributable to topical content for which Transport for NSW is the leading and credible Government agency: examples included the timing of gazetted Double Demerit periods and corresponding Police operations and the introduction of the minimum passing distance regulation affecting drivers and cyclists. Content about road rules and other facts (e.g. severity of crash impacts depicted in Crashlab trials) also performed strongly across most available Facebook metrics. As a communications channel, Facebook offers a plethora of content performance measures, including reach, engagements, audience location, video view duration, click-through and many others. At first, the excess of available data led to divergent and inconsistent reporting of social media performance. Internal efforts were re-focussed to identify a more effective measurement framework for gauging the two-way exchange between road users and Transport for NSW.

Framework for Continuous Learning

The balanced analysis of reach, engagement and sentiment data provided a strong foundation for ongoing weekly and monthly measurement of NSW Road Safety Facebook's performance. This model is similar to the intent of traditional campaign tracking frameworks, which seek to balance recall with diagnostic measurement of message awareness and promotion. Monthly benchmarks have been established for these three key metrics based on statistical analysis of 2017 calendar year data:

	Total Reach	Total Engagements	Positive Sentiment Rating
2017 Monthly Benchmark	2,847,485	177,821	69%

Table 1. Benchmarks for NSW Road Safety Facebook page, based on means from 1 January to 31 December 2017 (Sources: Facebook Business Manager, 2018; Universal McCann, 2017)

Ongoing analysis of these three thematic areas has created a feedback loop for continuous learning, whereby the crafting of post content, its personal relevance, the role of positive influencers and community self-moderation have been identified as key levers to facilitating productive two-way conversations with greater potential to engage the community on road safety and facilitate support current road safety directions.

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Identifying and treating high risk locations on high speed roads for cyclist crashes

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ARRB, Safe Systems and Human Factors

Abstract

The number of cyclist fatalities on high speed roads low compared to lower speed urban environments, however due to the more simplex nature of traffic movements there may be an opportunity to address the contributing factors to these crashes. A methodology to establish cyclist risk on a route using established crash risk factors (AusRAP) and then through a conceptual cyclist crash likelihood matrix developed to identify locations with a high likelihood of a cyclist being struck by a vehicle and identify suitable treatments to treat these often-isolated locations. The cyclist crash likelihood matrix is based on road design principles and identifies the locations that present a higher likelihood of a cyclist being struck from behind, side-swiped, or at an angle in an intersection or interchange due to restricted stopping sight distance, safe intersection stopping sight distance and cyclist clearance times through intersections and interchanges.

Background

Currently an assessment of a high-speed road to identify mitigation treatments would indicate that physical separation should be provided between the traffic stream or an off-road cycleway should be provided. This paper aims to identify the option to provide interim treatments (before physical separation or off-road cycleways can be provided) to reduce cyclist risk on high speed roads (rural, freeways and urban arterials) and provide a method to identify locations where cyclists are most at risk of being struck by a vehicle. It also aims to provide guidance on what treatments are required to reduce the risk of a cyclist being struck by a vehicle and demonstrate that once the risk and relevant treatment are identified low cost treatments can be implemented through existing maintenance programs, or mass action programs.

Methodology

The identification and assessment of cycling risks on a route was achieved by an analysis of existing road infrastructure, cyclist crash history, speed limit and cyclist volume data. The infrastructure data included lane widths, sealed shoulder width, road condition, cyclist treatments, sight lines and intersection and interchange layout type and quality. This data was analysed in AusRAP to establish the AusRAP cyclist SRS. A unique assessment methodology based on road design principles and existing cyclist provision guidance was developed to build a matrix to assess the likelihood of a cyclist being struck by a vehicle at an interchange, intersection or on a midblock section.

Identifying cyclist crash risk (likelihood and severity)

Cyclist crash risk at intersections and on midblock sections was assessed at a route level by producing a cycling SRS in AusRAP. SRS considers variables including the sealed shoulder width, cyclist treatment, curvature, sight distance, lane width, delineation, curve warning signage, traffic calming, grade, road condition, skid resistance, rumble strips, roadside parking, street lighting intersection layout type and quality. Currently the AusRAP model does not specifically assess cyclist risk at interchange crossings.

Identifying locations with a high crash likelihood

The likelihood of a cyclist being struck by a vehicle (cyclist risk) at an interchange, intersection or on a midblock section was determined by assessing the previously collected data with the guidance as per Austroads Guide to Road Design series and Cyclists Guide (Austroads 2016, 2017a, 2017b).

For an intersection or midblock section, the resulting compliance or on-compliance of the road infrastructure compared to the relevant guidance was entered into a matrix which identifies and ranks cyclist risk which ranges from Rare to Almost Certain. A cyclist risk of Rare is achieved when all of the criteria as per the above-mentioned Guides is met, a cyclist risk of Almost Certain is achieved when none of the criteria is met.

For interchanges a cyclist risk ranking was not provided. Given the complexity of sightlines, observation angles, narrow shoulder widths, potential high percentages of heavy vehicles, high traffic and ramp entry/exit volumes and high speeds at interchanges a pass/fail criterion was applied. With further investigation the pass/fail criterion can be reviewed, and a risk-based ranking applied in the same way that it was applied to intersections and midblock sections.

Treatment identification and mitigation

As the cyclist risk matrix was developed using road infrastructure condition, road design principles and cyclist facility criteria the treatments the risk resulting from the condition of these can be identified in a manner that is easily understood by practitioners. This allows the matrix to identify the risk, and the intuitively the relevant countermeasure treatment in a simplex manner. The matrix allows a practitioner to enter one or more countermeasure treatments to reduce the cyclist risk. These treatments are generally low cost and could be achieved within existing maintenance activities or in remedial works packages. Once treatments are selected within the matrix, the before and after cyclist risk is then shown for each location, as well as identifying the number of sites on a route the will demonstrate a reduction in cyclist risk.

Conclusion

The AusRAP risk assessment model and the methodology developed, enables cyclist routes to be assessed using established crash risk factors and road safety design principles. The matrix identifies critical high-risk locations and risk likelihood ratings based on treatments used to generate a crash reduction factor.

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Preparation of a Road Safety Strategy for the City of Addis Ababa

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Abstract

Many low and middle-income countries do not have strong crash and injury data systems. The experience of Addis Ababa is that the available data can be used, and augmented, to identify critical road traffic crash patterns and support good practice road safety management. The preparation of a road safety strategy in the city highlights the need to ensure high quality analysis of safety issues is integrated with straightforward participatory processes, and the importance of institutional arrangements to ensure plans are able to be followed through and resources effectively allocated to the issues that matter most. This paper reports on a critical diagnosis of road safety issues in a major African city, and the preparation of a good practice road safety strategy.

Background

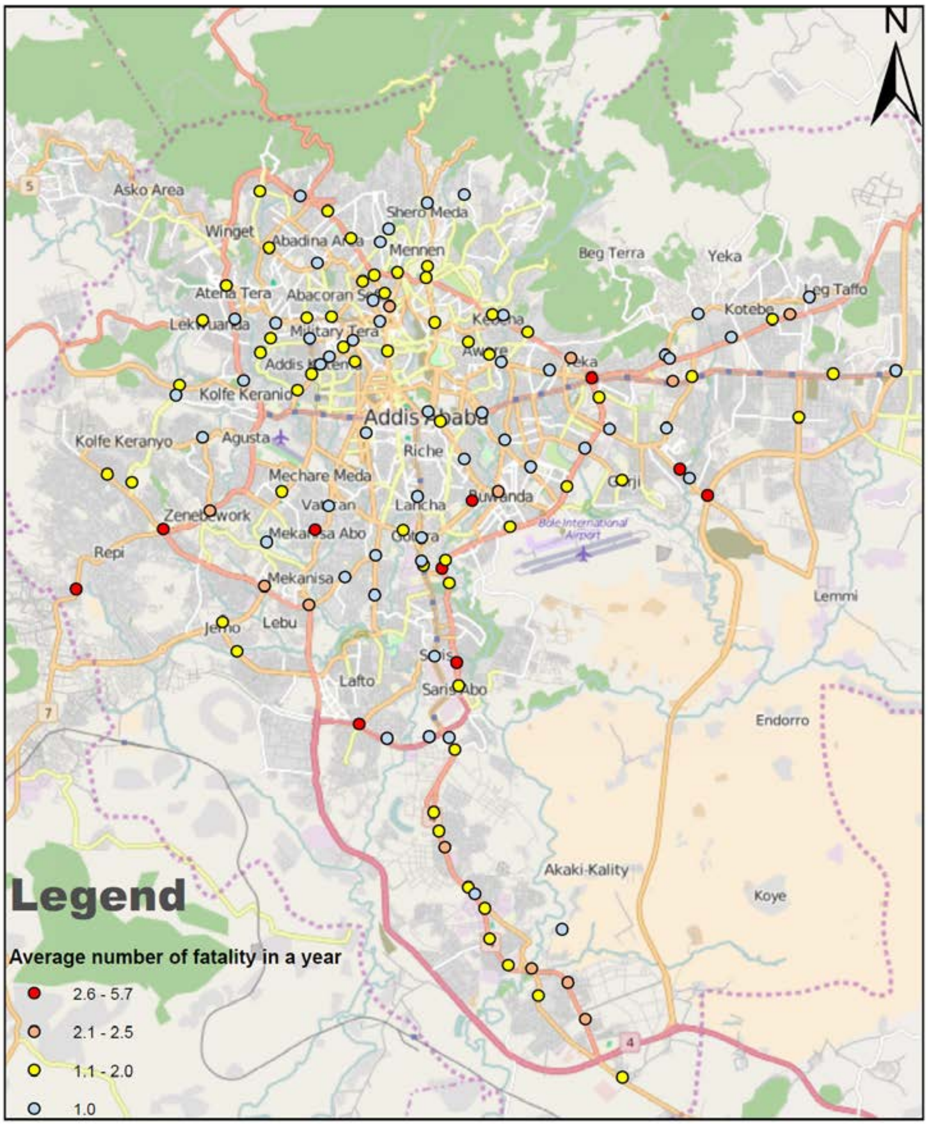
The Addis Ababa Police Commission reports that an average 391 people lost their life each year on Addis Ababa streets in the three years to 2014/15. However, the World Health Organization (WHO) estimates that the actual number of road traffic related fatalities in Ethiopia could be as much as six times the reported fatality figure.

Although the city's crash data is widely regarded as incomplete, a study of three years of the Police crash reports that were available identified where and when crashes were occurring, the road characteristics and vehicles types involved, the vehicle maneuvers being undertaken and the victims. The findings are summarised in Table 1 below, in terms of the available crash evidence, and the implications for future improvement. Figure 1 locates frequent fatal crash sites.

Table 1: Available evidence and their implication

Evidence	Implication
Most affected road user Pedestrian (86% of victims)	• Addis Ababa is a pedestrian city • Lack of attention to pedestrians
Road related characteristics of crashes • Major undivided two-way roads • At-mid block (73%) • Good pavement condition (84%)	• Pedestrians in conflict with high speed vehicular traffic • Unsegregated vehicular and pedestrian traffic
Vehicle maneuver before crash • Most vehicles are moving straight ahead or overtaking another vehicle (67%)	• Pedestrian in conflict with high speed vehicular traffic at-mid block locations
Time and days of fatal crash • Most fatal crashes happen during afternoon and night times (12 p.m. to 5 a.m.), and peak late at night (12 a.m. to 5 a.m.).	• Impaired pedestrians in conflict with vehicles driven by impaired drivers. • Higher traffic speed during night times and on weekends as density of traffic is lower • Lack of lighting at crossings during night time
Vehicle type • More than half of fatal crashes involve light vehicles • 59 % of fatalities involve commercial goods and passenger transport vehicles	• Pedestrians in conflict with high speed vehicular traffic • Long hour driving, sleep deprivation and infrequent work times

Figure 1: Frequent fatal crash sites in Addis Ababa



The City of Addis Ababa successfully applied to join nine other cities around the world in the Bloomberg Initiative on Global Road Safety (BIGRS). This facilitated a number of support projects, funded by BIGRS, and delivered in partnership with the city's Transport Programs Management Office.

The Africa Transport Policy Program (SSATP) established road safety as one of three pillars of its Third Development Plan 2015-18. Road safety management capacity and the need for policy and strategy development was identified as a need at a city level, as well as at a country level. In support of learning for all its Member Countries, SSATP work with the City of Addis Ababa to develop a road safety strategy, developing a framework for the city's work with BIGRS and future activity.

Method

A simple strategy development process was followed:

1. Bilateral engagement with and enrolment of major stakeholders
2. Rapid knowledge transfer on critical issues for road safety in Africa
3. Analysis of available data, and assessment of current road safety management capacity
4. Multilateral engagement to identify:

   a. an overall vision, and quantitative targets
   b. critical road safety issues in the city
   c. strategic directions to provide lasting road safety improvements
   d. major implementation initiatives directly linked to the vision and critical issues
   e. institutional road safety management arrangements for implementing the strategy, including governance, monitoring and evaluation and funding
5. Preparation, stakeholder review, and revision of a draft strategy document
6. Validation and publication of a final strategy endorsed by political leadership.

Results

The resulting *Addis Ababa Road Safety Strategy* approved by the City Cabinet was launched in March, 2017. It envisions Addis Ababa city free from road trauma by 2030, and sets two targets: to halve the number of deaths and severe injuries from road traffic crashes by 2023; provide access to safe, affordable, accessible and sustainable transport systems for all by 2030.

The strategy establishes seven strategic directions:

1. Developing a road safety management system,
2. Focusing on main roads, where trauma is most concentrated
3. Prioritizing pedestrians first, second and third
4. Enforcing key safety laws, supported by awareness creation
5. Improving crash and injury data management
6. Improving post-crash trauma response
7. Demonstrating and scaling up investment.

The 2017-2030 strategy is straightforward, adopts safe system principles, and is well aligned with the UN Sustainable Development Goals. It nominated the Addis Ababa Road Traffic Management Agency as the lead agency for the strategy and established an Addis Ababa Road Safety Council, chaired by the Deputy Mayor.

A three-year implementation plan was prepared, based on the seven directions, and the first implementation report is promising, including improvement of 11 locations with more than three fatalities, installation of speed humps at 47 crash locations, and improvement of night visibility by installing new street lights and maintaining existing ones.

Reported fatalities in the first six months decreased by 7% in the city compared with the previous year, and with a 19% increase nationwide.

Conclusions

Good practice road safety strategies can be effectively developed in African cities by: undertaking critical analysis of available data; using expert inputs in straightforward participatory processes; and developing ongoing management and implementation arrangements. The stronger the institutional capacity and arrangements, the more likely a strategy setting exercise can provide a genuine platform for tackling road safety at a city level.

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Prognostic capacity of Orebro Musculoskeletal Pain – Short Questionnaire in predicting recovery following non-fatal RTIs: results from an inception cohort study

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Abstract

Poor prognosis following non-fatal road traffic injuries (RTIs) contributes to unnecessary health care utilisation and high costs. We aimed to assess prognostic capacity of the Orebro Musculoskeletal Pain – Short Questionnaire (OMPSQ) in predicting recovery following non-fatal RTIs. Using data from an inception cohort study of non-fatal RTIs in NSW, we found statistically significantly higher proportions of fully recovered (GPE >4) 6 months after the injury in the low (OMPSQ score <50) than the high (OMPSQ score ≥50) risk groups. OMPSQ would have a potential to be used as a stratification tool for non-fatal RTIs into groups with distinct recovery.

Background

Road traffic injury (RTI) is a major public health problem worldwide, contributing to a large burden of mortality, disability and significant economic loss. In Australia, with decreasing trend of fatal RTIs, non-fatal RTIs is still on the rise and their associated costs are significant. An important contributor to the high costs of non-fatal RTIs is associated with poor prognosis, which leads to unnecessary health care utilisation. Using risk based stratification to direct health care service delivery according to prognostic sub-grouping is gaining favour musculoskeletal health care, including those resulted from RTIs. Our study aims to assess prognostic capacity of the Orebro Musculoskeletal Pain – Short Questionnaire (OMPSQ) in predicting recovery following non-fatal RTIs.

Method

This is an inception cohort study conducted with participants recruited from emergency department of 2 metropolitan hospitals, 3 rural health services, general practitioners, physiotherapists, police crash data and Motor Accidents Authority Registry in New South Wales, Australia. Participants were 17 years or older, sustained an unintentional RTI within 28 days of the crash, English speaking and a resident of NSW with a valid Medicare number. Participants with non-fracture injuries with principal injury region at the neck, lower back and lower limbs were stratified using the OMPSQ score at baseline into low (score <50) and high (score ≥50) risk. We assessed the changes in short-form 12-item (SF12) physical, and mental health scores between baseline and 6-month follow-up, and the proportions of participants reported fully recovered measured by Global Perceived Effects scale (GPE >4) between low and high risk groups. Paired t-test was used to compare changes in SF12 physical and mental, and chi-square test was used to assess the significance of the risk ratio of fully recovered between low and high risk groups.

Results

Of 2019 participants recruited, there were 166 non-fracture injuries with principal injury region at the neck, 78 in the lower back and 254 lower limbs. Between baseline and 6-month follow-up, there are statistically significant improvements in SF12 physical scores in both low and high risk groups across all three injuries.

Improvements appear to be larger in the low than in the high risk group, however, they were not statistically significant (Table 1). In terms of mental score, while there seems to be some improvements in all injuries and in low and high risk group, statistically significant improvement was observed in the high risk lower limb injury (change of 7.2, 95% CI: 2.6-11.9) (Table 1). Regarding the proportions of fully recovered, they were significant higher among those in the low than those in the high risk group. The trend was consistent and statistically significant across all three injury. Specifically, the proportions of recovered were 2.63 times (95% CI: 1.29-5.35) among those sustained neck injury, 3.96 (95% CI: 1.31-11.97) among lower back, and 3.59 times (95% CI: 1.60-8.06) among lower limb injury (Table 2).

Table 1. Mean and change (95% CI) of SF12 physical and mental scores between baseline and 6 month follow-up of neck, lower back and lower limb injuries stratified by high and low risk using OMPSQ

		Neck		Lower back		Lower limb	
		Mean	**Change (95% CI)**	**Mean**	**Change (95% CI)**	**Mean**	**Change (95% CI)**
SF12 physical score							
Low risk	Baseline	39.4		34.5		32.4	
	6 months	47.9	***8.5 (5.3-11.6)****	47.4	***12.9 (7.1-18.8)****	48.4	***16.1 (14.0-18.1)****
High risk	Baseline	31.9		24.4		26.2	
	6 months	38.6	***6.7 (1.9-11.5)****	33.4	***9.0 (2.8-15.1)****	38.8	***12.6 (8.4-16.8)****
SF12 mental score							
Low risk	Baseline	52.2		48.2		52.6	
	6 months	53.6	1.4 (-0.8-3.5)	49.6	1.4 (-3.6-6.4)	54.5	2.0 (-0.1-4.0)
High risk	Baseline	32.0		38.9		39.7	
	6 months	37.4	5.4 (-0.2-10.9)	39.6	0.6 (-6.0-7.3)	46.9	***7.2 (2.6-11.9)****

*statistically significant (p-value < 0.05)

Table 2. Recovery measured by Global Perceived Effects scale at 6 months

	Neck		Lower back		Lower limb	
	%*	**RR (95% CI)**	**%***	**RR (95% CI)**	**%***	**RR (95% CI)**
High	26.1		14.3		17.2	
Low	68.5	***2.63 (1.29-5.35)^***	56.5	***3.96 (1.31-11.97)^***	61.9	***3.59 (1.60-8.06)^***

*% recovered = % GPE ≥ 4; ^statistically significant (p-values < 0.01)

Conclusion

OMPSQ would have a potential to be used as a stratification tool for non-fatal RTIs into groups with distinct recovery. However, variations in recovery pattern exist between risk groups when different measurements of recovery are used.

See also the Online Submission Guidelines for the 'formatting guide' and Online Submission Instructions for uploading this Word File.

The Role of Kinetic Energy in Bicyclist's Injury Severity at Intersections

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Abstract

Kinetic energy management has considerable potential to achieve the objectives of the Safe System. A literature review of bicycle crash studies revealed that there is a big gap in knowledge in understanding the relationship of bicycle crash severity and kinetic energy of these crashes. This study investigated the trends of bicycle crash severity for the kinetic energy related factors. Based on an analysis of police-reported bicycle crashes in Victoria, the results revealed that, in general, similar trends between vehicle to bicycle and vehicle-to-vehicle crashes were identified; however, a number of significant differences were also highlighted.

Background:

The Safe System approach has been adopted in Australia and New Zealand to manage vehicles, road and roadside infrastructure and speeds to strive to eliminate death and serious injury as a consequence of road crashes (Office of Road Safety 2009). The approach recognizes that humans, as road users, will continue to make mistakes. Additionally, humans are physically vulnerable and are only able to tolerate limited kinetic energy exchange in a crash. Crash kinetic energy management is one of the main strategies to achieve the objectives of the Safe System approach. Therefore, in order to develop an effective strategy, it is necessary to understand the relationship between crash severity and crash kinetic energy.

Bahrololoom et al. (2018) investigated the factors influencing bicycle crash severity in Victoria, Australia. They examined the effect of factors, which belonged to pillars of the Safe System approach, on fatal and serious injury bicycle crashes. They concluded that more in depth analysis of the effect of crash kinetic energy would help to achieve a better understanding of the factors influencing bicycle crash severity. This study also concluded that it is important to investigate the dynamics of bicycle crashes.

Studies conducted on vehicle-to-vehicle crashes highlighted the importance of speed, crash angle and vehicle mass as the variables influencing delta-v (crash severity) of a crash, crash kinetic energy and occupant injury severity (Sobhani et al. 2011; Tolouei et al. 2011; Jurewicz and Sobhani 2016). Very few studies have been conducted to understand the dynamics of bicycle crashes and its effect on bicycle injury severity (Short et al. 2007); however, there is a big gap in knowledge about the effect of kinetic energy on bicyclist's injury severity. The aim of this study is to investigate the role of kinetic energy in bicycle crash severity at intersections. It examines whether similar trends can be found for the effect of impact speed, vehicle mass and angle of the crash on bicycle crash severity.

Method:

The Victorian Road Crash Information System (RCIS) database was used in this study. This database comprises police-reported data collected at crash scenes in Victoria, Australia. RCIS data includes minor injury, major injury and fatality crashes.

The final dataset extracted included all reported two-vehicle casualty crashes, in which at least one bicyclist was involved, that took place on the Victorian road network between 2004 and 2013. The total number of crashes for the ten years was 11336, 7180 of these crashes occurring at intersections. Fatal and serious injury (FSI) crashes accounted for 30.7% (3483) of the total number of crashes.

Impact speed, impact angle and vehicle mass were the significant variables in estimation of delta-v and kinetic energy of a vehicle-to-vehicle crash (Sobhani et al. 2011; Tolouei et al. 2011; Jurewicz and Sobhani 2016). The RCIS database includes vehicle mass data; however, impact speed and impact angle is not available from mass crash datasets such as this one. Previous studies on vehicle to vehicle crashes used speed limit of the approach and crash type as surrogate measures for impact speed and angle respectively. They confirmed that similar trends were found for the effect of these variables on crash delta-v, crash kinetic energy and occupant injury severity. In this study, these two variables were also considered for analysis assuming the similar relationships between surrogate measures (i.e. speed limit and crash type) and main variables (i.e. impact speed and impact angle) are acceptable for vehicle to bicycle crashes.

A binary logistic regression model was calibrated to explore how combination of speed limit, vehicle type and crash type affect bicycle crash severity.

Results:

Results of this study illustrated that higher speed zone was associated with higher possibility of being involved in a bicycle fatal or serious injury crash. This result is consistent with the results achieved for vehicle-to-vehicle crashes (Sobhani et al. 2011; Tolouei et al. 2011).

The results also confirmed the effect of vehicle mass on severity of bicycle to vehicle crashes was similar to the effect of mass on vehicle-to-vehicle crash severity. Heavier vehicles contributed to higher bicycle crash severity (Sobhani et al. 2013; Jurewicz and Sobhani 2016).

In terms of the crash type, it can be concluded that ‘right angle’, ‘right near/right far’, ‘from footway’ and ‘rear end’ crashes were the most dangerous crashes for bicyclists. Results of vehicle-to-vehicle studies showed that ‘rear end’ crashes were associated with lower crash severity (Jurewicz and Sobhani 2016). Dynamics of bicycle crashes plays an important role and should be investigated to achieve better understanding of contributing factors to this result. Lack of enough protection for bicyclist can be the other reason for achieving this result as higher amount of kinetic energy is transferred to bicyclist’s body (Corben et al. 2010).

Results further showed that ‘right turn side swipe’ and ‘lane change right’ crashes were associated with higher crash severity than the ‘left turn side swipe’ and ‘lane change left’ crash.

Results further showed that:

- Bicyclists aged 46 years and older are associated with higher possibility of being involved in bicycle FSI crashes (i.e. in comparison with other age groups).
- Wearing a helmet reduced the risk of being involved in FSI crashes for bicyclists.
- The risk of FSI crashes for bicyclists was highest in ‘other’ intersection layout types. This was followed by T intersections (i.e. in comparison with cross intersections).
- The risk of being involved in FSI crashes reduced when the traffic control for bicyclists was ‘roundabout’ (i.e. in comparison with no control).

Conclusions:

Results of the binary logistic regression model illustrated that, in general higher speed limit and heavier vehicles were associated with higher bicycle crash severity. This results are consistent with the results of vehicle to vehicle crashes. Results further showed that same direction crash types (such as real end crash) were also considered as dangerous crash types; while, the results for vehicle to vehicle crashes confirmed this type of crashes were associated with lower crash severity.

The following parameters can justify the few conflicts found between the results of vehicle to vehicle and vehicle to bicycle crashes.

- Bicyclists are vulnerable road users, so rear-end, left turn and sideswipe crashes are also more dangerous for them as they have no protection, unlike vehicle occupants.
- Bicycle crash dynamics are likely to be quite different from vehicle to vehicle crash dynamics.

The effect of these parameters will be investigated in future studies.

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Australian Naturalistic Driving Study (ANDS): Using 20,000 trips to get a glimpse at locations and speeds where data was collected

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Abstract

The Australian Naturalistic Driving Study provides immense opportunities for further understanding driver behaviour. Data collection being now completed, and a large subset of the data becoming available to researchers, it becomes important to look at what is available in the data. This paper presents a first attempt to develop a scalable approach for analysing data, by looking at the particular case of vehicle speed and driving location. A preliminary spatial database was created using ~20,000 New South Wales trips, and GPS points were map matched to Australian roads. This approach provides opportunities for studying locations where NSW drivers over-speed.

Background

The University of New South Wales leads a consortium conducting a large collection of naturalistic driving in Australia, also known as the Australian Naturalistic Driving Study (ANDS) [1]. This study aims at better understanding how drivers behave by collecting continuous data from a set of private vehicles equipped with a Data Acquisition System (DAS) every time they are driven. This DAS is composed of a unique system of sensors and data loggers providing acceleration in multiple axes, gyroscopic motion, indicator status, speed, radar, and GPS position. The purpose of this paper is to present preliminary results obtained on a large subset of the ANDS dataset and highlight research directions that could be followed to investigate drivers' speeding behaviours.

Method

Data collection was conducted with 360 volunteer (half from New South Wales and half from Victoria) drivers for 4 months each. A random subset of 18,613 of the NSW trips (out of the 145,000 trips available as of September 2017) was downloaded from the servers storing the ANDS data. Sensor data were recorded at 10 Hz. A schema was developed with the database management system PostgreSQL [2]. The library of spatial database functions PostGIS [3] was added to the database in order to be able to create location-aware queries. Maps of Australian roads obtained from OpenStreetMaps [4] were also imported in the database, and used for map matching. Map matching was performed by finding the closest road which had a direction within 25 degrees of the heading of the vehicle, as described in Wu and McLaughlin [5].

Results

The 18,613 trips analysed provided a total driving time of 4,700 hours, equating to an average of 15 minutes of driving time per trip. Data was largely collected in urban areas (local government areas of type *City* using the ABS terminology), with a more limited amount of rural driving (*Areas*). The locations where data were recorded are shown on Figure 1 by postcode. Figure 1 also reports the speeds as measured in a selected area of the data collection. For visualisations, Figure 1 is presented as heat maps.

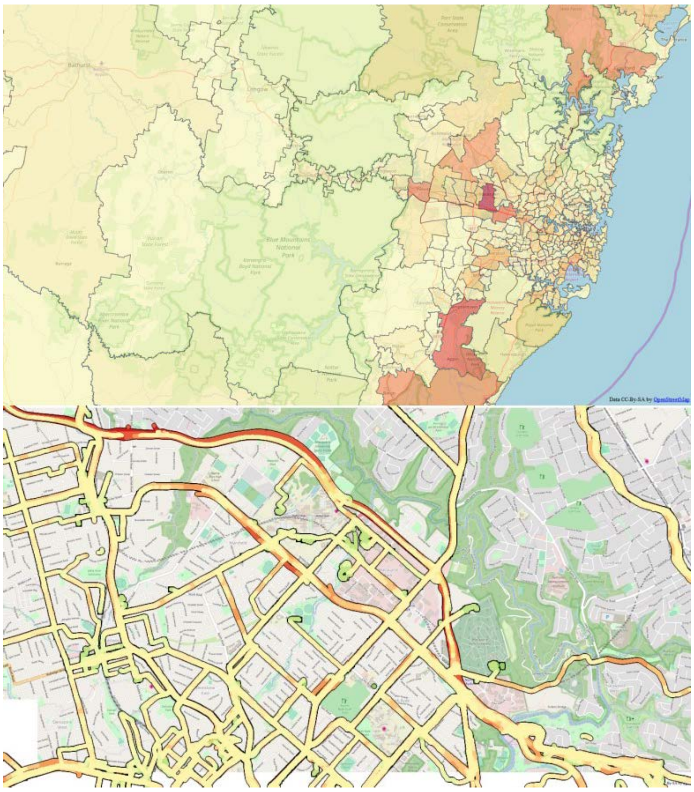

Figure 1. **View of where NSW data was collected by postcode and density (top), and speed profile of a selected Area close to Sydney (bottom)**

Conclusion

This paper presented a methodology to look at the ANDS data once all the data is available for research. The approach taken is scalable to the large amount of data recorded, and similar approaches have been already successfully applied by the American naturalistic study [6]. By combining the current results with speed limits obtained from OpenStreetMap, combined with the NSW speed zoning guidelines when data are missing, research can be conducted for understanding where and under which conditions driver over-speed. Adding the position of automated enforcement cameras, information which is also publicly available, provides opportunities for understanding further the effectiveness of such intervention.

Acknowledgements

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Factors influencing time to claim closure in older versus young road traffic injury claimants

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Abstract

Prolonged claim closure following road traffic injury is associated with adverse outcomes [1], yet has not been investigated in older people, despite Australia's ageing population and increasing life expectancy.

NSW compensation data was analysed using logistic regression to identify predictors of late claim closure (>24 months) in older (≥65 years) versus younger (17-64 years) people. Legal representation was the dominant predictor for both age groups after adjusting for other variables, although the odds were higher for younger people. Qualitative studies are recommended to identify older people's underlying reasons for earlier closure, the influence of legal representation and impact on recovery.

Background

Older people's hospitalisation rates for motor vehicle occupant injuries are second highest of any age group, and pedestrian injuries are the highest of any age group (Australian Institute of Health and Welfare, 2015). Older people have poorer RTI outcomes compared to younger people, including increased injury severity (Bauza, Lamorte, Burke, & Hirsch, 2008) (Newgard, 2008) and mortality (Bauza et al., 2008), and a greater proportion of head and chest injuries (Bauza et al., 2008) (Newgard, 2008). Older people with mild to moderate RTI may suffer poorer long-term physical functioning and general health (Gopinath et al., 2015). Australia has an ageing population and increasing life expectancy (Australian Institute of Health and Welfare, 2018). Older Australians make valuable contributions to society via paid and unpaid work. It is therefore important to understand the impact of RTI on older people.

Late RTI claim closure (>24 months) can be a marker for prolonged recovery, and has been associated with long-term conditions such as whiplash and chronic musculoskeletal pain (Gopinath, Jagnoor, Elbers, & Cameron, 2017), and also with lawyer involvement (Gopinath et al., 2016). Reducing the time taken to resolve a claim is a key objective of the 2016 NSW Motor Accidents CTP Scheme review 2016 (State Insurance Regulatory Authority, 2017). This study analyses NSW Personal Injury Register (PIR) compensation data to identify key predictors of late claim closure in older versus younger people.

Methods

NSW CTP data (NSW Motor Accidents Authority, 2015) on finalised claims for RTI's between July 2010-June 2013 was analysed. The main outcome was time to claim closure (early<=24 months; late>24 months) (Gopinath et al., 2016). Binary logistic regression was undertaken to identify key predictors of late claim closure in older versus younger people. Results were reported in accordance with the RECORD checklist (Benchimol EI, 2015). Ethical approval was obtained prior to undertaking the study.

Results

A total of 19,186 claimants met the inclusion criteria. Of these, 2137 (11%) were older, and 954 (45%) had late claim closure, compared to 8874 (52%) younger people. Mean time to claim closure was 24 months (SD 13) and 27 months (SD 15) for older and younger people respectively.

In older people, after adjusting for other variables, late claim closure was associated with younger age (OR 0.81, 95%CI 0.75-0.88), higher injury severity (NISS ≥9) (OR 1.76, 95%CI 1.37-2.26), whiplash (OR 1.41, 95%CI 1.13-1.75) and legal representation (OR 4.25, 95%CI 3.38-5.35).

In younger people, after adjusting for other variables, late claim closure was associated with increasing age (OR 1.03, 95%CI 1.02-1.04), female sex (male OR 0.91, 95%CI 0.84-0.97), regional/remote crashes (OR 1.23, 95%CI 1.11-1.37), being a vehicle occupant (OR 1.0) versus cyclist (OR 0.72, 95%CI 0.60-0.86), attending hospital (OR 1.84, 95%CI 1.13-1.33), NISS ≥9, (OR 1.84, 95%CI 1.65-2.05), head injury (OR 1.42, 95%CI 1.22-1.65), whiplash (OR 1.19, 95%CI 1.10-1.46), lower limb fracture (OR 1.27, 95%CI 1.10-1.46) and legal representation (OR 7.75, 95%CI 7.10-8.45).

Conclusion

After adjusting for other variables, legal representation was the dominant factor in late claim closure for both older (4 times higher odds) and younger (8 times higher odds) people. Qualitative studies are recommended to explore earlier claim closure in older people: the underlying reasons, influence of legal representation, and impact on recovery.

Table 1. Multivariate analysis, time to claim closure >24 months, older versus younger road traffic injury claimants

	17-64 years		**65+ years**	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
Age (per 5 years)	1.03 (1.02-1.04)	**<0.01**	0.81 (0.75-0.88)	**<0.01**
Sex				
Female	1.0 (ref)	-	1.0 (ref)	-
Male	0.91 (0.84-0.97)	**<0.01**	0.99 (0.82-1.19)	0.891
Crash remoteness (ARIA)				
Major cities (ref)	1.0 (ref)		1.0 (ref)	
Regional / remote	1.23 (1.11-1.37)	**<0.01**	0.96 (0.75-1.23)	0.731
Role in crash				
Vehicle occupant (ref)	1.0 (ref)	**<0.01**	1.0 (ref)	0.369
Cyclist	0.72 (0.60-0.86)	**<0.01**	1.37 (0.73-2.56)	0.326
Treated at hospital				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	1.22 (1.13-1.33)	**<0.01**	1.24 (1.00-1.54)	0.051
NISS >=9				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	1.84 (1.65-2.05)	**<0.01**	1.76 (1.37-2.26)	**<0.01**
Head injury				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	1.42 (1.22-1.65)	**<0.01**	1.23 (0.90-1.67)	0.190
Whiplash				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	1.19 (1.10-1.30)	**<0.01**	1.41 (1.13-1.75)	**<0.01**
Lower limb fracture				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	1.27 (1.10-1.46)	**<0.01**	1.25 (0.93-1.68)	0.137
Legal representation				
No (ref)	1.0 (ref)	-	1.0 (ref)	-
Yes	7.75 (7.10-8.45)	**<0.01**	4.25 (3.38-5.35)	**<0.01**
Constant	0.14 (-)	**<0.01**	3.63 (-)	**0.031**

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Exploring novice driver offences within Queensland: Pre and post the 2007 GDL changes

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Abstract

Existing research and evaluation of the current Queensland Graduated Driver Licensing system indicates the number of crashes and crash related injuries of novice drivers is reducing. However, to date there has been minimal research into the locations of specific novice driver non-compliance and the rates at which offences occur. This research fills the gap by highlighting areas of compliance and non-compliance across Queensland. Through applied analysis, focusing on offences recorded between 1997 - 2017, this study highlights different aspects of driver compliance and serves as a tool for future policy considerations.

Background

Novice drivers are at a higher risk for serious road crashes than experienced drivers (Bates, Davey, Watson, King, & Armstrong, 2014). During the first three years of driving, compliance with the road rules is important. However, a significant proportion of young drivers fail to comply with road rules (Chapman, Masten, & Browning, 2014; Scott-Parker, Watson, King, & Hyde, 2012). Within Queensland changes to the Graduated Drivers Licensing (GDL) process were implemented in mid 2007 in order improve young driver safety. Analysis of these changes, by an external research organisation, indicates crash and crash related injuries for inexperienced drivers were reduced (Senserrick, Boufous, Olivier, & Hatfield, 2016). This paper builds upon this earlier work by exploring and mapping pre and post differences in the number of offences in both rural and urban areas of Queensland.

Method

Data on drivers who committed driving offences within Queensland between 1997 and 2017 was obtained from the Queensland Department of Transport and Main Roads. Police district was used in order to identify rural and urban areas. Cases were excluded if no police station or district was recorded. A range of parametric analysis techniques were applied to explore provisional driver offences pre and post the changes to the GDL system in mid-2007.

Results

More than one million provisional driving offences were committed throughout Queensland during the examined time period. Of these offences, the majority were conducted by males aged between 17 to 25 years. The results indicate interesting differences between rural and urban areas. Additionally, the exploration of patterns within these areas such as, the time of day, day of week, and seasonal changes of recorded infringements provide a valuable tool for future policy decisions.

Conclusions

This study, with its focus on the offending behaviour of novice drivers, is an important addition to the literature regarding Graduated Driver Licensing. The rural and urban differences, while possibly reflective of police enforcement exposure, suggest some interesting policy implications. However, given the exploratory nature of this research, it is necessary to undertake further research in this area to identify the underlying reasons for these differences. One example of further research that could occur is examining the behavioural factors that predict this behaviour in rural and urban samples. Stevenson and Palamara (2001) undertook a similar study when they examined the behavioural predictors of young driver crashes in rural and urban areas.

Additionally, given that inexperienced young drivers do not appear to be deterred by formal traffic policing (Allen, Murphy, & Bates, 2017; Bates, Darvell, & Watson, 2017), it may be necessary to explore alternative enforcement approaches in order to improve compliance. This could include partnership policing approaches (Bates & Anderson, Under review) where police form partnerships with members of the community in order to use respective capabilities and resources to more effectively solve problems (Makin & Marenin, 2017).

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Young passengers becoming young co-drivers to improve road safety: SAFER-Passengers

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Abstract

The pervasive problem of young driver road safety has led to a plethora of interventions targeting the driver, some of which are designed to build the situation awareness skills (SAS) – including hazard perception, comprehension, and projection skills – of these inexperienced drivers (e.g., SAFER, Scott-Parker, 2017). Crash data reveals however that adolescent passengers can increase crash risk, and that adolescent passengers are fatally-injured in young driver crashes. SAFER-Passengers broadly addresses adolescent road safety by developing SAS in the young ‘co-driver’ (not ‘passive passenger’), and building the self-efficacy of the adolescent. Results of the SAFER-Passengers randomised controlled trial will be presented.

Background

The increased road crash risks for young drivers who carry peer-aged passengers is well-recognised; male passengers, and more peer-aged passengers as vehicle occupants, substantially increasing young driver crash risk (e.g., Chen et al., 2000). What is less well-recognised regarding young driver crashes is that in a considerable proportion of occasions, the young driver survives the crash while the passenger(s) is (are) fatally-injured. Disturbingly, research has revealed the pervasive incidence and involvement of young driver crashes in which sober adolescent and young adult passengers are fatally-injured in a crash involving an intoxicated young driver (Williams, West, & Shults, 2011). In addition, while the road crash risks for adolescents and young adults travelling as passengers of young drivers are recognised, road crash risks for adolescents and young adults are susceptible to the driving behaviour of *all* drivers. To illustrate in the Australian context in 2016, 26% of fatalities for adolescents and young adults aged 17-25 years was as a result of being fatally-injured as a vehicle passenger by drivers of *all* ages (BITRE, 2016).

Given that both inexperience-related and age-related factors have been found to contribute to the incidence and severity of young driver crashes, and that adolescents and young adults on occasion are, and can be encouraged to be, a positive influence upon their peer young drivers (e.g., Buckley & Chapman, 2016; Buckley & Davidson, 2013), the young driver road safety-focused intervention SAFER (Situation awareness fast tracking, including identifying escape routes, Scott-Parker, 2017) was modified to a broader adolescent road safety-focused intervention, SAFER-Passengers. SAFER addresses driving inexperience-related road safety risks by building situation awareness skills (SAS) (hazard perception, comprehension, and projection) in an engaging pre-licence game brought to life by the parents of the young novice driver. A randomised controlled trial has revealed that SAFER significantly improved situation awareness skills in the 15-year old prelicence driver, and in the 16-year old learner driver (Scott-Parker, 2017; Scott-Parker, Wilks, & Griffin, 2017). SAFER-Passengers builds both SAS, and the self-efficacy to ’speak up’ in the car, in the adolescent. A randomised controlled trial (RCT) of SAFER is currently underway.

Method

An RCT of SAFER-Passengers is underway with 60 Secondary Senior students attending two Sunshine Coast high schools (with random allocation of 30 students to SAFER-Passengers). In-car passenger behaviour is captured via GoPro recording of forward roadway and vehicle cabin (1-month period), with analysis of verbal and non-verbal communication pertaining to the road context focused upon manoeuvres, road users, exposure, and infrastructure. SAFER-Passengers is evaluated through process (experience of the intervention) and impact (investigation of passenger behaviour captured by GoPro cameras; self-reported efficacy) evaluations at two 6-month intervals post training, and compared to control participants and pre-intervention passenger characteristics.

Results

The baseline evaluation of the in-car behaviour and the SAFER-Passengers is currently underway, and the results of the first post-intervention evaluation will be presented at the conference.

Conclusion

Given the efficacy of SAFER, it is anticipated that participants in SAFER-Passengers will exhibit greater SAS and 'co-driving' behaviour, and self-efficacy, compared to control passengers.

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Sex differences are evident in self-reported but not naturalistic measurement of driving patterns of older drivers: implications for safe driving programs

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Abstract

It has been consistently reported that women self-regulate their driving more than men. Volunteer drivers aged 75 years and older from the suburban outskirts of Sydney, Australia joined a longitudinal study in 2012-2014. GPS in-vehicle monitoring was used to objectively measure driving and surveys of driving patterns. The study included 343 drivers (203/343, 59% men) with an average age of 80 years. Our results revealed that men were 3.85 times more likely to report driving beyond their local shire during the past year (95% CI 2.03-5.72) and 1.81 times more likely to report that they do not avoid night driving (95% CI 1.21-3.22). In contrast sex was not predictive of any objective measure of driving during a one-week period of monitoring. These findings suggest that men and women report different self-regulation practices but that actual driving exposure is quite similar. These findings can inform strategies to promote safe mobility.

Background

Self-regulation has been proposed as a means to increase safety on the road while preserving independent mobility (Oxley and Whelan 2008). Self-regulation has been defined as intentionally adjusting driving exposure to match driving ability and confidence (Molnar and Eby 2008) and there is a substantial body of literature examining the predictors of self-regulation. Wong and co-authors (2016) published a systematic review investigating the factors which predict self-regulation, summarised findings from 29 studies and found that most studies found women were more likely than men to practice self-regulation. However, few studies have used objective measures of driving to estimate self-regulation (Wong, Smith et al. 2016). Objective measures or naturalistic driving assessment is emerging as the gold standard in research into driving behaviour.

While there are strong associations between sex and self-reported driving, the relative strength of the association of sex to objectively measured driving behaviour is not known. We sought to examine the influence of sex on both self-reported and objectively measured driving in a large group of older drivers.

Methods

We measured driving exposure objectively using an in-vehicle monitoring device and through self-report in a community-based sample of 380 drivers aged 75 years and older who resided in the suburban outskirts of Sydney, Australia. The influence of sex on driving patterns was investigated, adjusting for age, self-reported comorbidities (Groll, To et al. 2005) and performance on a global measure of visual and cognitive function, the DriveSafe/DriveAware assessment tool (Kay, Bundy et al. 2012).

The Short Portable Mental Status questionnaire was also used to screen for cognitive impairment and a score of >2 was used as criteria for exclusion (Pfiefer 1975). The study protocol was approved by the University of Sydney Human Research Ethics Committee (10-2011/14235) and all participants signed a record of informed consent.

Self-reported measures of driving exposure included the furthest distance driven in the past year (driving space) from the Driving Habits Questionnaire (Owsley, Stalvey et al. 1999) and self-reported avoidance of night driving (Baldock, Mathias et al. 2006). Objective measures of driving distance, driving space (radius of travel from home) and night driving were recorded using an in-vehicle monitoring device.

Linear regression was used to assess the relationship between predictors and total kilometres travelled and logistic regression for the binary outcomes.

Results

We enrolled 380 drivers into our research study and instrumented 362/380 (95%) vehicles. The data in our reference week of driving were scrutinized for reliability and the final analytic data set was 343 participants. The average age was 80 years (range 75-94 years) and 59% were male.

We recorded a median of 109km of driving during the 1-week period of monitoring. During the 1 week of monitoring, close to one-quarter of the drivers (81/342, 23%) drove at least 20km away from home. When the participants were asked about their driving in the preceding year, three-quarters (288/343, 76%) reported that they had driven beyond their local shire. Night driving was relatively uncommon with only half of the group recording any driving outside daylight hours (172/343, 50%) during 1 week of monitoring and 70% of the participants reported that they did not avoid night driving (267/343).

Sex was a dominant predictor of self-reported measures driving behaviour. Men were twice as likely to report not avoiding night driving (OR 1.81, 95% CI 1.21-3.22), and four times more likely to report driving beyond their local shire in the last year (OR 3.85, 95% CI 2.03-5.72). For the objective measures, sex was not predictive of total driving distance, distance from home or night driving.

Conclusions

We report a strong association between sex and self-reported driving exposure but no association between sex and objective measurement of total distance driven, radius of travel from home and night driving among a large group of older drivers living in the community. These results call into question sex differences in driving patterns. It is possible that while more women report restricting their driving that actual driving practices are quite similar between men and women.

The fact that men and women report different self-regulatory practices may have implications for designing strategies to promote safety or helping older people to stay mobile in the face of loss of confidence or declining physical function. This study contributes to our understanding of the nature of self-reported and objectively measured driving behaviour, a methodology being used more frequently in research into driver safety. Naturalistic assessment of driving is preferred as an objective measure of driving and this study suggests that older men and women do not differ in the distances travelled, distance from home and driving at night, despite men being more likely to report that they drive further from home and do not avoid night driving.

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Roadside oral fluid testing for illicit drugs in Western Australia: Trend in testing and offences and characteristics of offenders, 2008-2015

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Abstract

This research sought to describe the trend in roadside oral fluid testing in Western Australia and associated offences and characteristics of offenders during the period 2008-2015. The rate of testing per licensed driver fluctuated over the period but showed signs of increasing in the latter years of the period, as did the rate of offending. Males and drivers aged 25-39 years were the most frequent offenders; repeat offenders were most likely to be female, aged < 40 years and to have first offended in regional WA. The results are discussed in relation to testing and enforcement practices.

Background

Impaired driving due to drugs other than alcohol is a growing area of concern. Unlike alcohol however, there is mixed and often contradictory evidence regarding which substances and levels thereof are most impairing and causally related to crash involvement (Palamara, Govorko, Broughton & Chambers, 2017). Notwithstanding these issues, roadside testing for illicit drugs in Australia commenced in 2004 in Victoria; Western Australia's program commenced some three years later in October 2007. Nowadays, all Australian States and Territories operate a roadside oral fluid testing program to enforce a 'zero tolerance'' of the three proscribed illicit substances: Cannabis, Methamphetamine and Ecstasy. This study investigates the trend in roadside testing in Western Australia, resulting offences, and characteristics of offending drivers over the first full eight years of the program, 2008-2015.

Method

Roadside testing operations data and Section 64AC offence data for the period 2008-2015 were retrieved from Western Australian Police for analysis. Operations-level data was analysed to calculate the number and rate of roadside oral fluid tests for illicit drugs conducted per year of operation. De-identified Section 64AC offence data was analysed to determine the annual number and rate of drivers testing positive for illicit drugs in oral fluids; the particulars of the offence, and the characteristics of single and repeat offending drivers. Reoffending drivers were identified through an applied 'case number'.

Summary Results

The rate of roadside oral fluid testing (Table 1) remained relative constant during the years 2008 to 2013 then significantly increased in 2014 and 2015 relative to other years. This increase was in part due to an expansion of testing in the non-metropolitan areas of Western Australia. Calculation of the annual rate of Section 64AC offences (Table 2) showed that for each additional year of operation the number of recorded offences per 100,000 licensed drivers significantly increased by an average of 10.9 (β=10.9; t=2.62, p=0.039) and by an average of 7.1 for each 1,000 roadside oral fluid tests conducted (β=7.1; t=9.18, p=0.000). The proportion of offences related to the detection of Methylamphetamine alone significantly increased by an average of 5.8% per annum, 2008-2015. Over the period, offending drivers were most likely to be male (79%) and aged 25-39 years (57%). Multivariate Cox Proportion Hazards regression showed that repeat offenders were significantly more likely to be female (HR=1.41, 95%CI 1.14-1.73); aged under 40 years (HR1.41, 95%CI 1.02-1.95) and to have first offended in Regional WA (HR=3.39, 95%CI 2.81-4.08). Around a third of repeat offenders had committed their second offence within 68 days of their first offence.

Table 1 Annual number and rate of roadside oral fluid testing for illicit drugs; Western Australia 2008-2015

Year	Roadside Oral Fluid Tests n	Rate^	95% Confidence Interval
2008	9,325	614.4	601.9-626.9
2009	7,496	483.1	472.1-494.0
2010	9,711	612.3	600.1-624.5
2011	7,598	469.8	459.2-480.3
2012	9,046	540.4	529.3-551.5
2013	7,265	420.4	410.7-430.1
2014	12,166	690.6	678.3-702.8
2015	27,899	1555.6	1537.3-1573.8

^per 100,000 Motor Vehicle Driver Licences on record in WA

Table 2. Annual frequency distribution and rates for Section 64AC traffic offences for illicit drugs; Western Australia 2008-2015

	Section 64AC Traffic Offences for Illicit Drugs				
Year	n	Rate 100,000 MDL	95% CI	Rate 1,000 ROFT	95% CI
2008	307	20.2	18.0-22.49	32.9	29.2-36.1
2009	235	15.1	13.2-17.08	31.3	27.3-35.3
2010	331	20.9	18.6-23.12	34.0	30.4-37.7
2011	355	21.9	19.7-24.23	46.7	41.8-51.5
2012	496	29.6	27.0-32.24	54.8	50.0-59.6
2013	402	23.3	21.0-25.54	55.3	49.9-60.7
2014	860	48.8	45.6-52.08	70.6	65.9-75.4
2015	2,241	125.0	119.8-130.13	80.3	77.0-83.6

MDL: Motor Vehicle Driver Licences on record in WA. ROFT: Roadside Oral Fluid Tests for Illicit Drugs

Conclusions

Western Australia's roadside oral fluid testing program for illicit drugs significantly increased over the latter years of the period 2008-2015. In these later years the rate of offending, particularly in Regional WA, and the detection of Methamphetamine also increased. These findings will be discussed in relation to changes in funding for testing and the policies and practices for roadside testing.

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Exploring collaborative user-centered design to develop ideas for greater social responsibility towards fitness to drive

Simone Steel and Kate Fayle

VicRoads

Abstract

Project Area: Medical Review – R U Fit 2 Drive?

Background

Ensuring that members of society are fit to drive is a cornerstone of the driver licensing system in Australian jurisdictions. Anecdotally it is known that licensed drivers are not clear on what impacts fitness to drive, or at least which medical conditions need monitoring to make sure they do not become an unacceptable risk to themselves and others on the road. However the assessment and monitoring process is not well understood, which requires a cooperative approach from doctors and patients, as well as careful management by the regulator.

VicRoads established a Design Lab to review and redesign policies and services in the registration and licensing domain. Its approach is user-centered service design – focusing on the user's experience in their engagement with VicRoads.

The objectives of the project were to:

- Understand stakeholder perceptions and expectations around early experiences of the medical review process;
- Review the effectiveness of the current customer experience;
- Determine the different channels a user may rely upon for information; and
- Explore the various ways a user can enter the medical review 'system', and the corresponding emotional experience.

The final set of insights would be used to identify opportunities to improve services and processes in regards to the fitness to drive assessment approach.

Approach

The intent of this paper is to highlight the non-traditional approach taken to problem solving, namely adoption of a broadly user-centered design process. The Design Lab formed a multi-disciplinary team and piloted an open 6 week ideation process. Elements of this approach included: the creation of a Design Lab and sharing of methodologies, tools and skills; stakeholder mapping, engagement with the public at customer services centres, contextual interviews with support organisations and VicRoads customer service officers, a customer journey mapping workshop, a digital customer journey mapping workshop, and frequent sharing and feedback to a core group of internal stakeholders from VicRoads.

The insights and identified themes of the design research process were shared and discussed with the VicRoads' medical review team, internal road safety experts and the operational policy team. The approach taken was to employ an *open studio* concept over a 6 week period. Open Studio is a collaborative ideation process. The design team introduced the team members to a user-centered design process: identifying and framing the problem and opportunities, ideating, rapid prototyping and user-testing possible solutions.

A collection of user stories were gathered and synthesised into three emerging themes; process visibility, information resources and social responsibility. Themes uncovered informed the key areas of opportunity covered in Open Studio.

At the conclusion of this process the team had great clarity over the following elements:

- the framing of the problem;
- articulation of the opportunity statement;
- scenarios and solution concepts;
- rapid and iterative prototypes, and
- the interests and perspectives of diverse internal and external stakeholders, including the users themselves.

The short timeframe allowed for rapid prototyping and ideation sprints. Open sessions were also held with other staff weekly to draw in broader perspectives and feedback. Photographs, films and audio recordings were created along the way to document the rich collaborative process to develop the *'R U Fit 2 Drive'* concepts addressing the need to elevate social responsibility and awareness of fitness to drive, which was presented back in week 6 to the wider group of internal and external stakeholders.

The Design Lab has developed a number of specific ideas about increasing social responsibility among people who have, or may develop conditions which require fitness to drive assessments. The key element is to identify ways in which VicRoads can work with people to assist in managing their condition and its impact on road safety. This may lead to more opportunites to improve services, processes and operational policies including public campaigns and educational approaches to build social responsibility and awareness.

Image 1: Customer Journey Mapping Workshop and digital workshop example

Image 2: Open studio ideation activities

Image 3: Open studio, iterative rapid prototyping

Where do we go from here? Predictability in tomorrow's traffic.

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Abstract

This extended abstract explores the various aspects contributing to predictability in a traffic environment, and how these aspects drastically change through the introduction of automated driving systems. Such automated systems will need to share the environment with humans, raising questions about how predictability can be achieved in such a way that automated systems can predict human behaviour and humans can predict the behaviour of automated systems. The talk presents an overview, research questions and a preliminary framework as a basis for discussion.

Predictability is the holy grail of safety research, as the correct anticipation of other agents' behaviour is crucial for adequate trajectory planning. A lack of predictability, in contrast, increases cognitive load and restricts the attentional focus, which can have fatal consequences when neglecting additional events and road users.

Within complex traffic and road use environments, predictability of different actors is foremost determined by simply understanding objects and their laws of physics. More notably, however, predictability is further increased by applying a) road rules/laws in combination with infrastructure (e.g., stop at red light), b) communication of intention between actors (e.g., indicating a turn), c) social and cultural norms, and more recently d) technologies such as C-ITS applications and in-car HMIs that extend the awareness horizon.

The introduction of automated driving systems drastically changes the notion of predictability in traffic environments, which are now shared between humans and essentially robots. This perspective raises critical research questions: How do we need to change the road rules and the design road of infrastructure so that human behaviour is easier to be predicted by machines and also, machines' behaviour can easily be predicted by humans? Is the latter desirable or will it lead to driving robots being bullied by human road users? How are intentions communicated between the automated car and the driver in both directions within the car as well as other road users outside the car? How do social and cultural norms need to be embedded in automation algorithms, and how do automated systems challenge and change those norms? In what way can novel HMIs be designed to support these aspects?

This talk presents an overview of the current state of the art and research in those areas. It presents a preliminary framework of predictability based on motion patterns and means of explicit communication, but also accounting for the impact of general rules and individual expectations. This framework (depicted in Figure 1 and summarised in Table 1) is suggested as a foundation for modelling actions and reactions in diverse types of traffic participants, including both automated and non-automated agents. It takes into account information previously analysed to identify behavioural patterns, but also refers to novel concepts currently investigated. It furthermore gives an outlook on potential supplementary technologies, which can represent an additional source of information in the case of automated driving. Current and future concepts are evaluated with regard to their respective value for real-time judgement in complex traffic scenarios featuring multiple agents, highlighting potential shortcomings and open issues.

Table 1. Prediction framework between AVs and various human road users

Directed Prediction	**Information Sources**		**New Technologies**
1. AV operator predicts AV	• HMI • Trajectory • Previous experience of driver with automation • Navigation and Routing • Automated driving style settings (eco/fast/…) • Known limits of automation	• Laws of physics • Weather, visibility & day time • Traffic Rules • Cultural behavior • Infrastructure	
2. AV predicts Operator	• Driver state modelling (drowsiness, gaze behaviour, reaching and grasping, …) • Driver model (driver classifiation, previous experience based on machine learning)		
3. AV predicts Cyclist	• Trajectory • Verbal & Gestures • Cyclist state modeling (Head and gaze direction, …)		New ways of communication (V2X, V2V) and data fusion (backend information about traffic participants) might enhance the AVs ability to predict traffic out of sensor reach.
4. AV predicts Pedestrian	• Trajectory • Verbal & Gestures • Group dynamics • Pedestrian state modeling (Head and gaze direction, …) • Demographics		
5. AV predicts Car	• Signals (indicator, brake lights, horn, flash lights) • Trajectory • Driver gestures • Vehicle to vehicle communication • Driver state modeling		
6. AV predicts Tram	• Vehicle to everything communication • Tracks • Signals (indicator, horn)		
7. Cyclist predicts AV 8. Pedestrian predicts AV 9. Car predicts AV 10. Tram predicts AV	• Signals (indicator, brake lights, horn, flash lights) • Trajectory • Driver gestures • Driver state modeling		• External HMIs • New road infrastructure • V2V, V2X
11. AV Operator predicts traffic	• Trajectory • Verbal & Gestures • Demographics • Group Dynamics • Signals • Tram Tracks • State Modeling • Experience in Traffic		
12. Traffic predicts AV Operator	• Verbal & Gestures • Driver State		

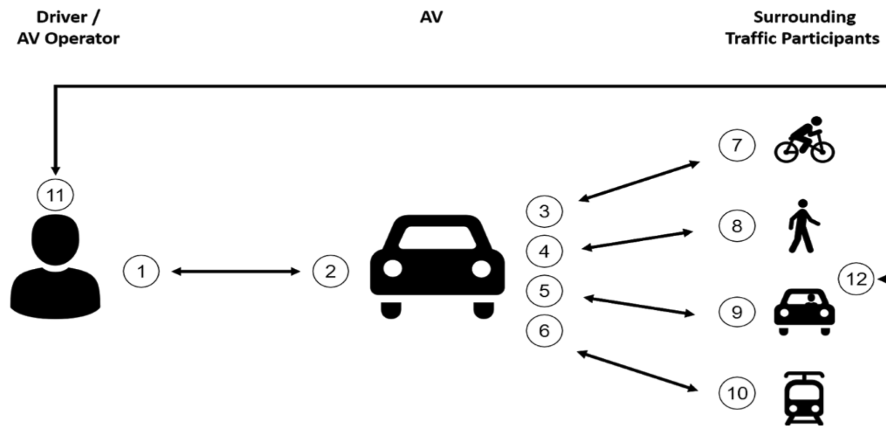

Figure 1. Where AVs might influence predictability in a future traffic mix

Overcoming methodological issues in a systems approach to the analysis of motorcycle crash data.

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Abstract

Motorcyclists represent an increasing proportion of road casualties however, while the risk factors associated with crashes can be established, less is known about the precipitating factors that directly result in a crash. Analysis of crash data based on crash type and key vehicle identifies distinct differences in the patterns of error by riders in single-vehicle motorcycle crashes, and by riders compared to drivers in multi-vehicle crashes. These patterns also vary by rider age group and provide potentially valuable information that may be obscured when the data is aggregated. Crash risk rates are also calculated using registration data as a proxy for the active riding population. This is proposed as an alternative framework for the analysis of motorcycle crashes to inform a systems approach to targeted countermeasures.

Background

A uniform set of police crash data is the primary resource for road safety policy analysis. The data includes a wide range of variables which are of varying relevance according to vehicle types. Crash type (single/multi-vehicle) and key vehicle (rider/other driver) are of particular relevance to motorcycle crashes, in addition to factors such as road alignment and road surface conditions. Motorcycles have higher proportions of single vehicle crashes and are less likely to be the key vehicle in multi-vehicle crashes (Allen et al 2017). Such variations reflect differences in the patterns of error by riders compared to drivers providing potentially valuable information for motorcycle safety measures (Geedipally *et al* 2010, de Rome *et al* 2011). This paper describes a framework for the analysis of motorcycle crash data as a means of improving the identification of precipitating factors, which may be obscured when data is aggregated.

Method

The methodology classifies motorcycle crashes into three classes combining crash type single vehicle/multi-vehicle crashes (SVC/MVC) and key vehicle rider/other driver (R/O) as defined in road user movement (RUM) codes (Devlin et al 2011). The key vehicle is defined as having the major role in the crash which, although not necessarily legally at fault, may reveal systemic patterns of error. The three crash classes were applied as a framework for the analysis of other known human and environmental contributing factors. The methodology uses registered motorcycles as a proxy for the population of active riders to estimating crash risk rates.(de Rome *et al* 2016)

Results

The results identified different crash types and patterns of error associated with each of the three crash classes and rider age group. Overall, SVCs accounted for 39% and MVCs for 61% where the key vehicle was 22% rider and 39% other driver. Riders were the key vehicle in rear-end (54%) and head-on (66%) collisions. Single vehicle crashes occurred equally on straight as on curved sections of road. The other driver was the key vehicle in 62% of all multi-vehicle crashes, including intersection crashes (76%), lane changes/turning (73%), and maneuvering(85%). Younger riders' crashes (17-25) involved more MVCs (64%) compared to 55% for older riders (40+). Young riders were more likely than older riders to be the key vehicle in MVCs (42% vs 37%).

Conclusions

The application of the three crash classes together with key vehicle data provided valuable information about patterns of error to inform rider and driver education programs. It also provides insights into the environmental features that increase road user errors with implications for infrastructure design.

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Cutting through the hype: Measuring driver attention and *actual* driver take-over times in automated driving

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Abstract

The transition between manual and automated modes is one of the primary safety concerns in semi-automated driving. This project directly addresses this concern by taking in-depth measurements from drivers operating a Tesla vehicle and responding to take-over requests in on-road driving conditions. The data collected via our driver monitoring system and other sensing technologies is being used to measure driver engagement during semi-automated driving and support a transition based on the engagement measure. These data will feed directly into the development of our next generation driver monitoring systems to improve the driver experience and safety in automated vehicles.

Background

Partially automated vehicles are already currently available in the marketplace with the most widely known being the Tesla and its Autopilot feature. One of the primary concerns in the human factors and safety community relates to the driver's ability to safely resume manual control of the vehicle after the automated driving feature is disengaged (e.g., Erickson & Stanton, 2017; Louw & Merat, 2017; Merat et al., 2014). An underlying hypothesis here is that these features will allow the driver to become less attentive to driving which could decrease their ability to safety monitor and react to changing driving demands. There is currently a chronic lack of relevant data collected from on-road driving conditions.

The CAN Drive project is designed to address this gap in knowledge and is one of the first projects in the world to measure how drivers actually behave in on-road driving conditions with partially automated vehicles. A key here is capturing in-depth measurements that afford determination of the impact on the driver's attentiveness to driving and their safety performance. A core program output is a dataset we can use to drive improvements in our automotive Driver Monitoring System (DMS) technology and that government can use to inform road safety strategy.

Method

In Phase 1 of the study, 30 drivers are being recruited and are participating in a driving study being conducted on a test track. While Phase 2 will be conducted on public roads, use of a test track in Phase 1 allows for more extreme forms of driver distraction and disengagement to be created safety.

The test vehicle is a Tesla Model S equipped with the Autopilot system. It is equipped with a range of sensing technologies that include our automotive DMS (that measures driver attention through analysis of gaze and other ocular metrics; Figure 1 (right) above steering column), forward-looking infrared camera (FLIR), and time-of-flight camera. The study will be conducted at the Sutton Road Training Centre where participants need to drive the Tesla in Autopilot mode while doing secondary task at different states from highly attentive to driving through to being highly distracted and disengaged from driving.

While Autopilot is engaged, drivers are asked to perform tasks that require them to take one or both hands off the steering wheel and eyes off the forward roadway for extended periods of time. For example, selecting music using Spotify presented on the centre console is one task (Figure 1, left). Data from pilot testing confirms that task completion times across three drivers range from 15-25 sec with up to 80% of this time being with the driver's eyes off road. Driving performance is assessed during an unexpected take-over request to the driver – and the driver's reaction time to respond and the quality of this response is measured and represents the primary safety outcome.

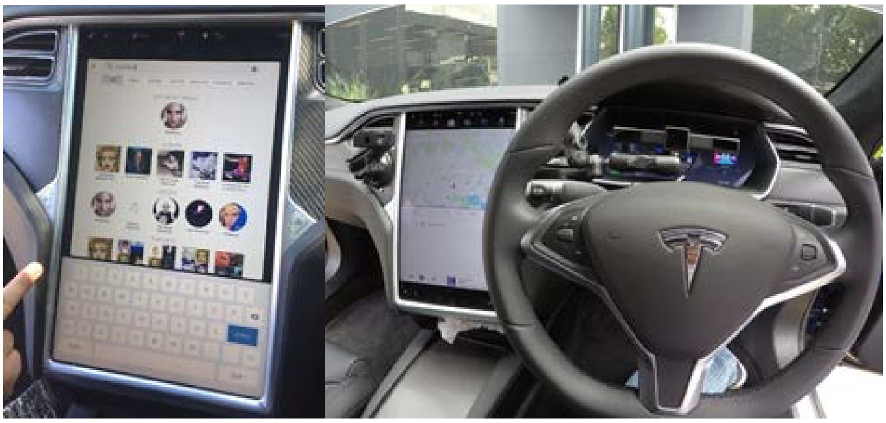

Figure 1. Searching for music on Spotify through the centre console of the Tesla (left) and position of the DMS (right)

Results/Conclusion

A key metric of interest is in using DMS to assess the level of driver engagement while driving in Autopilot mode. Moreover, we will assess the quality of mode transition based on the transition time and then investigate the relationship between driver engagement level and transition quality.

At the time of submission, data from 8 of the 30 participants have been collected. Data collection and analysis will be completed by the end of April, well in time to provide updated statistics in this abstract if accepted.

The CAN Drive project will support Seeing Machines' development of real-time driver monitoring systems to ensure sufficient driver engagement for safe transition.

Acknowledgments

This program is funded by the ACT Government. We acknowledge the strong support of the CAN Drive steering group through its co-chairs Kate Lundy and Glenn Keys. We also acknowledge the terrific support received from the Sutton Rd Driver Training Centre in providing access to their test track facility. Finally, we acknowledge the strong project management and technical team at Seeing Machines supporting the project, namely Nico Riquelme, Fivaz Buys and Kyle Blay.

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Workplace cyclist safety: a review of safety practices at Deliveroo

Marilyn Johnson[a,b], Sarah Smith[a], Phoebe Dunn[a], Pat Jess[a], Martin Wells[a], Sarah Dalton[a], Tina McCarthy[c]

[a]Amy Gillett Foundation, [b]Monash University, [c]Wheel Women

Abstract

Food delivery by bicycle is a growing service industry that has increased the number of bicycle couriers nationally. In 2017, the Amy Gillett Foundation undertook a review of the safety practices of one of Australia's leading food delivery services, Deliveroo. The review included initial contact (e.g. online approach, telephone and online screening), onboarding procedures (e.g. documentation, training, equipment) and broad systems (e.g. payment model, communications). While Deliveroo is to be commended for its existing safety measures and proactiveness in seeking to further improve its safe cycling practices, however, the review included 39 recommendations for action to improve safety of Deliveroo cyclists.

Background

Deliveroo do recognise the importance of safety for the people who ride bicycles as part of their food delivery services. Deliveroo does have cycling safety procedures, requirements and minimum standards designed to support rider safety. However, much of this originates from the UK, and does not relate to the Australian environment. The Amy Gillett Foundation was engaged to review of Deliveroo's onboarding practices for new riders in relation to safety.

Method

The review included three stages: 1) an audit of Deliveroo's existing cycling safety documentation, products and procedures (fact finding meetings and discussions), 2) Review of Deliveroo's existing cycling safety documentation, products and procedures (desktop analysis) including: induction phone call, onboarding presentations, online training, pre-ride check, Deliveroo kit (e.g. food delivery box, uniform, emergency lights etc). 3) On-road assessment of Deliveroo cycling confidence testing conducted in partnership with Wheel Women.

Results

From the three stages of the review, 39 recommendations were made in two key areas: onboard training materials and rider focused content. Onboarding training materials need to be revised for the Australian context with information including up to date information on cycling rules and state-specific road laws. Rider focused content needs to be improved to optimising rider-partner behaviours making them safer and better prepared to respond to the inevitable varying conditions they will experience. The recommendations cover the entire process of onboarding a rider at Deliveroo and is summarised in Table 1.

Other issues were identified but outside of scope. For example: assessment of food delivery box including weight (i.e. by occupational therapist or ergonomist), regular feedback from riders, mechanisms to update riders on any changes to road rules and payment structure (i.e. per delivery piece payment) that may lead to riders taking unnecessary risks to maximise deliveries and payment.

Table 1. Summary of recommendations to Deliveroo re onboarding and cyclist safety

Onboarding stage	Recommendation

Online content	• Australian context – reproduce videos to include Australian roads and paths, OH&S
	• Create separate videos to illustrate specific road rules, specifically targeting:
	    o Bike lights
	    o Priority to pedestrians on footpaths
	    o Mobile phone use
	    o Helmet use
	• Jurisdiction specific module for specific (different) road rules
	• Reporting protocols if involved/witness a crash
	• Develop a Cycling Safety Policy
	• Mandatory police check

On-bike rider assessment	• Demonstrate Deliveroo's duty of care • Assessors to have cycling safety knowledge, awareness of road rules, road confidence • Potential riders to wear a delivery box backpack during assessment • Rider safety in the rain, at night, tramlines
Onboarding presentation	• Consistent content ntationally • Images to include key safety features: helmet, bike light, bell • More detail about personal safety (e.g. obey road rules, ride predictably, safe riding around car doors etc) • Clarity about exclusion in some jurisdictions (e.g. city tunnels)
Equipment	• Additional reflective strips on the shoulder straps • Reflective strips to increase biomotion visiblity of riders

Conclusions

Deliveroo is to be commended for their approach to safety and for seeking advice to improve their onboarding safety focus. However, recommended action is needed to improve consistency and increase the safety of bicycle delivery partners.

Translating research into practice: insights into practical pathways to apply new research findings

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Abstract

Too often, there is a gap between research and action. For researchers, peer-reviewed scientific evidence is the benchmark of success, while for policy makers and practitioners, success is being able to apply findings in the 'real world'. In this presentation, we will unpack the practical process used to translate the research to practice taken in a major research project that aims to improve cyclist safety. We will discuss the approach used to bring together leading Australian and international road safety experts, practitioners and policy makers to build the pathway from research to practice and increased safety.

Background

Safer Cycling in the Urban Road Environment is a major research study funded by the Australian Research Council through the Linkage Scheme. The study started in 2013 and took a multi-disciplinary approach to understand the issues contributing to cyclist injury with a particular focus on the road environment. Now, four years later with two completed PhD studies (O'Hern, Lawrence), several scientific publications and conference presentations, the study is reaching its conclusion. To ensure the breadth and depth of research evidence produced by the study is shared with key local stakeholders and clear pathways to practice as established, a translational workshop will be held in June 2018. This presentation at the Australasian Road Safety Conference in Sydney will present the outcomes and insights from that workshop.

Method

The translational pathway has three key stages: 1) facilitated interactive workshop; 2) familiarisation of Melbourne context, and; 3) public forum. As an ARC Linkage study, this project has the advantage of existing partner organisations involved in the project from the beginning. Partner organisations include Main Roads Western Australia, VicRoads, Transport Accident Commission, Amy Gillett Foundation, Cycling Promotion Foundation will be joined by international experts, representative from local councils and staff from Monash Art, Design and Architecture (MADA) in an interactive workshop. The workshop will present the key research findings and develop pathways to implementation. Stage 2 is a familiarisation tour for the international experts prior to the workshop. This tour by electric bike will enable the experts to experience the good and the bad of Melbourne's cycling infrastructure and provide context before the workshop. The third and final stage is a public forum at Monash University where the international delegates will present insights from their own experiences and provide an opportunity to engage further with local researchers and practitioners.

Results and Discussion

The stages of the workshop will be held from 18-20 June 2018. Following the workshop we will update our submission to the 2018 Australasian Road Safety Conference to provide details on the success and the limitations of our approach and the next steps for action.

In this presentation we will present the successes and examine the limitations of this practical approach to translating research into practice. We anticipate that the findings will provide insights for other researchers and practitioners on how to close the gap between research and practice to achieve greater road safety outcomes.

The Challenges of Implementing Side Traffic Activated Rural Speeds (STARS)

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[a] Safe System Road Infrastructre Program, VicRoads

Abstract

One of the highest risk areas on rural roads is intersections, particularly where smaller side roads intersect with main roads. To find a low cost, effective treatment for high speed intersections Safe System Road Infrastructure Program is piloting Side Traffic Activated Rural Speeds (STARS) which is based on the Rural Intersection Activated Warning Signs (RIAWS) program that operates in New Zealand. Three intersections at Wahring, Yalca and Barnawatha have been selected for the Victorian-first trial and were switched on in December 2017. This article outlines the challenges that were identified and the practical solutions developed to overcome these challenges.

Background

One of the highest risk areas on rural roads is intersections, particularly where smaller side roads intersect with main roads. The speed at which a vehicle approaches and enters an intersection has a significant effect on crash likelihood and severity.

To find a low cost, effective treatment for high speed intersections Safe System Road Infrastructure Program is piloting Side Traffic Activated Rural Speeds (STARS). This treatment is based on the Rural Intersection Activated Warning Signs (RIAWS) program that operates in New Zealand. Vehicles approaching the intersections trigger an electronic speed limit sign on the main road, reducing the speed limit by 30km/h. This reduced speed limit will be active for as long as there are vehicles waiting to enter or cross the main road.

In early 2017 three intersections in rural north east Victoria were identified as good sites for the pilot. These are located in Wahring, Barnawartha and Yalca. Each intersection is unique, and was deliberately selected based on factors such as crash statistics and traffic volumes to ensure the pilot can be assessed under multiple conditions.

Problem statement

After visiting each site with a concept design in mind, it was clear that implementation would not be as simple as expected. Each site had its own set of challenges but some of the common ones were power supply, vegetation, and sign placement.

Another issue that arose at all three sites was that vehicles were not all necessarily travelling over the pavement where the loops were to be installed. At many of these rural roads there are gravel shoulders and vehicles often cut corners. In addition, there was also a challenge related to the pavement quality and use of detector loops.

Developed Solution

The Wahring site had a pre-existing mains power connection, but the Yalca system is fully solar powered, while Barnawartha uses a combination of solar and wind. Location of the electronic signs was driven by a combination of factors, from the location of the power source to minimise voltage drop, to visibility due to vegetation and site geometry. At all three sites safety barrier was installed to protect at least one of assets from nuisance hits.

Multi-loop detectors were installed at some sites to ensure that vehicles would be detected. On the side roads in-ground detector loops were chosen to deactivate the system by registering vehicle departure. At Yalca the pavement was already in poor condition at the intersection and there were concerns installation of the detectors would cause it to fail. Alternative detection systems were not viable, however so far there has been no sign of deterioration as a result of installing the loops.

Conclusion

These challenges were overcome and installation of the first pilot were completed in December 2017, with an evaluation conducted in mid 2018. Learnings from the initial pilot sites will be used to select and deliver a wider trial in Victoria, and further roll out of the treatment if successful.

Review of coroners' recommendations following fatal cyclist crashes involving heavy vehicles

Marilyn Johnson[a,b] and Lyndal Bugeja[b]
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Abstract

Heavy vehicles are overrepresented in cyclist fatality crashes. This study is a review of coroners' findings and recommendations for all cyclist fatality crashes involving a heavy vehicle. Nationally from 2000 to 2016, there were 141 cyclist deaths involving a heavy vehicle, coroners made recommendations in 17 cases with 51 individual recommendations. The recommendations were examined through the lens of the Safe System. Most recommendations focused on Safe People followed by Safe Roads and Safe Vehicles. Despite the range of recommendations from coroners nationally, little direct action has been identified in response to the recommendations to improve cyclist safety.

Background

Crashes involving cyclists and heavy vehicles are infrequent but have severe consequences. Of over 14,000 cyclist crashes from 2002 to 2012 in Victoria, heavy vehicles were involved in fewer than 5 percent of all crashes, yet over a third of fatal crashes (Garratt et al, 2015). This study, conducted through the Amy Gillett Foundation and Toll Group partnership, analysed recommendations made by coroners following heavy vehicle/cyclist fatality crash investigations.

Method

All heavy vehicle/cyclist fatality crashes were identified in the National Coronial Information System (NCIS) from 1 July 2000 to 31 December 2016. Coroners comments and recommendations were extracted from each case and the Safe System informed the analysis.

Results

Nationally from 2000 to 2016, 141 cyclist deaths were identified in the NCIS. Findings were reviewed for 140 cases, one case was excluded as it was still under investigation (Open). Most cyclist fatality crashes involved heavy vehicles classified as 'Trucks' (n=118, 84.3%) the remainder involving Bus/Coach (n=22, 15.7%). Figure 1a shows the crash trend and Figure 1b shows the total number of these crashes by state and territory.

Safe Roads and roadsides

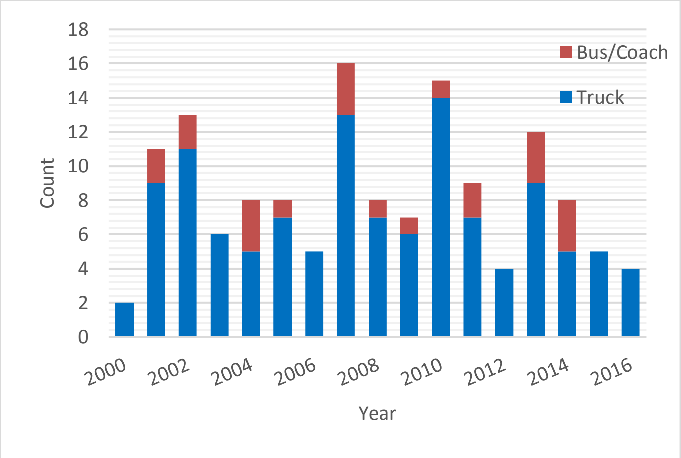
Coroners made 13 recommendations in relation to roads and roadsides, including:

- review of the guidelines and design standards
- restriction of parking to improve safety
- increased signage, roadside and on heavy vehicles
- use of technology to activate a head start light for cyclists at bike boxes

Safe Speed

No recommendations were made in relation to speed, posted speed zone nor travel speed.

Figure 1. Cyclist fatality crashes that involved a heavy vehicle in Australia, 2000 to 2016 (n=140)



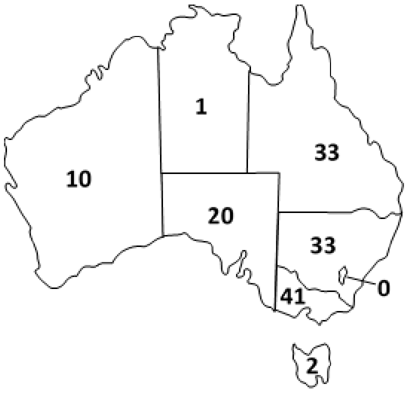


Figure 1a. Crash frequency, all cases by Year

Figure 1b. Crash distribution, all cases by jurisdiction

Safe Vehicles

Coroners made 12 recommendations in relation to vehicles. Most recommendations related to visibility and maximising drivers' capacity to see outside the cabin, including:

- Rear vision camera – trial and install to maximise driver accessibility and visibility
- Prohibit conventional shaped heavy vehicles unless fitted with appropriate warning technology

Recommendations also included: ensuring all external doors were secured, locked, regularly checked and fitted with alarms, signs to warn other road users about the dangers of being in the blind spot and side underrun bars. Recommendations for bicycles focused working brakes and wider tyres near tram tracks.

Safe People

Coroners made 22 recommendations about people, including:

Public education campaign
- Cyclist safety
- Visibility around trucks
- Safe behaviour with car doors
- Parental supervision of children

Procedural check
- Exterior doors
- Maintenance log and all defects reported
- Bus driver checklist – checked twice a day

Bicycle road races
- Improved planning, standards and training

Death of cyclists due to pass too closely was noted as a considerable concern. Road rules to specify minimum passing distances have been amended in all Australian jurisdictions, except Victoria and Northern Territory.

Discussion/Conclusion

Coronial findings follow extensive investigations however to date most recommendations lead to little action. This review is an initial investigation as part of a larger national study of Coroners' recommendations and the subsequent action to improve road safety outcomes for all road users.

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Delivering Safe System outcomes in Mildura

Lisa Steinmetz[a], Chris Jurewicz[a], Christopher Davis[b], Kenn Beer[c], Chris Hall[c]

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Abstract

Mildura Rural City Council's Road Safety Strategic Plan embraces a Safe System approach to support a safe community.

In delivering the Strategic Plan, a municipal speed limit review was undertaken and speed management plan developed. Revised speed limits, reflecting road environment rather than default limit, were proposed. The expected reduction in fatal and serious injury crashes associated with the proposed new speed limits were evaluated. Findings of the speed limit review, as well as expected fatal and serious injury crash savings are presented. The paper will also consider community response and acceptance of the proposed measures.

Background

Mildura Rural City Council recognises road safety is a major factor in community health and wellbeing. The Council's Road Safety Strategic Plan embraces the Safe System approach to support this.

Safe speeds are a key pillar of the Safe System. Recognising this, a municipal speed limit review was undertaken.

Method

The Speed Management Plan included two speed management scenarios:

- Treatment scenario 1: Two broad speed limit regions; 40 km/h in built-up areas (Figure 1: yellow region) and 80 km/h in rural areas (Figure 2: light blue region)

- Treatment scenario 2: Application of the two broad speed limit regions supplemented with additional changes on certain roads including:

    - raising or lowering speed limit from 40 km/h
    - raising or lowering speed limit from 80 km/h.

AusRAP star rating assessments and ANRAM fatal and serious injury (FSI) crash estimates were undertaken to compare the treatment scenarios with the baseline (before) scenario.

Results

In order to achieve better alignment with Safe System Safer Speeds principles, the speed management plan recommended (Figure 1):

- Lower speed limits (generally 40km/h) in built-up areas (where high levels of pedestrian activity and property access exist)

- Typically 80 km/h speed limit (20 km/h reduction) on narrow, undivided rural roads

- For Treatment scenario 2, further raising or lowering of speed limits on certain roads (as outlined in the Method) recognizing that alternate speed limits were appropriate due to the standard of the road.

AusRAP and ANRAM were used to assess fatal and serious crash risk for the baseline and treatment scenarios. It found:

- For the baseline scenario:
  - 70% of the network had an AusRAP 1 or 2-star rating.
  - Approximately 78 FSI crashes were expected over five years.
- Treatment scenario 1:
  - 11% of the network achieved a 5-star rating. The proportion of the network with 3+ stars increased by 32%.
  - 45% reduction of FSI crashes
- Treatment scenario 2:
  - 4% of the network achieved a 5-star rating. The proportion of the network with 3+ stars increased by 32%.
  - 34% reduction of FSI crashes.

Conclusions

Safe speeds are a key pillar of the of the Safe System. A speed limit review can help identify opportunities to revise speed limits to improve alignment with Safe System principles.

AusRAP and ANRAM can provide insights on the degree of Safe System alignment and outcomes associated with proposed treatment options (compared with a current scenario). The AusRAP and ANRAM analysis for the Mildura speed limit review found:

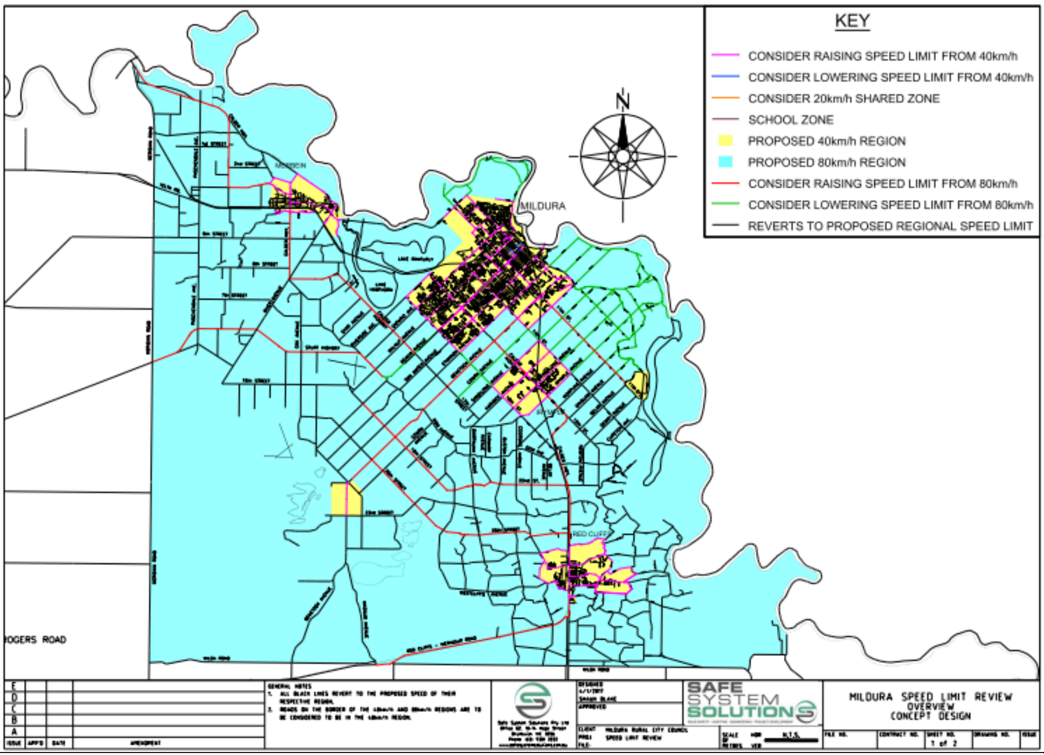
- roads that experience the highest individual risk (lowest AusRAP star ratings) tend to be on the perimeter of Mildura and on rural roads, while roads that experience the lowest individual risk tends to be in the Mildura city centre.

- roads that experience the highest collective risk (ANRAM FSI) tend to be near the centre of Mildura. This is reflective of the individual risks along these road sections and the higher traffic volumes exposed to the risks on these roads.

Table 1. AusRap and ANRAM assessment results

AusRap Star Ratings						
	Baseline scenario (before)		Treatment scenario 1		Treatment scenario 2	
	Length (km)	Percent	Length (km)	Percent	Length (km)	Percent
5 Stars	4.2	0.64%	74.3	11.35%	22.40	3.42%
4 Stars	30.70	4.69%	48.6	7.42%	99.00	15.12%
3 Stars	158.80	24.26%	279.50	42.70%	282.00	43.08%
2 Stars	274.90	42.00%	209.5	32.00%	194.30	29.68%
1 Star	186.00	28.41%	42.70	6.52%	56.90	8.69%
Not applicable	0.00	0.00%	0.00	0.00%	0.00	0.00%
Totals	654.6	100%	654.6	100%	654.6	100%
ANRAM FSI crashes						
	Baseline scenario (before)		**Treatment scenario 1**		**Treatment scenario 2**	
Total estimated FSI crashes	78.27 FSI crashes		42.74 FSI crashes (45% reduction)		51.70 FSI crashes (34% reduction)	

Overview



Built-up areas and surrounds

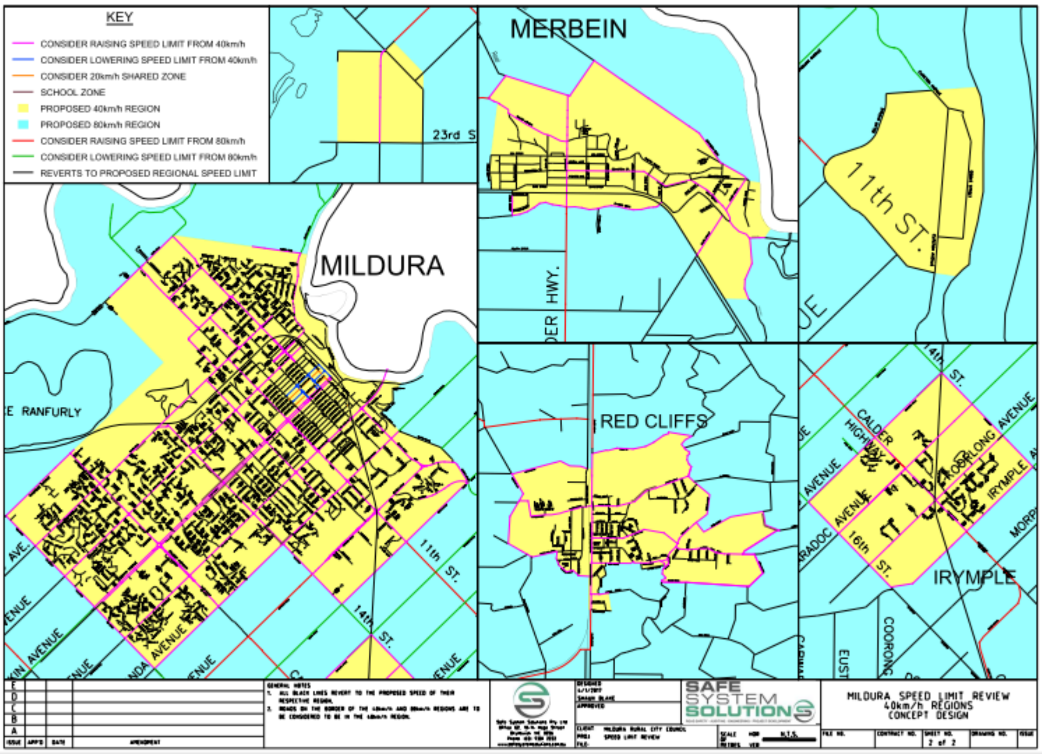


Figure 1. Mildura proposed speed management plan

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Calibrating Infrastructure Risk Rating (IRR) to Inform Speed Management in Queensland

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Abstract

Infrastructure Risk Rating (IRR) is a road assessment methodology designed to assess road safety risk, primarily as an input to the speed management process. It is one of the attributes underpinning the framework in NZ Transport Agency's Speed Management Guide and has been applied nationwide in New Zealand. As part of reviewing their speed management guidelines, the Department of Transport and Main Roads were keen to test IRR on Queensland roads. This paper presents the results of applying IRR on various road environments in Queensland with the aim of developing a single IRR model that is calibrated for all roads.

Background

In 2017, the Department of Transport and Main Roads started a review of the method for determining an appropriate speed limit specified in the Manual of Traffic Control Devices (MUTCD) Part 4 Speed Controls. The intention of this review is to identify a speed management method that supports the implementation of speed limits that are more aligned with the Safe System framework underpinning Queensland's Road Safety Strategy 2015-21.

As part of this review, TMR were keen to understand the effectiveness of Infrastructure Risk Rating (IRR) on Queensland roads in a speed limit setting context. IRR is a road assessment methodology developed in New Zealand to assess road safety risk based on infrastructure elements and interactions with surrounding land use, independent of crash history (Waibl et al., 2016). It is a significant input to the framework in NZ Transport Agency's Speed Management Guide and has been applied nationwide in New Zealand (Durdin et al., 2016).

The testing and calibration of IRR on Queensland roads involved the application of the methodology on:

- A sample of Queensland's state-controlled network (12,635 km),
- The Rockhampton network (577 km), and
- The Logan network (1,527 km).

Methodology

IRR assessment involves the input of the following road and roadside attributes: road stereotype, land use, carriageway width, horizontal alignment, roadside hazards, intersection density, access density and traffic volume. A category-based risk score is assigned to each attribute which then feeds into the IRR equation resulting in an overall risk score and rating for the road (Waibl et al., 2016).

The effectiveness of IRR on Queensland roads was evaluated by comparing the correlation between IRR and actual safety performance. The calibration process involved identifying modifications to the New Zealand IRR model to make it suitable for Queensland roads. This was an iterative process with the aim of achieving the highest correlation between IRR and actual safety performance for all three networks.

Modifications

Application of IRR on Queensland roads identified several modifications to the New Zealand IRR model to calibrate it for Queensland roads. These modifications were identified with a view of developing a single IRR model for all Queensland roads.

The traffic volume attribute was removed from the urban IRR model. This attribute is used to account for exposure to multi-vehicle conflicts. However, the Logan network results suggested that the link between traffic volumes and head-on crashes observed on rural roads does not apply on urban roads.

A slight modification was made to the alignment category score. The risk score associated with 'curved' alignment was changed from 1.8 to 1.5. This change suggests a lower crash rate on curves in Queensland compared to New Zealand.

Results

A comparison of the calibrated IRR model with fatal and serious injury (FSi) rates for the sample of Queensland's state-controlled network is shown in Figure 1.

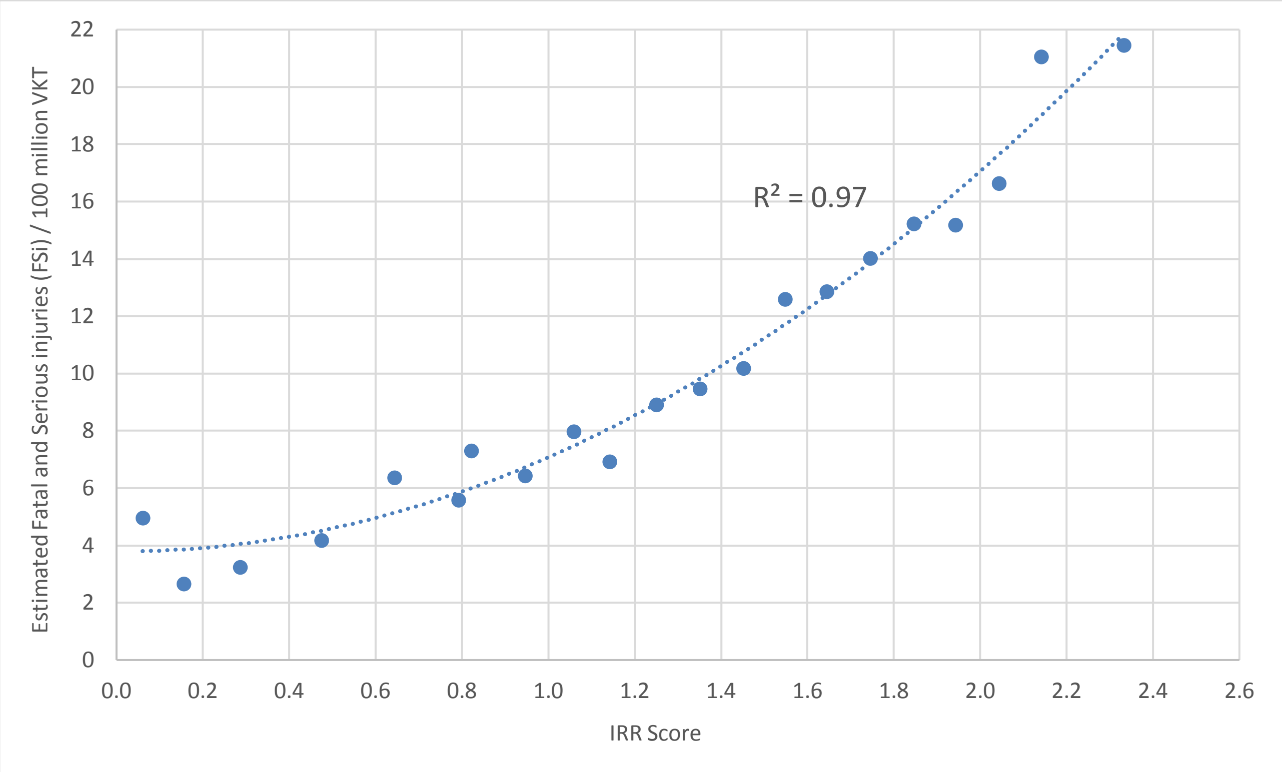

Figure 1. Comparison of IRR with FSi Rate – State-Controlled Network Sample

Across most of the 21 data bins, FSi rates increase as the IRR scores increase. This strong correlation validates the suitability of the model for Queensland roads. Following this result, TMR have incorporated IRR to their speed limit setting process.

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Assessing the combined effects of task factors and sleep need on driving

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Abstract

Driver fatigue has been attributed to both sleep need and to task-related factors, including time-on-task. The current simulator study examined the sleep-task interaction to determine their relative contributions to fatigue. Sixty participants were randomly assigned to two sleep conditions (shorter vs. longer) before a 2-hour drive. In addition to time-on-task, cognitive task load (higher vs. lower) was also manipulated as a task-related factor. Significant effects of sleep restriction and time-on-task were observed on performance (lane position variability - SDLP) and subjective ratings (sleepiness, alertness, effort). The implications for understanding driver fatigue are discussed.

Background

Much of the focus around driver fatigue has been on sleep-related contributors. The effect of task-related contributors (e.g., time-on-task, cognitive load) has received less attention. However, recent research suggests in-vehicle tasks that increase cognitive workload can reduce the effects of fatigue on driving performance. It is not clear whether such tasks also reduce the effects of fatigue due to sleep need, or how sleep and task factors combine to affect fatigue. Accordingly, the aim of the current study was to examine the interaction of time-on-task, task load and sleep need on driving performance and subjective fatigue.

Method

Design

A 2 (sleep restriction) by 2 (cognitive load) factorial experiment was conducted. Time-on-task varied within participants across the 2-hour drive. Each participant took part in one of the four conditions defined by shorter (≤5 hours in bed) or longer (8 hours in bed) sleep opportunity the night before the test drive and lower (reading posted speed limits) or higher (calculating speed limits) cognitive task load. Lane position variability (SDLP) and subjective ratings of sleepiness, mental alertness, and workload were measured.

Participants

Sixty participants (age M=23.85; SD=3.85; male=46.7%) with at least a probationary licence responded to study advertisements at UNSW and were randomly assigned to conditions.

Materials

A 2-hour (~200 km) monotonous drive was created on a Forum8 desktop simulator with straight, ‘rural’ road, no scenery or traffic and gentle curves every 5kms. The speed limit changed 18 times across the drive. Speed limit calculations were those used by Dunn and Williamson (2012). Participants verbally rated sleepiness and mental alertness on 9-point scales before, after, and every 300 seconds when prompted during the drive. Ratings were recorded via a desktop microphone. Cognitive workload was rated on the NASA-TLX. Sleep was confirmed with Phillips Actiwatch 2s.

Procedure

Participants attended a training session then, following their sleep manipulation night, they completed preliminary ratings and drove the 2-hour test scenario commencing at 9:30am. At the end of the drive, they completed final ratings including the NASA-TLX.

Results

Preliminary ANOVA analyses of performance and subjective sleepiness and alertness ratings over time showed significant effects of sleep condition and significant effects of time-on-task. Participants in the longer sleep condition had significantly greater lateral control (smaller SDLP), lower sleepiness ratings and greater alertness ratings than participants in the shorter sleep condition. Participants in the shorter sleep condition also rated the task as requiring significantly greater effort than those in the longer sleep condition. Lateral control deteriorated, alertness decreased and sleepiness increased over time. Significant overall effects of the cognitive load manipulation were not found. Further investigation of potential interactions is being undertaken.

Conclusions

Both sleep restriction and time-on-task reduced performance, increased subjective sleepiness and reduced mental alertness. The task load manipulation, however, was not effective. The implications of the pattern of performance and subjective findings will be discussed.

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Bouncing back and maintaining mobility: the relationship between resilience and driving in the Ozcandrive study

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Abstract

This study explored the concept of resilience as it relates to driving-related abilities, perceptions and practices in drivers aged 75 years and older (Male: 69.9%; Mean age = 81.74 years, SD = 3.38, Range = 76.00-90.00) in the Ozcandrive cohort study. Participants completed a range of functional/health assessments and self-reported driving questionnaires. Data for a subset of 166 Ozcandrive participants from Melbourne, Australia were analysed. Results show that higher resilience scores were correlated with higher levels of driving comfort, positive perceptions of driving abilities and more frequent driving during challenging situations.

Background

Resilience is "the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress" (American Psychological Association, 2018, para. 4). The concept of resilience has gained increasing research attention over the last two decades and is well documented in ageing literature (see MacLeod, Musich, Hawkins, Alsgaard & Wicker, 2016). However, no research has examined the concept of resilience as it relates to the driving behaviour of older adults. This exploratory study aimed to examine the relationship between resilience and driving-related abilities, perceptions and practices.

Methods

The Candrive/Ozcandrive study is a multicentre, prospective cohort study which involves 1,230 older drivers from Canada, Australia and New Zealand. Participants completed yearly assessments (for up to eight years), including demographic and driving history questions, functional performance assessments, and self-reported information on driving-related abilities, perceptions and practices. Full study details can be found elsewhere (Marshall et al., 2013). Preliminary analyses are presented from a subset of Ozcandrive participants (n = 166, Australia) who completed a resilience scale in Year 3 of data collection. Participants were primarily male (69.9%) with a mean age of 81.74 years (SD = 3.38, Range = 76.00-90.00).

Resilience was measured using the 14-item Resilience Scale. Scores range from 14-98, with higher scores indicating higher resilience (Wagnild, 2011).

Driving comfort was measured using the 13-item daytime (DCS-D) and 16-item night-time (DCS-N) Driving Comfort Scales. Scores range from 0 to 100 percent, with higher scores indicating greater driving comfort (Blanchard et al., 2010; MacDonald, Myers & Blanchard, 2008; Myers, Paradis & Blanchard, 2008).

Perceived driving abilities were measured using the 15-item Perceived Driving Abilities (PDA) scale. Scores range from 0 to 45, with higher scores indicating more positive perceptions of driving abilities (Blanchard, Myers & Porter, 2010; MacDonald et al., 2008).

Driving practices were measured using the 14-item Situational Driving Frequency (SDF) scale. Scores range from 0 to 56, with higher scores indicating driving more often in challenging situations (MacDonald et al., 2008; Myers et al., 2008).

Results

Participants had a mean resilience score of 78.97 (SD = 10.53, Range = 52.00-98.00), indicating a moderate level of resilience. Females had significantly higher resilience scores than males (Median: 82.50 and 79.00, respectively; U = 2210.50, p = .02). Table 1 shows small but statistically significant correlations between resilience scores and various driving-related scales. Participants with higher resilience scores reported: more comfort during both daytime and night-time driving; more positive perceptions of their driving abilities; and more frequent driving during challenging situations.

Table 1. Correlations between resilience and driving-related abilities, perceptions and practices.

Driving Scales	**r**	**p**
DCS-D	.20	.01
DCS-N	.20	.01
PDA	.30	<.001
SDF	.20	.01

Conclusions

Preliminary analyses suggest a significant relationship between older drivers' resilience and their driving-related abilities, perceptions and practices. Results are based on a subset of older drivers who were very healthy and active. Future research will investigate whether resilience scores change over time, and if they do, whether these changes are associated with major life and health-related events.

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Characteristics of Single Cyclist Injury Crashes in South Australia

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Abstract

One of the targets in the South Australian Government's State Strategic Plan is to double cycling participation by 2020 from the 2011 baseline of 299,000 residents riding a bike in a typical week. A potential consequence of increasing cyclist participation is an increased number of cyclist crashes. To address the safety of cyclists on public roadways a number of strategies to reduce vehicle and cyclist conflicts have been implemented. These include minimum passing distance laws (when overtaking cyclists) as well as segregated or dedicated cycling infrastructure. However, risk remains even in the absence of vehicles, with single cyclist crashes representing approximately half of all cyclist casualty crashes. This paper explores some of the characteristics of single cyclist injury crashes occurring on public roadways in South Australia.

Background and Method

Between July 2014 and December 2017, all injury records for road crash casualties presenting to the Royal Adelaide Hospital were examined. Of the 2,068 cases, cyclists accounted for 20 per cent of injuries, about half of which were single cyclists. Hospital records were examined in detail and where possible, matched to police crash records in the SA Traffic Accident Reporting System (TARS). The injuries for all the cyclists were coded using the Abbreviated Injury Scale (AIS; Association for the Advancement of Automotive Medicine, 2005).

Results

Around half of the hospital records examined did not have a corresponding report in TARS. Males aged 30 to 69 years accounted for 73 per cent of the injured sample and 41 per cent of the injured sample were aged between 40 and 60 years of age. According to maximum AIS injury coding, 60 per cent of the injured cyclists sustained an MAIS 2 injury and 23 per cent of injured cyclists a MAIS 3 (or greater) injury. Alcohol intoxication as a contributing factor in single cyclist crashes was noted in about seven per cent of cases, with 71 per cent of these recorded a BAC of 0.2 or higher.

Loss of consciousness was observed among 36 per cent of all injured cyclists, and this was also reflected in the cyclist head and neck body regions being one of the most injured in the sample. Thirty-nine per cent of all injured cyclists sustained an MAIS2+ injury and six per cent an MAIS3+ injury for this body region (head and neck). Extremities and chest body regions were also commonly injured body regions, with 46 per cent and 22 per cent of injured cyclists, sustaining an MAIS2+ injury for these body regions, respectively. While in 36 per cent of crashes cyclists spent less than a day in hospital, 12 per cent remained in hospital for at least a day, 36 per cent for two to seven days, with the remainder spending between 8 and 28 days in hospital.

The most frequent crash type involved a cyclist ‘rollover’ (79 per cent). Almost half of these occurred on steep descents in the Adelaide Hills. The distribution of crash types in the sample and the maximum injury severity for those crash types is shown in Table 1.

Table 1. Crash Type and Injury Severity

	Maximum Abbreviated Injury Scale					**Total**
Crash Type	**0**	**1**	**2**	**3**	**4**	
Roll over	2	31	96	34	3	166
Hit fixed object	1	1	18	7	1	28
Hit pedestrian			3			3
Rear end			3			3
Hit animal			2	2		4
Hit object on road		1				1
Hit parked vehicle			1			1
Other			1			1
Right turn			1			1
Side swipe				2		2
Unknown				1		1

Cyclists were deemed solely responsible for their crash in 90 per cent of crashes, however, in several crashes, potholes and road debris were found to have caused the crash. Types of crashes in which the injured cyclists were not considered at fault included crashes in which they tried to avoid a collision with a motorized vehicle, crashes with kangaroos, crashes with pedestrians on a trafficable road and crashes with other cyclists. In 92 per cent of crashes a helmet was worn.

Conclusion

This study summarises some of the characteristics of a sample of single bicycle crashes that resulted in an injury and hospital presentation. It was found that single cyclist crashes generally led to quite serious injuries, and these crashes and injuries are under reported in official road crash data. However, in a holistic approach to road safety, all injury crashes occurring on the public road transport network need to be considered, particularly when developing strategies and methods to reduce road crash serious injuries. Efforts to increase cycling participation need to be balanced by measures to prevent or mitigate single bicycle crashes. While safety measures might be complex for bicycles due to their inherent instability under many riding conditions, simple actions such regular road maintenance (including clearance of debris and timely repair of potholes) can reduce crash risk for single-cyclists.

References

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Road user perception of safety at Safe System intersections

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Abstract

This study examined driver perceptions of safety at metro and regional intersections with different types of control. Data was collected using an on-line survey with 696 participants drawn from the Royal Automobile Association of South Australia's Member Panel. Results demonstrate a greater perception of safety associated with the use of roundabouts, yet a reduced perception of safety associated with a lesser known Safe System design of raised plateaus. Additionally, the results suggest that there is some confusion about the need to give way to other traffic at traditional controlled and uncontrolled intersections, further supporting the need for Safe System intersection designs.

Method

Design

Data were collected using a self-report on-line survey. The survey was designed to obtain information regarding participant demographics, their perceptions of safety at intersections with different types of traffic controls, and their understanding of intersection warning signs.

Participants

Participants were recruited from the RAA Members panel, which is made up of RAA members who elect to respond to regular surveys. A total of 696 RAA members completed the survey. The majority of respondents (91%) were aged over 45 years, and 79% were from the Adelaide metro area. Most had held a full driver's license for more than 20 years (94%) and reported driving regularly on metro and regional roads. In general, limitations associated with the recruitment method meant that systematic bias may have been introduced by recruiting a specific cohort of road users.

Measures

Controlled intersections

Participants were shown stylized images of the same four-way intersection from the controlled approach and asked to answer questions regarding their perception of personal safety if undertaking a right turn at the intersection. The form of control was different in each image.

Rural T-junctions

Participants were shown stylized images of the same regional T-junction intersection with and without control and hazard signs from the terminating road and asked to answer questions regarding their understanding of the need to give way to other traffic when turning from the terminating road.

Intersection warning signs

Participants were shown images of standard intersection warning signs and asked to answer questions regarding their expectation of the need to give way to other traffic at an upcoming intersection.

Results

Differences in perceived safety were assessed by Chi Square test for statistical analysis with α = 0.95

Perception of personal safety at intersections

For the metro intersection (Table 1), there was no significant difference between perceived safety when faced with stop and give way controls. When faced with a give way control with plateau (raised intersection designed to reduce through vehicle speeds), perception of safety was reduced compared to traditional give way and stop controls (p<.01). When faced with a roundabout control, the perception of safety was improved (p<.01).

For regional intersection (Table 1), both the stop control and roundabout control were perceived as being more safe than the give way control (p<.01).

Table 1. Perception of personal safety at intersections

	Very safe	**Moderately safe**	**Neither safe nor dangerous**	**Moderately dangerous**	**Very dangerous**
Metro intersections					
Give way control	14.2%	46.1%	17.4%	21.4%	0.9%
Stop control	16.5%	43.8%	18.0%	20.3%	1.4%
Give way with plateau	10.9%	45.1%	19.5%	22.3%	2.2%
Roundabout	21.8%	46.1%	15.1%	13.9%	3.0%
Regional intersections					
Give way control	15.2%	37.8%	17.5%	26.0%	3.4%
Stop control	20.3%	36.6%	17.1%	21.7%	4.3%
Roundabout	25.7%	42.7%	16.4%	13.5%	1.7%

Giving way at regional T-junction intersections

When presented with the regional T-junction intersection, a proportion of respondents misidentified the need to give way to all traffic on the continuous road. This misidentification was more common with no control (7.0%) compared to with give way control (3.2%).

Understanding of intersection warning signs

More respondents identified a need to give way to traffic at an upcoming intersection when faced with a cross road ahead (W2-1)/side road ahead (W2-4) sign with a directional arrow compared to without an arrow (p<.01) (Table 2). More respondents identified the need to give way to traffic at an upcoming intersection when faced with a stop sign ahead sign (W3-1) compared to a give way sign ahead sign (W3-2) (p<.01). There was no significant difference between identification of the need to give way when faced with a T-junction beyond curve or T-junction ahead signs.

Table 2. Responses to the question "do you expect to be required to give way to other traffic at an upcoming intersection?"

Warning sign	Yes	Sometimes	No	I don't know
 *(W2-1 with arrow)*	26.3%	15.9%	42.5%	15.2%
 *(W2-1 without arrow)*	57.8%	34.8%	3.6%	3.9%
 *(W2-4 with arrow)*	3.0%	4.9%	87.9%	4.2%
 *(W2-4 without arrow)*	12.6%	13.2%	71.4%	2.7%
 *(W3-2 give way sign ahead)*	84.6%	4.7%	1.6%	9.1%
 *(W3-1 stop sign ahead)*	95.0%	1.3%	1.3%	2.4%
 *(W2-14 T-junc. beyond curve)*	95.3%	3.2%	0.6%	1.0%
 *(W2-3 T-junction ahead)*	93.4%	4.6%	1.0%	1.0%

Conclusion

The survey results show that roundabout controlled intersections, commonly the most well-known form of Safe System intersection design, were regarded as safer than traditional controlled intersections, but those with plateaus were perceived as less safe. These results suggest a need to educate the public regarding the benefits of Safe System intersection design. Findings regarding giving way at rural T-junctions and the understanding of intersection warning signs suggest that there is some confusion about the need to give way to other traffic at controlled and uncontrolled intersections. The findings of this research suggest that Safe System intersection design can benefit road safety.

A consumer-centric approach to designing information supplied with child restraints reduces errors in use: Laboratory results and field study protocol

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Abstract

The greatest challenge to optimal crash protection of children in cars is the long standing problem of errors in use of child restraints (CRS). We have worked with industry to address this problem through better design of information supplied with CRS. This paper presents results from a controlled laboratory-based trial evaluating these materials. Of those exposed to existing materials, 5% used the CRS without error, however of those exposed to the new materials, 28% achieved 100% correct use ($p<0.001$). To evaluate the effectiveness under real-world conditions, we are now conducting a field-based cluster randomised controlled trial (cRCT).

Background

Despite observation data that indicate continuing high rates of incorrect use of CRS by Australian children (Brown, Hatfield, Du, Finch, & Bilston, 2010; Keay et al 2013; Koppel, Charlton, & Rudin-Brown, 2013) and estimates that children who incorrectly use restraints are at 3-fold risk of injury in a crash (Du et al, 2010) there are few known effective countermeasures to this problem.

To use a CRS correctly, parents/carers need to understand how to correctly install the restraint in their vehicle and how to correctly secure their child in the restraint. Parents frequently report relying on materials supplied with restraints as a primary source for this information (Fong, 2017). Continuing high rates of errors, however, suggest current approaches to developing these materials may not be ensuring key information is adeqautely communicated**.** In other contexts, a consumer-driven approach to developing usage directions for medication has greatly improved correctness of use((Sless & Wiseman, 1997). As reported previously, we have used this consumer-driven method to develop new product information to accompany CRS at the point of sale (Hall et al, 2016). The effectiveness of this infomration in reducing errors in use was tested in a laboratory-based controlled trial and we now plan to confirm this effectiveness in the real-world using a gold-standard cRCT.

Laboratory-based trial method

A controlled laboratory study was conducted with 36 experienced and naive CRS users. Participants had to be over 18 years and conversant in English. Randomisation software was used to assign participants to control (n=18) and intervention (n=18) groups. Participants were asked to installed a convertible CRS in the forward-facing mode, and secure a child-size mannequin within the restraint. Control participants were provided with the existing instructions for that restraint. The intervention group were given the new materials, consisting of an A3 instruction sheet, swing tag labels and access to on-line videos via quick response (QR) codes affixed to the materials. Correct use was assessed using a 20-item pro-forma. One-way Analysis of Variance (ANOVA) was used to compare differences between groups on overall correct use and percentage correct use.

Laboratory- based trial results

Figure 1 illustrates the difference between the two groups on the proportion with no errors ($p<0.001$) and on the proportion who had no serious errors ($p<0.001$). On average, the intervention group (M= 89.08) achieved 11.7% higher percent correct than the controls (M= 77.38, $p=0.048$).

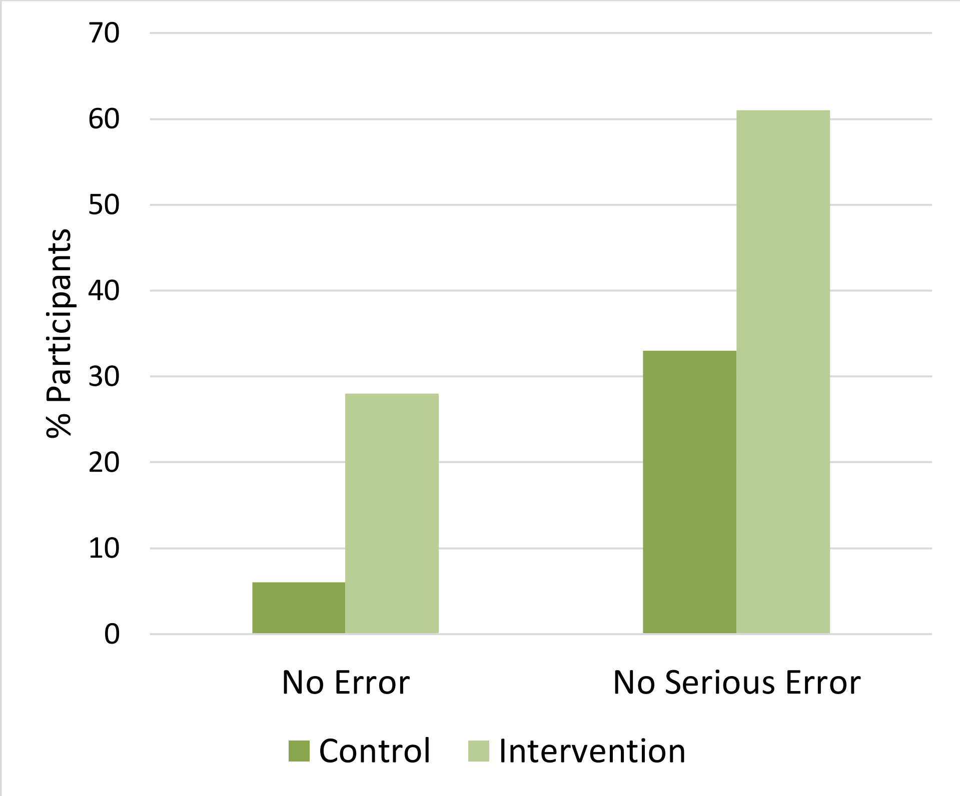

Figure 1. Reduction in errors in intervention group compared to control group

Field-based cluster randomised controlled trial protocol

To confirm effectiveness under real-world conditions a cRCT is underway. Retail stores (n=22) in greater Sydney have been randomised into intervention sites (n=11) and control sites (n=11). Participants (n=836) will enter the study on purchase of a restraint. Outcome measures are errors in installation as observed during a six-month follow-up home assessment, and adjustment checks made by the parent when the child is placed into the restraint (observed using naturalistic methods). Correct use and adjustment checks will be compared between control and intervention groups using logistic regression. This study will be completed in 2020.

Conclusions

The consumer-centric approach to developing instructional materials appears to be an effective measure to reduce errors in use. This needs to be confirmed under real-world conditions and a cRCT is underway.

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Horns and Hooves on the Highway - A Collaborative approach to road safety encourages local and regional involvement

Greg Hayes

WALGA RoadWise

Abstract

In the Kimberley region of Western Australia, what started as a discussion about issues associated with stray cattle on roads has grown into an innovative whole-of-region road safety campaign which has been embraced by state and local agencies, communities and special interest groups, members of the community and tourists alike.

Launched in February 2016, *Horns and Hooves on the Highway* is not just a catchy slogan, it is a call to action to raise awareness about one of the biggest road safety concerns in WA's north - the risks associated with straying cattle on the roads. (see Table 1)

While it is acknowledged that Main Roads WA and the pastoral industry play key roles, local road safety committees believe their role is to raise awareness of the risks and provide advocacy in bringing stakeholders together to discuss a way forward on the issue.

Background, Method, Results and Conclusions

The *Horns and Hooves on the Highway* campaign was borne out of tragic events and anecdotal evidence which suggests that cattle were involved in Kimberley crashes more often than reported. There were 235 cattle strikes in the Kimberley region during 2015. This figure is more than 800 if combined with the Pilbara region statistics[1].

Launched by Kimberley RoadWise committees together with Main Roads WA, the campaign includes support for investment in safer roads and roadsides treatments including, fencing, gates and grids and the investigation of possible speed limit reductions in known high-risk areas.

For the first phase, Main Roads WA (Kimberley) provided initial funding for 1000 *Horns and Hooves on the Highway* branded bumper stickers to be distributed across the region, while agencies agreed to adopt campaign branding on their work and personal e-mail signatures. A social media campaign was also implemented to raise awareness of straying cattle as a risk associated with driving on the region's roads.

The RoadWise committees of the Kimberley were successful in obtaining funding through the Government of Western Australia's Road Safety Community Grants Program for the implementation of the next phase of the campaign which commenced late 2017.

This second phase will involve data collection through community surveys, the writing of a discussion paper with recommendations for advocacy action by local road safety groups and the production of promotional and educational materials in a variety of languages, additional bumper stickers and an expanded social media campaign featuring local images.

The Carnarvon RoadWise Committee, and the Goldfields Esperance Industry Road Safety Alliance have also adopted the campaign and received grant funding from the Government of Western Australia's Road Safety Community Grants Program to assist with implementation.

[1] Government of Western Australia, Main Roads WA statistics.

The Kimberley Industry Road Safety Alliance has also adopted the campaign and recently commissioned a draft discussion paper be developed and make recommendations in order to address legal and other impediments to removing stock from roads and roadsides.

Horns and Hooves on the Highway took out the 2016 Insurance Commission of Western Australia's Regional Safety Award at the WA Regional Achievement and Community Awards. The win reinforces the significance of local campaigns in contributing to community safety in the regions.

The *Horns and Hooves on the Highway* campaign is testament to the ability of the Kimberley road safety network to work together to address a local issue in a collaborative way.

Local Government area	**Fatal**	**Hosp**	**Medical**	**PDO Maj**	**Total**
Shire of Wyndham East Kimberley		1		12	13
Shire of Derby West Kimberley	1		5	39	45
Shire of Halls Creek			2	6	8
Shire of Broome			1	21	22

Table 1. Main Roads WA detailed crash data 5 year period to 31 December 2015

Figure 1. Horns and Hooves on the Highway bumper sticker – English version.

Field Operational Test for Cooperative Intelligent Transport Systems (C-ITS)

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Abstract

This paper reports on the progress of a large on-road field operational test (FOT) of eight Cooperative Intelligent Transport Systems (C-ITS) safety applications on about 500 public and fleet vehicles, and road infrastructure, in the City of Ipswich, Queensland, Australia. The FOT is conducted by the Queensland Department of Transport and Main Roads (TMR), Queensland University of Technology (QUT) and is financially supported by the iMOVE Cooperative Research Centre (CRC). It adheres to the European standard FESTA methodology. This paper describes progress related to the study design covering use case description, research questions, hypotheses formulation and identification of surrogate safety measures.

Introduction

This FOT – currently the largest planned in Australia – will provide a core data set to build a standardised analysis methodology and evaluate safety benefits of C-ITS. The FOT is now at the design and preparation phase and follows the FESTA (2017) methodology which comprises international best practice guidelines, and lessons learned for conducting FOTs for in-vehicle technologies that deliver safety, mobility and environmental benefits. The main research question we are addressing is: what are the safety benefits of deploying C-ITS? Safety benefits will take into account exposure, risk of crash, injury, incidents, near crashes, crashes and other safety performance indicators.

The focus of the paper is on use case description, research questions and hypotheses and safety measures as described in Figure 1. Such information helped to specify the experimental design and to define boundary conditions. By following the FESTA guidelines, the experiment will warrant solid and consistent data analyses. A literature review has revealed a range of previous FOT and related projects which provide insight into challenges and opportunities likely to be encountered in this trial. A key aspect to the study outcome is the sanctity of the data accumulated during the trial, and availability to support hypotheses testing. Accuracy, consistency, and transparency are qualities that must be maintained throughout the chain of data collection and analysis to ensure scientific validity of results.

Some aspects of C-ITS equipment capabilities are still under discussion. This paper will discuss constraints and issues linking data collection equipment and hypotheses through the eight use cases. Each use-case has been selected as part of a business case conducted by TMR and are: Emergency brake warning (V2V), Stopped or slow vehicle warning (V2V), Turning warning for bicycle riders and pedestrians (V2I), Red light warning (V2I), Road works warning (V2I), In-vehicle speed warning (V2I), Back-of-queue warning (motorways) (V2I), and Hazard warning (V2I).

Methodology

The overall hypothesis is that C-ITS applications will trigger a driver's safe reaction/behaviour upon reception of warning messages across the eight use-cases. This observational study is a before-and-after within-subject design. Each driver (N=500) will be assigned to the baseline (control) or intervention (treatment) group after all before measurements of the exposure or risk factor variables are recorded.

The surrogate measure of safety performance attributes available for analysis is GPS (speed location) data related to vehicles and infrastructure (for example, traffic light location or Work Zone). This implies that analysis driver behaviour and risk evaluation and interpretation are constructed from GPS data which could feature errors and inaccuracies.

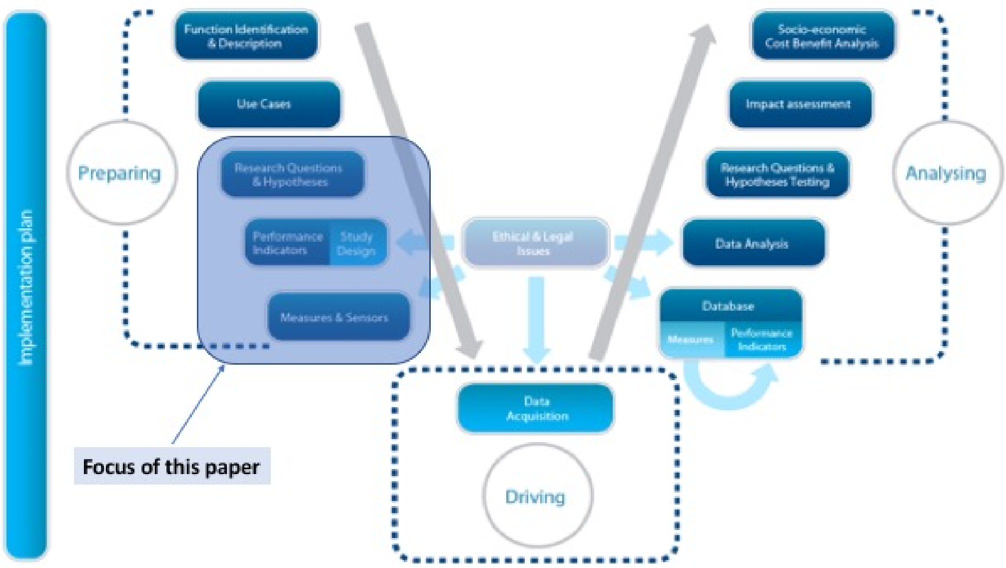

Figure 1: FESTA methodology

Conclusion

The evaluation findings will be used by transport agencies (local, state and federal) to support infrastructure investment, both digital and physical, that supports the emerging C-ITS need. Specifically, this C-ITS Pilot will (i) validate the impacts and benefits, and user perceptions; (ii) demonstrate technologies and build public awareness and uptake; (iii) grow government's technical and organisational readiness and (iv) encourage partnerships and build capability in private and public sectors.

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The efficacy of driver performance and subjective measures for investigating fatigue and distraction: A simulator study

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Abstract

Driver fatigue and distraction contribute to a significant proportion of traffic fatalities and injuries worldwide. This paper presents a sub-set of results from an ongoing collaborative research program to develop and evaluate driver state monitoring technology to reduce road trauma. Seventy participants completed simulated drives and a secondary task distraction protocol under both drowsy and alert conditions. Preliminary results show that under the drowsy and distracted conditions, drivers experienced a higher proportion of lane exceedances and crashes than when they were alert and non-distracted, and were more likely to self-report higher levels of subjective sleepiness when drowsy.

Background

Driver fatigue and distraction remain significant contributing factors to crashes worldwide. In Australia it is estimated that 20-30 percent of all fatal crashes are due to fatigue (Williamson & Friswell, 2013). Distraction is a similarly pervasive problem, accounting for as many as one in ten fatalities on Australian roads (Centre for Road Safety, 2017).

Driver state monitoring technology offers great potential to reduce trauma associated with driver impairment (Lenne & Fitzharris, 2016; Fitzharris, Liu, Stephens & Lenne, 2017). Despite a recent surge in research in this area, much of it is informed by single measures of drive state only. In order to be effective, the technology should be based on those measures that are most sensitive to detecting changes in driver state in four broad areas: physiological, subjective, visual behaviour and subjective measures. This project uses all four measures to inform the development and evaluation of driver state monitoring technology to reduce fatigue and distraction related incidents. The current presentation examines the efficacy of a sub-set of these measures - driver performance and subjective workload, based on the results of a driving simulator study.

Method

Participants

80 car drivers are being recruited from the Monash University Accident Research Centre (MUARC) participant database and via advertisements placed on billboards and on-line (Ethics Approval No. 8247). At the time of writing, 70 drivers have completed the study.

Advanced driving simulator

The MUARC Advanced Driving Simulator consists of a Holden Calais cab mounted on a 4 degrees-of-freedom motion platform in a climate controlled room with a half cylinder forward screen and a flat rear screen. The programmed simulator scenario comprised a monotonous drive on a rural two-lane highway ranging between 80-100 km/h. Ambient traffic was present but infrequent, with light levels maintained at a low, constant level.

Experimental design

Participants completed three sessions on separate visits to MUARC: a briefing session to screen for simulator sickness and obtain consent, and then an 'alert' and 'drowsy' session in counterbalanced order. The latter two sessions comprised two 30 minute blocks of baseline driving and two 30 minute blocks of secondary task driving. The secondary task comprised 10 minute blocks of visual distraction, cognitive distraction and combined visual and cognitive distraction (high workload). Task ordering of the secondary task blocks was counterbalanced across participants.

Results

A 2 (Drowsy or Alert) x 2 (Distraction or Baseline) repeated measures ANOVA will be used to analyse the data. Indicative results show that under the drowsy condition, drivers experienced a higher proportion of lane exceedances and crashes than when they were alert, and were more likely to self-report higher levels of subjective sleepiness. Under the distraction condition, drivers experienced a higher proportion of lane exceedances and crashes than baseline, and were more likely to self-report lower levels of subjective sleepiness. Results of the full analysis will be shown in the presentation.

Conclusions

Driving performance and subjective measures appear to be effective for measuring fatigue and distraction under simulated driving. Future stages of this research program will examine the efficacy of the full suite of measures in both simulator and on-road environments to inform the design of an effective driver state monitoring system.

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Injury Characteristics of Cyclist Versus Vehicle Crashes in South Australia

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Abstract

For the 2012 to 2016 period, 21 cyclists were killed on South Australian roads, a further 331 seriously injured and almost 2,500 received minor injuries. Little information is available on the types of crashes that lead to cyclist injuries and the types of injuries incurred. Deeper understanding of the circumstances leading to crash involvement for cyclists is likely to result in more targeted countermeasures. This paper explores the circumstances that lead to injuries for a group of 207 cyclists injured in crashes with another vehicle on public roadways in South Australia. The injury characteristics by the different crash mechanisms are also explored.

Background and Method

For the period July 2015 to December 2017, the Centre for Automotive Safety Research examined all injury records for road crash casualties that presented to the Royal Adelaide Hospital. Of the 2,068 cases, 204 were cyclists involved in a collision with another vehicle. The hospital records for each cyclist were examined in detail and matched to SA Traffic Accident Reporting System (TARS) data. The injuries for these cyclists were coded using the Abbreviated Injury Scale (AIS) - 2005. The injury severity score (ISS) was also determined.

Results

Male cyclists made up 80 per cent of the cases with those aged 40-49 years accounting for 19 per cent. In terms of maximum abbreviated injury score for any body region, 97 per cent of the cyclists sustained at least a MAIS 1+ injury, 68 per cent MAIS 2+ injury and 17 per cent MAIS 3+ injury. For injury severity score, more than 15 per cent of injured cyclists sustained an ISS of 12 or more. The body region most seriously injured was extremities, with 43 per cent of all injured cyclists sustaining an MAIS2+ injury and 5 per cent a MAIS3+ for this body region. Head injuries were also highly represented, with 29 per cent of cyclists sustaining a MAIS2+ injury and eight percent a MAIS3+ injury. In 46 per cent of cases the cyclists spent less than a day in hospital, however, 37 per cent of injured cyclists remained in hospital for 1 to 5 days, 8.1 per cent spent 6 to 10 days and almost 8 per cent were hospitalised for 11 days or more.

Table 1 shows the highest MAIS value for each cyclist for a particular crash type. Right angle crashes accounted for 33 per cent of all cyclist injuries. Half of all right-angle crashes were the result of three right angle crash manoeuvres. In 21 per cent of the right angle crashes the crash was the result of the vehicle pulling out from a side street or driveway on the cyclist's left, 16 per cent occurred at roundabouts where a driver failed to give way to a cyclist and 13 per cent were the result of a driver travelling in the same direction who turned left across a cyclist’s path. There were 27 crashes where a cyclist struck a parked car, 13 of which were the result of a door of parked vehicle being opened in front of a cyclist.

Table 1. Crash Type and Injury Severity

Crash Type	Maximum Injury Scale						*Total*
	0	1	2	3	4	5	
Right angle	2	14	38	12	2		68
Right turn	1	19	19	7	1		47
Side swipe	1	15	23	1	3	1	44
Hit parked vehicle	1	9	17				27
Rear end	1	2	4	4			11
Head on		1	3	2		1	7
Total	6	60	104	26	6	2	204

The majority of cyclist crashes were deemed by police to be the fault of the driver, accounting for 72 per cent, while 22 per cent of cases were deemed the fault of the cyclist (the remainder were unknown). In more than half of cases where the driver was at fault, the driver was undertaking a turning manoeuvre while the cyclist was travelling straight.

Conclusion

The findings of this study have resulted in a greater understanding of the complex circumstances leading to crash involvement for this vulnerable road user group, including the road configurations and infrastructure that render cyclist at greater risk of crash involvement. Utilizing the Safe System approach, this understanding can be applied to the development of more targeted countermeasures that reduce their risk of crash involvement on public roadways and the subsequent injuries incurred.

Protecting Road Users against Wrong Way Drivers

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[a] Auckland Motorway Alliance, [a,b] Beca,

Abstract

Wrong Way Driving (WWD) occurs when a driver either inadvertently or deliberately drives against the traffic flow. On a divided road, particularly motorways and expressways, WWD results in a serious safety risk due to the high speeds that tend to be involved when a collision occurs. Despite being a serious international phenomenon, it has typically been viewed as being in the too difficult basket to try and resolve and hence appears to have been largely left unaddressed. The Auckland Motorway Alliance (AMA) started from first principles to bring together a multi-Agency and multi-disciplinary team to develop tools and systems to target this issue.

Background.

The need for protecting against WWD was clearly recognised through the number of deaths and serious injuries sustained on the Auckland Motorway network and the exposure that our road workers are placed in due to breaches of work sites.

WWD can typically be categorised into three broad groups:

- Unintentional - where the driver has been momentarily distracted or confused.
- Impaired - a driver with alcohol, drugs (including prescription), age or medical impairment.
- Deliberate - typically in an attempt to evade police.

The drivers in each of these three categories all display different driver behaviour, meaning each potentially requires a different treatment solution. This exacerbates the challenge of developing a treatment solution to prevent drivers making that initial mistake or deliberate choice and providing protection for all road users, including the wrong way driver.

We note a high risk group are those with age related impairments. Our experience has seen 50% of WWD fatalities caused by old age related impairments. This user group is also over represented in Japan with respect to WWD. With an increase in aged driving it is reasonable to assume that the risks of wrong way driving will increase over time. Hence a need to act now.

The AMA has developed and are implementing what we believe to be a complete safe system that:

- Firstly, reduces the likelihood of drivers making a mistake by modifying physical infrastructure at interchanges;
- Secondly, detects and provides an activated warning system to alert drivers, should they make a mistake allowing them to self-correct;
- Thirdly, provides early warning to the Auckland Traffic Operations Centre (ATOC) operators and response teams allowing faster resolution times and deployment of warning to other road users should the WWD proceed to the mainline, and;
- Finally, while it is only at conceptual stage, accommodates triggers for activating systems for the disabling of a vehicle should the above interventions be breached.

Development of a System

During 2009/10, two low cost cameras that could detect and record wrong way driver movements were deployed. The cameras were used to test the concept and robustness of detection, while increasing the understanding of the frequency and cause of events.

Based on the trial, it was considered realistic to set a goal to build a robust and largely automated detection system that would activate warnings for the WWD and alert other motorists of pending danger and also provide ATOC with early warning of an arising situation.

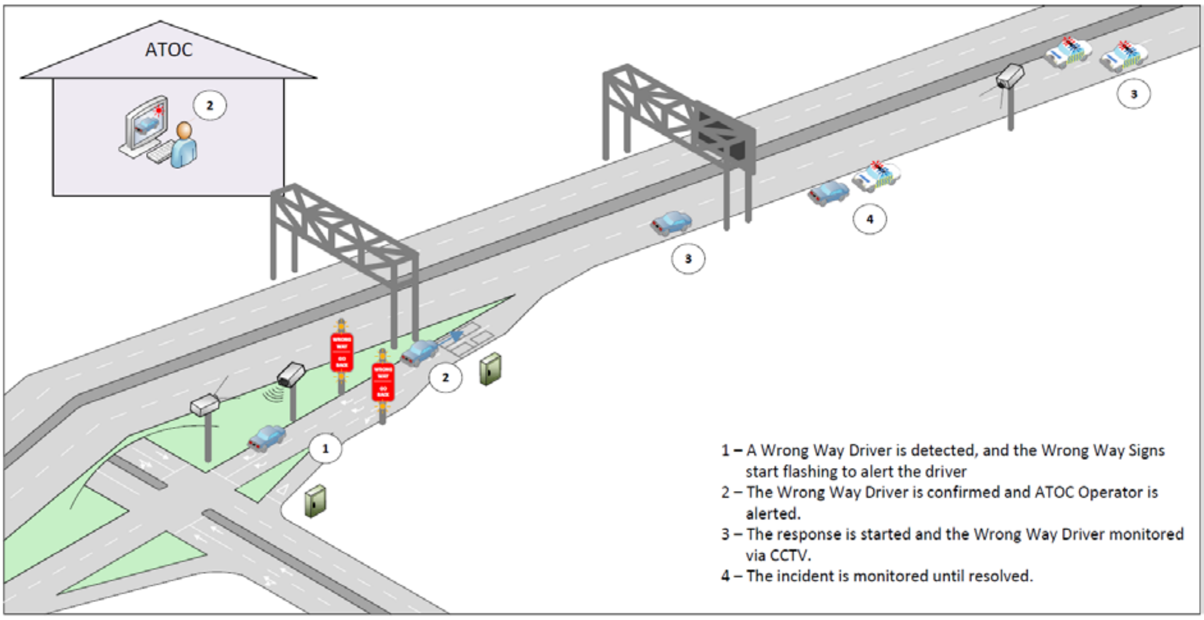

Figure 1. WWD Detection and Monitoring at Off Ramps

To complement the detection, monitoring and warning systems, a range of physical works were also identified with the aim of preventing drivers making a mistake in the first place. Many of these are very simple, e.g. changing the solid green aspect on the traffic signals to a straight ahead arrow. This has resulted in 80-100% reduction WWD movements at the site we are presently monitoring. Other initiatives include changes to signage location and content to improve conspicuity and comprehension.

This project has also utilised military developed hardware in the form of the X-Net, in what is a world first application in terms of protecting road work sites against WWD.

This paper will provide an overview of this project, exploring the drivers, their behaviors, treatment options and development, the limitations and successes and system that is presently being deployed across the Auckland Motorway network.

Determining Fitness to Drive for Drivers with Dementia:

A Practitioner's Perspective

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Abstract

Currently in Australia medical fitness to drive decisions for individuals with dementia are largely conducted by front line practitioners. Given recent changes to the fitness to drive guidelines, little is known about the processes that these practitioners use to make these decisions, and how the guidelines might assist them in making determinations about driving capacity. In order to investigate this a short survey has to date been completed by 42 practitioners. Practitioners reported that the current guidelines do not provide adequate information to enable an informed decision, with calls for a more objective assessment tool. Given the road safety implications of these decisions it is prudent to investigate this further.

Background

In a number of countries such as the UK, USA and Canada, medical fitness to drive reviews for people with dementia are routine (Lincoln & Radford, 2014; Meuser, Carr, Unger & Ulfarsson, 2015). This is a trend that is increasing internationally, with the onus of responsibility to make fitness to drive decisions falling more and more to medical practitioners (Carr, Duchek, Meuser & Morris, 2006). This is because often primary care physicians are the first port of call for all patients (Sims, Rouse-Watson, Schattner, Beveridge & Jones, 2012). There are also additional benefits to the use of in-office decision making in that it is more widely accessible and cost effective than on road assessment (Wilson & Pinner, 2013).

In Australia, medical fitness to drive assessments for individuals with dementia are made by front line practitioners including, general practitioners, geriatricians, neuropsychologists, neurologists and occupational therapists. Guidelines on how to make this determination were released in 2012 and updated in 2016, but there has been no investigation into how useful these guidelines were for practitioners. Furthermore, little is known about the approaches and tools the practitioners employ in clinical settings to assist with making decisions about driving capacity.

Method and Results

A short survey has to date been completed by 42 practitioners. The results of the survey study supported previous findings that practitioners do not feel comfortable with making the final decision regarding fitness to drive for individuals with dementia. Practitioners tended to rely largely on self-report or informant information regarding current driving practices. Although practitioners reported that the level of cognitive functioning was the most important factor in determining safe driving, only 25% of practitioners employed the use of cognitive assessments, and the tools utilised were highly varied. Whilst the vast majority of practitioners were aware of the fitness to drive guidelines, over half did not find them to be sufficient in enabling objective and reliable determinations of driving capacity to be made. Due to this, almost all practitioners reported that they believe they have missed cases of unsafe driving in this population. Over 85% endorsed the need for a more objective tool, with some calling for an in-office battery of tests to assist in the decision making process. Significantly, over three quarters of practitioners reported that they gave never received training on how to make fitness to drive decisions. Given that the current driver licencing system for individuals with dementia depends on medical fitness to drive reviews, the lack of suriety by practitioners regarding making fitness to drive decisions can have a detrimental impact on both the safety of the individual drivers, but also the community as a whole.

Discussion

Future research therefore is required to investigate the most appropriate objective assessment tool for clinical use. Furthermore, due to the overwhelming lack of professional development practitioners have received, there needs to be a focus on the development and implementation of appropriate educational and training programs. It is hoped that through the implementation of education and an in-office objective assessment tool, practitioners will be able to make better informed decisions on driving capacity for individuals with dementia which balances individual independence with overall community safety

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Automated Safety Evaluation of Intersections using Advanced Video Recognition Technology

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Abstract

The present study aims to assess the utility of advanced video recognition technology in assessing road safety at intersections. In particular, this study assessed safety performance of three complex intersections in Brisbane by using safety surrogates automatically measured by an advanced video recognition technology. Traffic movement data on typical weekdays at the chosen intersections were video recorded. Conflict analysis was then performed by analyzing traffic interactions among vehicles, pedestrians and cyclists. In particular, Time-To-Collision (TTC) and Post Encroachment Time (PET) were used to identify frequency, severity and locations of the conflicts at each intersection. Subsequently, suitable countermeasures were identified to reduce these conflicts and improve safety at these intersections

Background

The traditional approach of safety assessment mainly focuses on crash occurrence and consequences gleaned from police reported crash data. However, there are several well-known ethical as well as scientific issues of using post-hoc crash data for traffic safety analysis. In contrast, analysis of observable non-crash traffic events can provide with reliable surrogate measures for determining the road safety situation at a location of interest (Chin, Quek & Cheu, 1992; Chin & Quek, 1997; Parker & Zegeer, 1989; Allen, Shin & Cooper, 1978).

This study applies an advanced automated traffic safety diagnosis technique from prerecorded video data to evaluate safety performance of three complex intersections in Brisbane and suggest potential strategies for intersection improvement and risk mitigation.

Method

The three intersections, operated and maintained by the Brisbane City Council, selected for this study included: a) Vulture St Intersection, b) McCullough St Intersection, and c) Turbot St Intersection. The primary data consisted of video footage of traffic movements at the study intersections collected for two consecutive days using overhead video cameras placed on a trailer. Video data of the first of these two days was used for camera calibration, while the second day data collected between 7 am and 7 pm was used for conflict analysis.

Automated safety analysis included three components: automated volume count of various types of road users, conflict analysis, and violation analysis. Conflict analysis included counting conflict frequency, and identifying conflict severity and location (conflict points). The conflicts observed covered vehicle-vehicle, vehicle-pedestrian and vehicle-cyclist interactions.

In this project, two well-known conflict indicators viz. Time-To-Collision (TTC) and Post Encroachment Time (PET) were considered. Thus, a conflict with either TTC ≤ 3 seconds or PET ≤ 1.5 seconds was considered for further analysis.

The minimum time-to-collision (TTC) of each event was mapped to a Severity Index (SI) using a transformation developed by Saunier & Sayed (2008). The SI is a measure of conflict severity ranging from 0 (uninterrupted passages) to 1. Events with a higher severity index correspond to more severe traffic events.

Results

At the Vulture St Intersection, a total of 941 conflicts with TTC ≤ 3 seconds and 61 PET conflicts were observed. About 37% of TTC conflicts at this site had a SI of 0.8-1.0, indicating a larger proportion these conflicts are severe. About 72% of these conflicts were rear-end conflicts, and about 23% conflicts were side-swipe conflicts. These conflicts mostly occurred as a result of the interactions between right-turning traffic and through traffic along various approaches of the intersection. Countermeasures for this intersection included removal of left-turn slip lane, realignment of pedestrian crossing, and installing directional/lane type diagrammatic signs.

At McCullough St Intersection, a total of 336 TTC conflicts and 137 PET conflicts were observed. About 74% conflicts at this site were rear-end conflicts, about 13% were head-on conflicts, and about 6% were side-swipe conflicts. Countermeasures for this intersection included reversing priority at an approach by installing give-way treatment, extending left-turn stand-up lane and redesigning signal phases.

At Turbot St Intersection, a total of 465 TTC conflicts were observed; of these about 80% conflicts were rear-end conflicts, 13 were right-angle conflicts, and 7% were side-swipe conflicts. A significant number of these conflicts resulted from drivers not properly guided through the intersection. Countermeasures for this site included extending separator median by Chevron painting, demarking lane types by pavement directional arrows, installing pedestrian crossing ahead sign and directional diagrammatic signs.

Conclusions

The study demonstrates the capability of automated video analysis technique in diagnosing safety of complex intersections and identifying targeted countermeasures. These methods can be used to investigate particular road user behavior such as maneuvers of cyclists at roundabouts and lane filtering of motorcyclists or could be extended to conduct a before-after evaluation of safety countermeasures. A worthwhile research direction would be investigating the relationship between safety surrogates and historical crash records at these intersections.

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Application of Macroscopic Safety Models for Hot Zone Identification

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Abstract

Macroscopic safety research provides important insight into dealing proactively with road safety problems in the transport network. This research explores the need to develop and use macroscopic safety models in Australia, especially for network screening. Using road crash data from Melbourne, Australia (2010-2012), safety performance functions (SPFs) are developed for total, serious injury and minor injury crashes. Potential for Safety Improvement (PSI) is adopted as the measure of the crash risk. The developed PSI's are used to identify the various hot zones (high-risk crash zones) in the Melbourne transport network.

Background

In most Australian states, road safety research has mainly been conducted at the microscopic level. The main objective of the microscopic safety research is to identify transportation system locations (road segments, intersections, etc.) that possess underlying correctable safety problems (Cheng and Washington, 2005). Microscopic collision prediction models (CPMs) take into account the characteristics of the crash locations as well as vehicles and individuals involved in the crash.

Microscopic safety studies are known to be a reactive approach to road safety research as assessments are undertaken after safety problems have arisen (Hadayeghi et al, 2003). Although microscopic safety studies have proved successful, they require a significant crash history in each micro-location(Lovegrove and Sayed, 2007) and are difficult to be integrated in regional transportation planning.

Conversely, recent research has shown that analysing crash frequency at the macroscopic level is an insightful tool to investigate traffic safety problems. At the macroscopic level, crashes aggregated into a defined spatial unit are modelled to understand and quantify the impacts of socioeconomic and demographic characteristics, land use characteristics, transportation demand and network attributes so as to provide countermeasures from a planning perspective. Macroscopic models provide a safety planning decision-support tool that facilitates the assessment of safety implications of alternative network planning initiatives and scenarios (Hadayeghi, 2009).

Such studies have a low cost (Lovegrove, 2007) and allow a proactive approach, by targeting road safety at an early planning stage, with the potential for significant reductions in collision frequencies. The objective of this research is two-fold: (1) to demonstrate safety modelling at the macroscopic level and (2) to demonstrate the importance and application of macroscopic safety models for transport hot zone screening in Australia.

Method

Accident frequency analysis is commonly modelled using crash-data modelling techniques such as the Poisson and negative binomial (NB) models, along with their variants. In this research, crashes are modelled using the NB model to start with. The study proceeds to address two very fundamental methodological issues in crash modelling: spatial autocorrelation and unobserved heterogeneity using the random parameter NB and the semi-parametric geographically weighted Poisson regression models. Using road crash data from Melbourne Metropolitan area (2010-2012), aggregated into statistical area level 2 (one of the spatial units defined by Australian Bureau of Statistics (ABS)), safety performance functions (SPFs) are developed for total, serious and minor injury crashes. Potential for Safety Improvement (PSI) is developed and used as a measure of the crash risk. Three screening categories are also developed from the PSI for the hot zone screening.

Results

The result demonstrates the capability of macroscopic safety models and PSI measures to identify hot zones in a large metropolitan area. For the total crash model, 9 zones (3.11%) were identified as in the top 10% for priority treatment. In the serious injury and minor injury models, 8 (2.77%) and 10 (3.46%) hot zones were identified respectively. An important observation made is that 49.54% of the zones for total, serious injury and minor injury are warm zones. This result indicate that nearly 50% of the zones have the potential of becoming hot zones in the future. The spatial distributions of the hot and warm zones for the three crash types are found to be similar, with the hot zones mostly concentrated in the south eastern part of Melbourne.

Conclusions

The macroscopic safety analysis undertaken in this paper is of critical importance as it provides planners with an essential tool in incorporating safety considerations into long term transportation planning. It is expected that safety practitioners and planners will be able to suggest appropriate safety countermeasures that would be effective in dealing with the current hot zones as identified using the PSI screening method as well as the future expected road safety conditions. The proactive nature of macroscopic models would greatly contribute to the achievement of the Towards Zero Strategy in Australia.

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Road Safety – Is It a Local Government Priority? (What Does the Evidence Suggest?)

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Abstract

Almost 70% of the 392 fatalities on NSW roads in 2017 occurred on country roads (Transport for NSW, 2018). Each year, upwards of half the State's road fatalities occur on local roads, roads that are the sole responsibility of local government.

As THE road authority, local councils have the legislated responsibility to manage their road infrastructure; fundamentally this includes ensuring the safety of road users on their networks.

Councils and the State Government can no longer plead ignorance to the contribution local roads make to the tragedy and trauma occurring across NSW. Unfortunately, the current situation sees a myriad of systemic hurdles that result in local government not making road safety a priority?

What is required to change this?

Overview

When considering an application for a three-fold expansion of a regional quarry operation, what led a local council to reject a proposal by the developer to upgrade the local road in a way that would demonstrably reduce road safety risk to road users?

What is the basis to council blaming the deceased driver of a single vehicle runoff road crash for the cause of a crash, particularly when Council was aware that there had been at least two fatal crashes on the same section of local road over the previous 18 months (Mooren 2017, Sarkissian 2018)?

Are councils interested in understanding why people are being killed and seriously injured in crashes in their local government area (LGA)? Are they equipped to learn from crashes on their roads, to apply best practice principles of the Safe System approach and contribute to the national and state goals of zero death and serious injury on public roads?

And what is an appropriate response by local government to crashes occurring on their road network, both at the human level, to understand the impact on local communities, and from a technical perspective, to prevent further crashes and the associated trauma occurring?

If accepted, a full paper will draw on the author's experience of over 16 years working in NSW local government and more than 10 years working on national and international road safety projects, to discuss areas where local government, its Councillors, managers and staff, are prevented from understanding and seriously fulfilling their road safety responsibilities.

The discussion will reference to two real world examples to illustrate the type and range of systemic barriers that work against Councils making road safety a priority. The first case study outlines a potential future tragedy in waiting that, if realised, will significantly impact in a small rural community; the second case study will outline an example of a tragedy that has already had such a tragic impact and discuss the Council response by the community to calls for action to prevent even more harm.

In highlighting the type of systemic barriers faced by local government, the paper will discuss where systemic change and improvement is necessary to allow Councils to better identify road safety risk on their road networks and to develop appropriate strategies that allow them to better manage these risks, permitting this important tier of government to ‘make it happen done’ and move towards zero death and serious injury.

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Roadside Random Drug Testing In Victoria 'Making Towards Zero Happen'

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Abstract

In December 2004, Victoria Police became the world's first jurisdiction to implement roadside illicit drug testing (RDT). Initial implementation was a restricted centrally managed program, with limited numbers of tests conducted each year. The RDT program is strongly supported by a range of agencies and road safety partners that provide services to ensure the program is robust, credible and achieves contemporary road safety objectives. The legitimacy of RDT in Victoria provides community confidence that has enabled the program to expand significantly to become a state-wide enforcement program. The RDT program provides a valuable contribution to making towards zero happen.

Background

In December 2004, Victoria was the first jurisdiction in the world to introduce a random roadside drug testing (RDT program using oral fluid (saliva) as the testing matrix. The program is risk based rather than impairment based and is only applicable to the three illicit drugs, methamphetamine (MA), 3,4 - methylenedioxymethamphetamine (MDMA) and cannabis, delta-9 tetrahydrocannabinol (THC). The RDT program does not require a driver to display observable signs of impairment as a prerequisite to conduct a drug screening test. The program is risk based, that is, a driver that has one or more of the three target illicit drugs present, at any level, is at a higher risk of being involved in a collision than a drug free driver[1]. The legislative provision to conduct these tests equips police with powers to enable random roadside testing, and to remove offending drivers from the roads.

The powers to conduct roadside drug testing in Victoria demands that high levels of transparency and credibility of the enforcement program are maintained. Maintaining the credibility of the program is fundamental to providing community confidence, and allowing the program to continue to increase its levels of testing to meet the dimensions of the road safety harms sought to be prevented. The RDT program is strongly supported by a range of agencies and road safety partners that provide services to ensure the program is robust, credible and achieves contemporary road safety objectives. The agencies that support the RDT in Victoria include the Victorian Institute of Forensic Medicine, VicRoads, and the Department of Justice and Regulation. The range of services provided by these agencies include independent analysis and confirmation of police roadside detections, statutory and regulatory reviews and reforms, the analysis of roadside detection rates, and the analysis of the prevalence of illicit drugs detected in driver injury and fatal road trauma collisions.

The community confidence in RDT has supported increases in the levels of roadside tests conducted annually. After the commencement of the program in 2004 a total of 13,000 tests were conducted in the first full 12 months of testing. These tests were conducted in very limited, Drug Bus centrally

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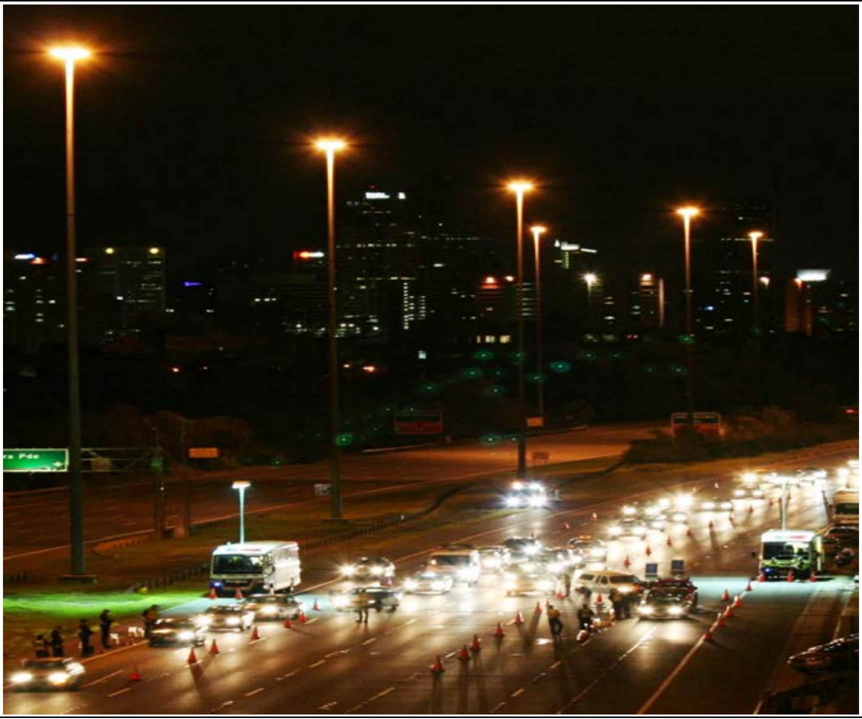
managed and highly controlled operations, to closely monitor and establish the validity of the testing program. In 2009 the number of tests carried out increased to 22,000, and included the introduction of car-based highway patrol members in some regional areas of the state. In 2010 testing increased to 42,000 tests per annum, once again increasing the number of police trained to conduct the testing. In 2014 a full state-wide enforcement program was implemented enabling 100,000 test per-annum to be conducted and sustained. Sustained effective collaboration with the road safety partners has continued to demonstrate a need to do more to prevent incidences of illicit drug detections in road trauma. This presentation will demonstrate how the learning's already established, and learning's that continue to emerge from the multi-agency approach to RDT continue to provide an evidence based approach to support the success of RDT enforcement in Victoria.



Reckless cyclists or impatient drivers? A naturalistic study of group riding in Perth, Western Australia

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Abstract

This study aimed to describe the unsafe events and road rule violations observed among groups of riders in Perth, WA using naturalistic video and GPS data. A total of 72.5 hours of eligible naturalistic group riding video footage recorded from cameras mounted on bicycles were analysed. Common violations were stop sign violations and riding more than two abreast. For unsafe events, 65% of the events involved an interaction with a motor vehicle, with over half of these involving unsafe overtaking manoeuvres (58%). Recommendations include motorist education as well as considering the safety needs of group riders in road infrastructure design.

Background

Group riding (also called 'bunch' or 'peloton' riding) is rapidly gaining popularity in Australia (O'Connor & Brown, 2007). Currently, there is little information on the safety issues faced by group riders in Australia. Therefore, this study aimed to describe the unsafe events and road rule violations observed among groups of riders in Perth, WA using naturalistic video and GPS data.

Method

This study consisted of a convenience sample of 22 cyclists who exclusively recorded group riding video footage in Perth WA, between May 2015 and April 2017. Participants were eligible if they rode as part of a group of five or more cyclists (including themselves) at least once a month. Data collection included the recording of up to six hours of group riding video footage from front and rear mounted bicycle cameras, GPS data and an interview. All video footage was viewed manually to identify the unsafe events (crashes, near misses and incidents) and road rule violations (red light, stop sign and other violations) that occurred while riding on the road. The type and percentage of unsafe events and violations were then described in detail. Correlations between group size and the mean number of violations and unsafe events per hour were also calculated. This study was approved by the Curtin Unversity Human Research Ethics Committee.

Results

A total of 72.5 hours of eligible group riding video footage from 22 participants, recorded over 68 trips were analysed by two researchers. In terms of road rule violations, 38 (10%) out of a total 368 red lights faced and 113 (75%) out of 150 stop signs faced were violated. A total of 191 'other' violations were observed, the most common being riding more than two abreast (48%), riding on the wrong side of the road (25%) and occupying more than one lane (15%). There was a significant positive correlation between the number of riders in the group and the number of 'other' violations per hour ($r= 0.413$, $p<0.001$).

A total of 186 unsafe events (crashes, near misses, incidents) were observed with 65% involving an interaction with a motor vehicle. Over half of these involved overtaking manoeuvers in which a motor vehicle was at fault (n=69, 58%) including failed overtaking attempts, risky overtaking and close passing. Fifteen percent of events (n=18) involved aggressive behaviour on the part of the driver or cyclist/s. For events not involving a motor vehicle (35%), over half (n=36, 54%) involved an interaction with another cyclist. A further 36% involved a temporary hazard, poor road maintenance or a road design or infrastructure issue. There was no significant correlation between the number of riders in the group and number of total unsafe events per hour or between the number of 'other' violations and unsafe events per hour. Since this study involved a convenience sample from Perth only, the generalisability of the findings may be limited.

Conclusions

Common safety issues for groups of cyclists included unsafe overtaking by motor vehicles and road design/ infrastructure issues. Recommendations include motorist education on how to drive around groups of cyclists as well as considering the needs of cyclists in the design of popular group riding roads. This may include a reduced number of roundabouts and traffic islands, less traffic calming, wider bicycle lanes and improved road maintenance. Cyclist education and training is also recommended to reduce the observed number of violations.

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Re:act – Swinburne students challenged by businesses to create behavioural change in their peers around truck safety

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Abstract

Re:act is an annual behavioural change project that aims to make 18-25 year olds consider their actions by increasing awareness of the dangers they may face on the roads. This year's Re:act project challenges final year Swinburne University Communication Design students to create a campaign to change behaviour in their peers around safe interactions of young road users with trucks. The winning campaign is chosen by Re:act partners and rolled out on Swinburne campus during 'O-Week'. This paper explores the Re:act process, results and the types of messaging students identify to achieve cut-through with their peers.

Background

Now in its third year, the Re:act working group has demonstrated how organisations can collaborate to influence road safety. Re:act was established by Hard Edge, a National Road Safety Partnership Program (NRSPP) Partner, in collaboration with Swinburne University to engage communication and design students in developing a campaign to change behaviour among their peers around key road risks.

The campaign gives students an opportunity to engage with leading businesses in a 'real-world' learning experience. The students receive a brief and must then research safe systems, design a campaign and pitch it. The winning campaign is executed across campus and surrounding transport nodes during 'O Week'. Local high schools have also adopted previous campaigns.
In addition to Hard Edge, Swinburne and NRSPP, other Re:act founding partners include RACV, TAC and Transurban. The 2018 theme – safe interactions of young road users with trucks – has seen Australian Trucking Association (ATA) and Melbourne Metro Transport Authority join the working group. Both are eager to understand and incorporate project outputs to engage vulnerable road users with road safety messages. ATA plans to use campaign messaging to 'remodel' its Safety Truck to better target this age demographic.

Method

NRSPP and Hard Edge, with Re:act corporate partners, developed a campaign brief. Re:act formally commenced February 27 when students received the brief and a chance to interact with the ATA Safety Truck at the Automotive Centre of Excellence in Melbourne. The aim is to provide students a 'real world' experience with corporate clients, campaign development within specified resources, and introduce them to road safety.

The students' course, which runs for 10 weeks, involves:

- Re:act partners provide campaign brief to Swinburne students (10 groups of 3) and facilitate Q&A around parameters, safe systems and course expectations.
- ATA Safety Truck gave the students an opportunity for insights into traditional education and engagement methods. Students provided opportunity to travel through Melbourne in a truck to understand the challenges of facing drivers.

- Students conduct their own research, begin developing a campaign and testing it with peers.
- A Q&A session provides an overview of background research and safe systems to students and Re:act partners. Students test campaign ideas with corporate partners for constructive feedback.
- Two weeks later, students submit a one page summary for further critique.
- Students present to Re:act partners on April 3 for judging. The winner and runner-up present their campaigns at ATA's National Conference, illustrating shifts in communication mediums and messaging to a high-risk demographic.
- The winning student/s work with Hard Edge to refine the winning campaign, which is then executed in Swinurne's 'O Week' and shared with other campuses and partner networks.
- The reach and effectiveness of the campaign is evaluated.

Results

A representative from the top three finalists attended ATA national conference in Canberra in April where they presented their campaigns. The winning campaign will be launched in August as part of Swinburne's 'O Week', so the findings will be summarised during the 2018 ARSC conference.

Conclusions

These will be confirmed in April with the top three campaigns summarised.

On-road observations to identify potential contributors to road trauma, and opportunities for road safety improvements in Lao PDR

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Global Road Safety Solutions Pty Ltd

Abstract

Road safety in Lao PDR is following the trend of increasing trauma with increasing population and motorised vehicle use. On-road observations of road user behaviours and road infrastructure were conducted to assess potential contributors to road crash deaths and injuries in Lao PDR. Lack of helmet and seat belt wearing, high travel speeds, lack of safe pedestrian amenity, limited road and roadside infrastructure, and use of intrinsically unsafe vehicles were identified as key contributors. These risk factors suggest that Lao PDR's road crash deaths and injuries can be greatly reduced by stronger enforcement, more comprehensive laws, and Safe System infrastructure.

Background Road safety in Lao People's Democratic Republic (Lao PDR) is following the trend of increasing trauma with increasing population and motorised vehicle use. Two to three wheeler vehicles make up the majority of the country's vehicle fleet (Nguyen, 2013), and vulnerable road users (motorcyclists, bicyclists and pedestrians) account for the majority of road deaths in Lao PDR (WHO, 2015).

Method On-road observations of road user behaviours and road infrastructure were conducted in the capital Vientiane and rural areas of Lao PDR to assess the extent to which well established risk factors that are known to contribute to road crash deaths and injuries exist in Lao PDR, based on well established risk factors.

Results The on-road observations highlighted low and/or inappropriate (e.g. worn without the strap done) helmet wearing, low seat belt wearing especially in the back seats, high travel speeds, failure to give way to pedestrians on marked pedestrian (zebra) crossings, pedestrians walking along the roadway, lack of pedestrian infrastructure (e.g. footpaths), use of pedestrian paths for purposes other than walking (e.g. commercial acitivies, parking), limited road and roadside infrastructure (e.g. sloped ends and fishtail ends), and extensive use of high risk vehicles (e.g. motorcycles, modified hand tractors) in Lao PDR. The motorcycle helmet law in Lao PDR requires both drivers and passengers to wear a helmet but does not specifically require that the helmet be fastened. On-road observations of helmet wearing in daylight hours revealed that 35.9% did not have the chinstrap done up. The observations further revealed that helmet wearing dropped at night compared to daylight hours in central Vientiane from 85.9% to 25.8% and in non-central areas of Vientiane from 69.0% to 44.7%. The seat belt law in Lao PDR does not cover rear seat passengers and seat belt wearing was virtually zero for rear seat occupants. Police were also observed not wearing seat belts in cars and not wearing helmets on motorcycles. Shops and stalls taking over the footpath are not uncommon in many countries, but the extent of the problem seemed particularly large in Lao PDR, with many vendors even taking over the road itself. Modified hand tractors and cargo areas of vehicles with no seat belts and facing sideways to the direction of travel were also found to be used as ways to transport passengers in Lao PDR, posing significant risks of death and serious injury (Ericson, 2010).

Conclusions These risk factors are managable, and suggest that Lao PDR's deaths and injuries from road crashes can be greatly reduced by stronger enforcement, more comprehensive laws, and Safe System infrastructure. Opportunities are discussed based on international evidence.

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Preparing for driving cessation: More thought than action

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Abstract

Driving cessation is a difficult topic that many older drivers avoid, however being prepared for transport dependence may mitigate the negative outcomes associated with driving cessation. In a population based survey 1181 older drivers reported their level of contemplation and planning for driving cessation. Socio-demographic, health characteristics, and transport use were compared between those who had given driving cessation no thought (pre-contemplators), thought about it (contemplators) and made plans (active planners). Active planners were a small minority, were older, and reported poorer health than the other groups. 46% had not thought about driving cessation at all.

Background

For older drivers the possibility of no longer being able to drive can be a difficult, emotional and often avoided topic, especially when there appear to be few alternatives. Preparing for life as a non-driver, much like preparing for life after retirement from work, may assist older people make an easier transition and mitigate some of the negative outcomes associated with driving cessation. These include increased risk of depression (Chihuri et al., 2016), reduced activities outside of the home (Marottili et al., 2000), and increased mortality (Edwards, Perkins, Ross, & Reynolds, 2009). This presentation will describe 1. the extent to which older drivers are thinking about and planning for driving cessation; 2. what plans they are making; 3. the characteristics of those who are planning for cessation compared to those not planning for, or contemplating, giving up driving.

Method

Population based telephone survey of 1181 older drivers (in New Zealand) recruited through stratified random sampling, aged 65 - 96 years. Measures included each participant's level of contemplation and planning for stopping driving, socio-demographics and health (e.g., health status, quality of life, mobility), current transport use, and perception of driving ability becoming a problem within five years.

Results

Almost half (46%) of older drivers had given no thought to the possibility of having to stop driving (pre-contemplators). Of the remaining older drivers, 81% had given it some thought but had not made any plans (contemplators) and 19% had made plans for the possibility of not driving (active planners). Compared to pre-contemplators and contemplators, higher proportions of active planners were older, female and widowed/single. They were more likely to report worse health, moderate/severe mobility problems, and two or more chronic health conditions. Higher proportions of active planners were already using mobility scooters and community transport, however the overall use of alternative transport was low and driving was the primary mode of transport for all older drivers. One third of active planners anticipated having problems with their driving within the next five years. Fewer contemplators (17%) and pre-contemplators (7%) expected to have problems.

Conclusion

In car dependent societies like Australia and New Zealand planning may ease the transition out of licensure, and reduce negative impacts. Although half of older drivers had given some thought to no longer being able to drive, very few had made any plans for this. Those that had made plans were older, more likely to be female and reported poorer health. The results from this study are consistent with prior research which indicates few drivers are planning for how they will meet their transport needs once they are transport dependent, even when they expect their driving ability to become an issue. Future research with this cohort of older drivers will measure outcomes following driving cessation to understand the influence of planning and the types of plans made, on success in adapting to life as a non-driver.

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The redevelopment of DriveSmart: a new life for an evidence-based approach to online learner driver training

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Abstract

It is well known that novice drivers are consistently overrepresented in road trauma. In order to improve learner drivers' hazard perception, safe response and attentional control skills, the DriveSmart program was originally developed and tested with two main aspects: scenario video-based exercises and attentional control training. While the original learning framework is still considered to be valid, key issues relating to the age of the program prompted a need for substantial redevelopment. Scripting, filming and post production of new video-based scenarios was completed in 2017 with the redeveloped DriveSmart website expected for public launch in June 2018.

Background

Despite clear reductions in the number of young drivers killed on Victorian roads, young novice drivers continue to be overrepresented in road trauma. In Victoria in 2016, 19% of drivers who lost their lives were aged between 18 and 25 years, despite this age group representing only around 10% of Victorian licence holders (TAC, 2018). In order to support learner drivers to become safe solo drivers, research was conducted by MUARC to inform the development of the original DriveSmart training program in the late 1990's.

The DriveSmart Program

The original DriveSmart concept included two main aspects: scenario video-based exercises and attentional control training. Scenario-based exercises develop skills relating to perceiving and responding to hazards both in specific circumstances where novice drivers are known to be at higher risk as well as in novel circumstances that will aid in the generalization of skills to a wide range of situations. Attentional control training uses techniques to improve the ability of novice drivers to allocate attention to the right things at the right time (Hagston, Hughes & Wallace, 2015).

The first iteration of DriveSmart was publically released in 2000 on CD-ROM and later moved to an online delivery in 2014. Simulator-based evaluation of the original DriveSmart found it to be effective in training the target skills (Regan, Triggs & Godley, 2000). Although the underpinning research and learning outcomes of the product are still consistent with more recent findings (Hagston et.al., 2015), the age of the program itself was negatively impacting on program delivery particularly in regards to;

- Limited screen size of the original design did not map well to modern wide-screen formats
- Program was not compatible with mobile devices
- Original video capture was poor in comparison to modern video format standards and expectations
- Accessibility and program engagement limitations, particularly in regards to the attentional control module
- Lack of integration and alignment with new learner driver programs and Safe System.

Redevelopment

Given the large number of users accessing the DriveSmart program, over 70,000 at the time of redevelopment, and the lack of a comparable product in market, the decision was made to redevelop the DriveSmart program. The redeveloped DriveSmart program will remain consistent with the original program's underpinning research, learning framework and approach but will incorporate a number of enhancements. Key changes include:

- A mobile optimised approach suitable for completion on a smart phone or tablet
- Increased focus on user engagement features
- Improved video capture data
- Improved accessibility for users (including CALD users)
- Inclusion of a broader range of road users, including vulnerable road users, and high speed merging
- Adjusted focus of scenarios to reflect changes in common crash types for novice drivers
- Alignment with broader learner driver resources, the Safe System and Towards Zero.

Filming and post production of scenarios was completed in mid-2017 and Beta delivery of all 100 scenario based learning activities and 14 attentional control activities was completed in mid-February 2018. The redeveloped DriveSmart website is expected to launch at the beginning of June 2018.

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Vehicle modification prescription for drivers with disabilities: development of consensus based prescription guidelines to optimise user interfaces and safety

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Abstract

Vehicle modifications (VMs) may be essential to ensure drivers with disabilities can access and drive motor vehicles independently and safely: safer driver-vehicle interfaces are an imporant contributor to meeting the goals of ”Toward Zero” for this driver group. Occupational therapy driver assessors (OTDAs) routinely prescribe vehicle modifications based on individualised assessments. Following stakeholder consultation, safe systems and human factors analysis and a literature review, we identified resource gaps in information to support a licensing authority approved, and evidence based, VMs prescription process. Using an action research approach, we established content validity for items and developed consensus-based draft VMs prescription guidelines ready for trialling by OTDAs.

Introduction and Aims

The independence of drivers with disabilities (DWDs) relies on application of the safe system approach: optimising safer human-machine interfaces through VMs such as alternative primary/secondary controls and access/egress enhancements (Brouwers et al., 2010). OTDAs have primary responsibility to recommend VMs to drivers and driver licensing authorities (DLAs). Currently no resources provide detailed guidance to support the complex process of the VM prescription to match human factor requirements and individual capacities (Di Stefano & Stuckey, 2015). We sought to (a) clearly articulate components and stages of VMs prescription process, (b) establish content validity for items, and (c) confirm practicability of items for a draft set of consensus-based guidelines.

Methods

A literature review, ergonomic and safe system driving task analysis, and targeted project advisory group (PAG) (including expert OTDAs, DWDs, key advocacy groups and funding/regulating agencies) informed the participatory action research study design. A survey investigating DWDs experiences (reported elsewhere), focus groups (FGs), and PAG consultation, were used at different stages. Action research processes utilise user expertise to investigate phenomena, developing meaningful outcomes and optimising ownership and application (Koshy, et.al. 2010).

We synthesised evidence from DWDs survey results, literature/resource review, and ergonomic/task analysis to develop draft VMs guidelines (e.g. Di Stefano et al, 2015: European Committee for Standardisation, 2013: Henriksson & Peters, 2004: Herriotts, 2005: Norweg et al., 2011). In the absence of an available purpose-specific survey tool, an instrument was designed and ratified by the PAG then distributed to all practicing OTDAs in the DLA. The survey gathered demographic information (15 items) and elicited current practice ratings on a 4 point scale (‘yes all the time’, ‘sometimes’, ‘never’, ‘don’t know’,‘not applicable’)(49 items), and comments to action statements.

FGs systematically reviewed/validated all items, and sought item consensus agreement on inclusion (as “essential” or “desirable”) and feedback (e.g. clearer wording). Quantitative and qualitative data were analysed. In the absence of practice domain prescribed criteria, the PAG unanimously determined that ≥90% should be the objective cut-off for consensus agreement levels for guideline items.

Results

Practice guideline categories included:

1. General assessment and prescription principles (e.g. standardized assessment results),
2. Person-centered and human-machine factors (e.g. impairments, inability to access standard control configurations),
3. System factors impacting VMs provision (e.g. DLA requirements),
4. Driving as an occupation (e.g. worker vehicle requirements),
5. VMs training issues (e.g. access to equipment),
6. VMs evaluation
7. In-vehicle evaluation, and
8. On-road driving in traffic.

Fifty three OTDAs (81.5% of total) returned questionnaires and/or attended FGs. No-one suggested new, or rejected, items or categorizations. Collated survey and FG item responses confirmed consensus agreement for 39 of 49 items as ”essential inclusion”. Content analysis identified suggested wording changes to improve item clarity/meaning related to two themes (a) OTDA role clarification and differentation (e.g. reliance on vehicle installer for compliance) and (b) current practice limitations (e.g. accessing equipment to trial).

Discussion and Implications

We (a) clearly articulated components of the prescription process, (b) established item content validity, and (c) confirmed practicability of items for this first international draft set of consensus-based OTDA VMs guidelines, now ready for trialing. Enhanced road safety via consistent prescription processes and safer human – machine interfaces is the ultimate goal of the new guidelines.

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Unfolding the full extent of major road trauma crashes

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Abstract

Major trauma (MT) is a term used for pre-hospital patients that have sustained life-threatening injury. Trauma patients from the same road traffic crash are seldom matched in hospital data and therefore the individuals in need of medical care from MT crashes are likely underestimated. Using a hospital and police matched road crash database, additional individuals from MT crashes were retrieved. The sample of individuals increased from 2,542 MT patients to a total of 4,937 individuals. Emergency department presentations increased by 39.8% and ambulance transportation by 34.8%. Ninety-five additional fatalities were not accounted for in the original MT sample.

Background

Injuries and fatalities from road traffic crashes are a great burden to global health (WHO, 2015). Major trauma (MT) is a term used in pre-hospital and acute hospital care for patients that sustained life-threatening injury to the body or who died in hospital from trauma. Analyses of MT normally use hospital data at patient level with an Injury Severity Score (ISS) above 12 or 15 (Palmer, Gabbe, & Cameron, 2016), and in-hospital fatalities. Such data generally do not provide matching between trauma patients from the same road traffic crash. This likely underestimates the number of patients requiring medical care from MT crashes. The objective of this study was to determine the additional number of people involved in MT crashes in Sweden.

Method

Data from April 2011 to March 2017 was retrieved from the Swedish Traffic Accident Data Acquisition (STRADA) (Howard & Linder, 2014) which is a dedicated road crash reporting system containing matched hospital and police data. Police and hospital emergency departments (ED) report road injuries directly to the STRADA and individuals are matched automatically within the system. First, MT patients were selected from ED reported data using the following criteria; road users (pedestrians, cyclists, powered two-wheeler riders, car/truck/bus occupants) that were transported by ambulance with an ISS > 12 or died in hospital. Then, matched individuals involved in the same MT crash was added to the sample. Finally, three data groups were generated: 1) major trauma patients, 2) additional ED patients, and, 3) road users solely reported by the police.

Results

The original MT sample included 2,542 patients from 2,444 road crashes. An additional 1,012 ED patients or fatalities were identified through ED records. Of these ED patients, 884 (87.4%) were transported to hospital by ambulance and 488 (48.2%) were admitted to ward. The police reported 1,383 MT crash participants beyond those presenting to the ED. In total, there were 4,937 road users exposed to a MT crash. In Figure 1 the proportion of road users and their injury level is presented per data group. In the original MT group a higher proportion of vulnerable road users is present because many are impacted by another vehicle or they have been in a single vehicle crash. Car occupants are the most frequent road user in all three groups. There were 30.6% patients who were moderate (ISS 4-8) to severely injured (ISS 9-12) and a total of 95 fatalities in the additional ED and police groups.

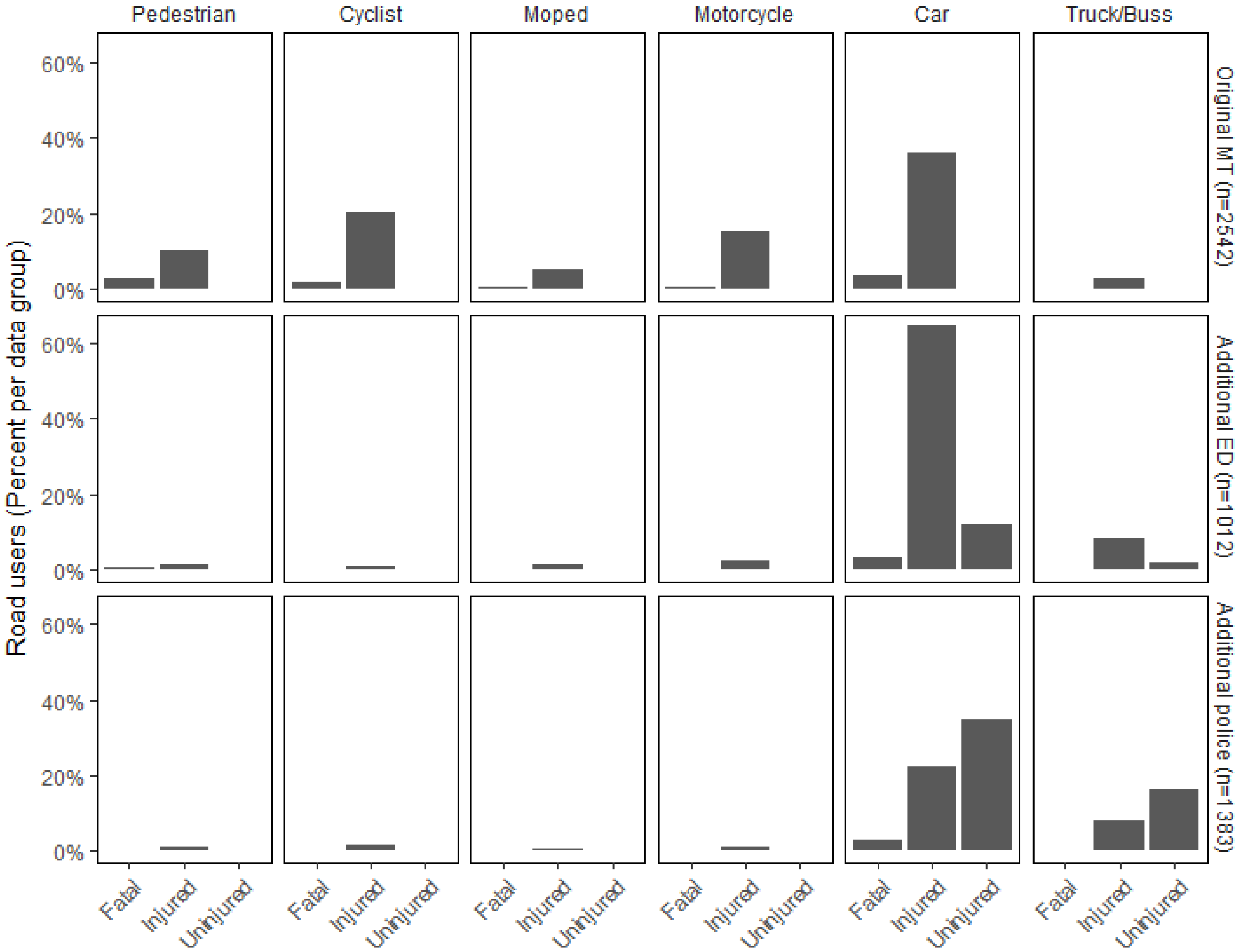

Figure 1. Injury level distribution per road user category involved in major trauma crashes. Original MT: ISS > 12 and in-hospital deaths. Additional ED: uninjured and ISS ≤ 12 and dead upon arrival. Additional police: uninjured, injured according to the police and died on-scene.

Conclusions

The burden of major trauma crashes on the society and the health care system is much larger when all road users involved in these crashes are considered. The matched crash data revealed an increase of ED presentations by 39.8% and ambulance transportations by 34.8%. Ninety-five additional people who lost their lives in these major trauma crashes were identified. This work emphasises the need to prioritise the prevention and mitigation of MT crashes. The study also highlights the need for improved opportunities in data linkage across authorities to better guide crash and injury prevention strategies.

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The Queensland Speed Conversation – Changing the way motorists look at speed

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Abstract

In May 2016 the Queensland Department of Transport and Main Roads (TMR) released the Queensland Speed Conversation (the Conversation) which sets the long term vision for changing Queensland motorists' attitudes and behaviours around speed through education and empowerment of individual responsibility. TMR has engaged with various motorist groups through a range of communication methods to commence delivery of this vision. Consequently, there have been significant learnings around readiness of motorists to receive speed education and creating positive engagement between motorists and speed messaging. These learnings are continually fed back into activities to continually improve the efficacy and relevance of speed safety messaging delivered to Queensland motorists.

Background

Speed continues to be a major contributing factor to road trauma in Queensland, with around 1 in 4 fatal crashes caused by speeding. Speeding is a unique behaviour in that many motorists who engage in speeding do not accept the associated crash risks as they have never experienced adverse consequences or feelings of impairment as with other equivalent risky behaviours such as drink driving.

Yearly attitudinal surveys continue to demonstrate that a large proportion of motorists travel over the speed limit and that the potential to receive penalties for speeding is one of the key determinants in deciding whether to speed. In contrast, a vast majority of motorists believe individuals are responsible for their own speed decisions and that it is time speeding was considered socially unacceptable (MCR, 2017). These self-reported attitudes indicate there is both a need and an opportunity to educate motorists about the realities of speeding and empower individuals to take responsibility for making safe speed choices to keep themselves and others safe.

The Conversation recognises this need and opportunity and commits TMR to the long term vision of changing the attitudes of Queensland motorists around safe speeds. While attitude and behaviour change can be a difficult process that needs to be pursued over many years, it is essential to create more sustainable and voluntary adoption of safe speeds to reduce speed related road trauma in Queensland.

This commitment represents a culture change to Queensland's normal business of achieving safer speeds in parallel with continuing effective programs, such as enforcement. To deliver on this commitment TMR has focused education and messaging efforts at a number of areas and target groups aligned with the aims for creating, increasing and sustaining public demand for safer speeds (Austroads, 2016), including:

- internal departmental messaging
- general external messaging (for example, social media)
- project related engagement and communication (for example, location specific messaging run in parallel with speed limit reduction demonstration sites)
- offence related targeted messaging (for example, warning notices for repeat offenders)

- non-speed related driving behaviours messaging (for example, road safety messaging for Cloncurry).

After nearly 18 months (at time of conference) of implementing the vision under the Conversation, there have been significant learnings about Queensland motorists' attitudes and reception to speed safety education that have been used to inform future education messaging and content. Learnings include:

- Speed safety facts that challenge customers' existing views are generally poorly received. Likely explained by a lack of understanding around methodologies and limitations of road safety research.
- 'Traditional' misconceptions about speed and enforcement still persist, such as perceptions of cameras as revenue raising, covert cameras as ineffective for safety, and speed limits should increase as roads and vehicles become safer.
- Motorists are more receptive of speed safety content when packaged with content that reinforces existing road safety views.
- Targeted, localised messaging is better received, by both road safety stakeholders and the public.
- Partnering with stakeholders to deliver messaging improves reach of messages as well as relevance of messages to recipients.
- Education and messaging can be cost efficient by utilising knowledge, skills and reach within the organisation and existing stakeholder networks.

Yearly attitudinal surveys and evaluations of individual projects will continue to provide guidance around the impact of these speed safety messaging efforts. However, evaluation of actual impacts on behaviour continue to be affected by the difficulties in identifying long term, direct, causal relationships between educational content and changed attitudes and behaviours.

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Implications of Traffic Sign Recognition Systems for Road Operators

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Abstract

Achieving a zero fatality vision will require innovative new approaches such as adoption of vehicle systems that warn, aid and ultimately replace the driver. Vehicles are now available with machine-vision based systems which can read and interpret traffic signs. However, machine-vision systems require 'readable' infrastructure. Austroads engaged ARUP to consider the implications of traffic sign recognition systems on road operations, including their design, maintenance and configuration at the road side. Based on literature reviews, on-road and off-road evaluations and stakeholder interviews, we have determined that road side infrastructure changes will be required to make Australia's signs more readable.

Background

Global research from has shown that speed assistance can significantly reduce travel speeds and therefore crashes. Research undertaken in the United Kingdom (Carsten and Tate, 2005) shows that speed assistance systems can reduce fatal and serious injury crashes by between 10 and 36 per cent depending on the level of control exerted on the vehicle and driver.

Early deployments of traffic sign recognition systems in Australia caused the vehicle industry to report issues with readability with LED variable speed limit signs, vehicle mounted signs, location of signs at the road-side, maintenance of signs and text qualification on speed signs. In some cases, vehicle manufacturers have chosen to disable traffic sign recognition systems when imported into the Australian market. This project seeks to validate and understand those issues in order to provide advice for changes to Australia's traffic signing regimes.

Method

To better understand readability of signage, the project undertook evaluations of traffic signage, through on-road and off-road testing of a range of modern traffic sign recognition equipped vehicles and a range of road environments (*Table 1).*

Table 1. On-road and off-road trial evaluations

Trial	**Vehicles involved**
Australian Automotive Research Centre test track	Holden (prototype vehicle) Ford (prototype vehicle) BMW (5-Series) Volvo (XC60) Mazda (6)
Melbourne on-road	BMW (5-Series)

	Volvo (XC90 and XC60) Mazda (6)
Sydney on-road	BMW (X3) Volvo (V40)
Auckland on-road	BMW (X3) Volvo (XC60) Mazda (CX-5)

Recording data from the trials utilised vehicle cameras and in vehicle observations which was both quantitative and qualitative. As a part of each test use case a video camera was placed on the front windscreen to provide a view of the roadway. A second synchronised video camera was positioned so that it focused on the instrument panel where TSR responses are displayed. (*Figure 1*). The role of the observer was to note down discrepancies as a cross reference to the video or any additional observations that enhanced the findings of the study, such as commentary from the driver.

Figure 1: Example data capture system for traffic sign recognition systems

Results

Analysis of data capture was performed to record differences between vehicle traffic sign recognition expected responses and the actual response of the systems. Responses were aggregated across the traffic sign use-cases, and vehicles involved in the study. Sign readability issues identified included:

- Text variations such as time of day, vehicle base, weather or notes to end a speed zone were not readable

- LED variable speed limit signs could not be consistently read depending on their design
- Traffic signing locations on side-roads and off-ramps were often placed within a camera system's viewing range
- Vehicle mounted signs were inadvertently read by camera systems when they had not been activated.

Conclusion

This study has validated concerns with traffic sign recognition readability of Australia's speed signing approach through on-road and off-road testing of current vehicle technology. The study, once finalized (August 2018), will produce recommendations for consideration for changes to be considered in future drafting of AS1742 – Traffic Signs, and Austroads Guide to Traffic Management.

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Closed roads to Safe People

Pre-learners, disabilities and caravans: using closed roads to develop safe drivers

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Abstract

Safe people is arguably the most difficult component of the Safe System to create positive change, yet safe people are critical to maximise safety on our roads. This presentation will provide an overview of the programs delivered at the METEC Driver Training Centre to three key groups: 1) pre-learner drivers, 2) people living with a disability and 3) drivers towing (e.g. caravan, boat). Insights will include experiences from all three driving groups and the instructors who teach the courses and recommendations to creating safe drivers and safe roads for all road users.

Background

Driving is a complex task and learning new skills on public roads can be intimidating. This presentation provides insights from driver training experiences for three key driving groups: pre-learner drivers, people living with a disability and older people learning to tow a caravan. The training is delivered at the METEC Driver Training Centre in Victoria in two parts: 1) in-class theory and 2) on-road driving experience on a 5km circuit of closed roads that emulate public roads. Closed to the public, it provides a safe space for people to learn and importantly, to make mistakes that will not have traumatic outcomes, which aligns with the Safe System principles that humans will make mistakes but those mistakes should not result in death or serious injury. The focus is to deliver holistic driver education that creates positive attitudes and behaviours.

Pre-learner and Learner drivers

For young potential drivers, establishing good habits and behaviours during the pre-learner period is critical to developing a safe attitude about driving. Individual experiences, the opportunity to ask questions and drive in a safe, simple environment are key elements to building a strong basis for safe learner and probationary drivers. METEC has been providing driver education and training to pre-Learner and Learner drivers, since 1971. Our combination of in-class information covers a range of information; including road law, attitude, hazard perception, distractions, fatigue and drug and alcohol awareness. Feedback received from parents, teachers and students alike is positive and supportive of both the content, and the ability for inexperienced drivers to reinforce their in-class learnings with an on-road component in a realistic and safe environment. In the last financial year we had over 5400 student visits and feedback from participants, parents and teachers of participants was overwhelmingly positive in their acknowledgement of the safe driving messages and providing a platform for first-time and inexperienced drivers to gain solid road-law and hazard perception knowledge whilst driving in a safe controlled environment. An "off-road" facility supports the VicRoads staged learning approach by providing a suitable controlled environment to practice and develop beginner skills. Long term, in depth studies are planned for 2019.

In Victoria, the State Government recognises the importance of a staged approach to learning, through the VicRoads program, Road Smart (VicRoads 2018). Piloted at METEC in 2017, Road Smart is now available to all Year 10 students at no cost and METEC is an authorised "Off-road" facility.

People with disabilities

For people with disabilities, driving can be a pathway to independence. The National Disability Insurance Scheme supports people living with a disability in their plan for Specialist Driver Training under the Improved Daily Living category. For other people, driving offers a valuable, if somewhat unexpected, form of therapy. A short case study is Bill, a 22 year old man with a severe intellectual disability who will never be able to drive independently on public roads. On arrival at METEC he is typically anxious, making loud noises and occasionally throwing himself on the ground. However, when Bill engages with his Instructor, he immediately calms. He remains calm and engaged throughout his 20 minute session as he drives a dual-operated car around the closed roads. Driving is valued as therapeutic and important for his cognitive skills.

As a “closed road” facility, METEC is for many the only option to drive either therapeutically or as a process of providing a place for those that are unlicensed, and without a permit, to ascertain the probability of a long-term outcome. Some participants with a learning disability can take longer than usual to learn and comprehend the complex task of driving, others will not, and should not, progress to public roads. As parents are usually the first point of contact with our Organisation, their description of the disability and/or the challenges faced by their children, varies greatly and is subject to opinion and interpretation, they are generally unlicensed at this point with no experience at all. An initial meeting is imperative to have some understanding of the ability to communicate, answer questions and comprehend information before any driving is done. For many young people with Autism Spectrum Disorder, experiencing the task of driving will help them to better understand the complexities of driving and work towards gaining a learner permit with a view to eventual driving independence or alternatively, reaching the conclusion that they don’t want to or are unable to drive at all.

Grey nomads & travellers

Every year a growing number of baby boomers retire, buy a caravan and start their great Australian road trip. While these self-proclaimed grey nomads are lifelong drivers, for many, towing a caravan is a new and unfamiliar experience. Closed roads provide space to learn and develop specialist towing skills including the mechanics of loading, hitching, driving to avoid overload, sway and control. Skills that maximise towing safety, both for themselves and other road users are essential. Towing safely requires the consideration of many factors, including loading, hitching, weight ratios and limits to be checked, all before you even get on the road. As more cashed-up baby boomers hit retirement, many choose the flexibility of travelling in their own vans. Many choosing to head north for winter periods and enjoy the warmer weather on offer. The 55+ age group is the most common age for longer period and distance trips, however the 30-54 age demographic is growing steadily for shorter overnight trips. The number of Caravan registrations has increased by 30.7% from the five year period 2011-2016, with the overall numbers increasing annually. Crash statistic information is difficult to find and unavailable from the usual statistical agencies, however loss of control of vehicle and/or van is not uncommon and can occur without warning and be catastrophic, however with the current and projected growth of the Industry we are sure to see many more Caravans on our roads. There are many safety aspects to consider when towing a Caravan, load capacity, weight distribution and brake set-up of both vehicle and Caravan, just to name a few. We still then need to consider the practical skill levels of the driver and the importance of a solid understanding of all the mechanical elements in play that are required to tow safely, competently and with confidence for the safety of all road users.

Conclusions

The closed road facility at METEC provides a safe space to learn. For new drivers, drivers with a disability, grey nomads and nomads in general, it’s a space to learn and develop new driving skills.

While for people with more severe disabilities provides the opportunity to experience driving that would otherwise not be possible on public roads.

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www.caravanstats.com.au Caravan Industry Association of Australia

Application of Machine Learning to Severe Injury Prediction in Rural Run-off-road Crashes

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Abstract

This paper describes how Machine Learning (ML) techniques were used gain a deeper insight into the factors leading to rural run-off-road casualty crashes being severe. The ML findings were compared with a conventional binary logistic modelling approach.

The findings showed that roadside objects hit, road curvature, vehicle type and age, and the number of persons in vehicle were strong predictors of run-off-road crash severity. More importantly, ML highlighted specific combinations of risk factors which were linked to high risk of severe injury in a run-off-road casualty crash. ML may enable a more synergistic approach to risk and Safe System assessment.

Background

Run-off-road crashes are the cause of nearly half of all road-related severe injuries on rural roads in Victoria. Significant funds are being spent on Safe System road environment treatments to reduce occurrence and severity of run-off-road crashes. Yet, there has been limited published research linking road, vehicle and road user contributions to the problem.

Machine learning is an analytical branch of computer science which automates pattern-recognition to generate data models. Models (i.e. algorithms) learn from large volume of training data by iteratively recognising connections between variables and defining strength of these connections (Mannila & Heikki 1996, Domingos 2015). Thus, generalizing from training data, machine learning allows to find hidden data insights and to make predictions without being explicitly programmed.

This approach is often feasible where descriptive or inferential statistics would be of limited value, or time consuming due to scale and complexity of data (SAS 2016). As more data becomes available, more ambitious problems can be tackled with machine learning. This includes predicting rare events such as equipment failure, or deeper understanding of human behaviour e.g. web searches or new pricing models. As a result, this branch of computing science is becoming widely used in scientific and commercial fields.

There are multiple machine learning challenges which require a model to predict an output variable given a number of input variables. These problems can be divided into classification and regression problems (BigML Team 2018). The first is used for categorical output variables. The latter for continuous output variables. This paper focussed on a classification prediction whether a casualty crash on a rural state road in Victoria would be severe casualty crash (fatal or serious), or other injury (minor).

Method

Three machine learning techniques: Association Rules, Random Decision Forests and Deep Neural Networks, were used to identify a range of interlinked road, vehicle and road user risk factors contributing to severe injury outcomes in run-off-road casualty crashes on Victorian rural undivided roads. The machine learning findings were compared with those derived using a conventional binary logistic modelling approach.

Machine learning in non-parametric and makes no assumptions about correlation of input variables. Machine learning captures interactions between input variables, while standard binary logistic assumes variable independence. This variable interaction capability is important when seeking to recognise positive or negative synergies.

As in binary logistic modelling, validation and model performance metrics are used to manually optimise machine learning model designs. In both approaches, the process started with 26 input (independent) variables, with the output (dependent) variable being a probability of binary severe or non-severe crash. Using backward elimination, variables with little contribution/lack of significance were iteratively removed to optimise the models.

Victorian crash data obtained from VicRoads (2012-16) and ANRAM rural undivided road inventory data were used to develop training (80%) and validation data (20%) for the models.

Results

The findings of machine learning models showed that: roadside objects hit, road curvature, vehicle type and age, age of the most severely injured person, and the number of persons in vehicle were strong predictors of run-off-road crash severity. More importantly, machine learning techniques highlighted the specific combinations of factors linked to high risk of severe injury in a run-off-road casualty crash.

Association Rules, a data mining technique, was able to show groupings of variables which were more strongly associated with severe injury outcome when present together. Figure 1 shows one of such associations showing links between severe run-off-road crash outcome (FSI=1) and hitting a tree on a straight section (CurveBinary=0). Severe outcome is also associated with vehicle category 'car' made before 2012. Female gender of the most severely injured occupant was indirectly associated with severe outcome.

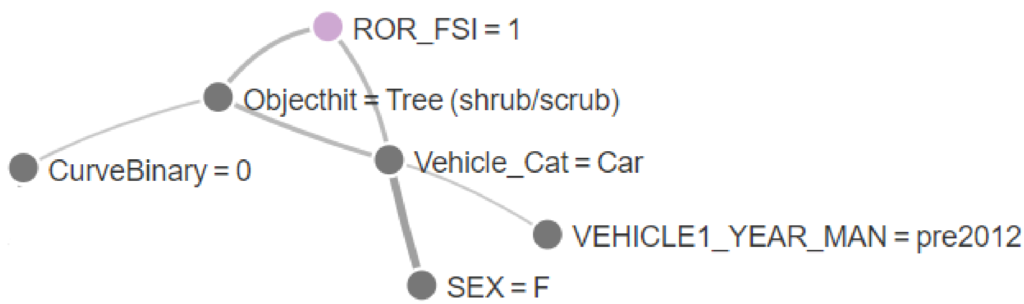

Figure 1. Example of an association rule between severe outcome and other variables

Figure 2 is an output of a Random Decision Forest ensemble and shows that children and seniors were at most risk of severe injury in run-off-road casualty crashes (lighter shade). It also shows that crashing in pre-2012 vehicle increased these chances considerably.

Overall, Deep Neural Network model validation against a random 20% sample not used in training provided slightly better Accuracy, Precision and Spearman's Rho (0.23), than Random Decision Forests model ensemble and the binary logistic model.

Binary logistic regression provided a statistically significant model with the best AIC chosen to promote parsimony, although with fewer variables. Object hit=tree/pole, curvature=present, occupant=senior, number of persons, vehicle category=motorcycle, and AADT, were retained, still providing a useful understanding of severe outcome risk.

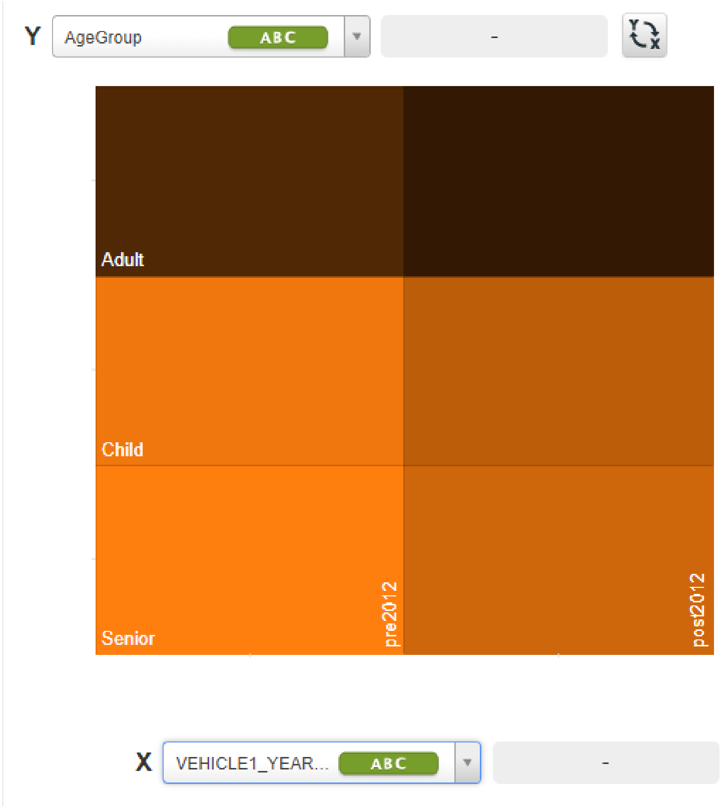

Figure 2. Example of machine learning insights: effect of vehicle age and most severely injured occupant age on probability of sever injury (lighter colour = higher)

Discussion and Conclusions

The paper discussed how selected machine learning techniques might contribute to a more systemic understanding of road safety by recognising and demonstrating interactions between risk factors, while providing comparable predictive strength to conventional methods. Also, machine learning methods are more automated and require less assumptions being made by the modeller (i.e. less source of bias, error).

This new knowledge may offer an opportunity for a more synergistic approach to road safety and its strategic improvement.

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Can Mobility Management Deliver the Next Step-change Towards Safe System

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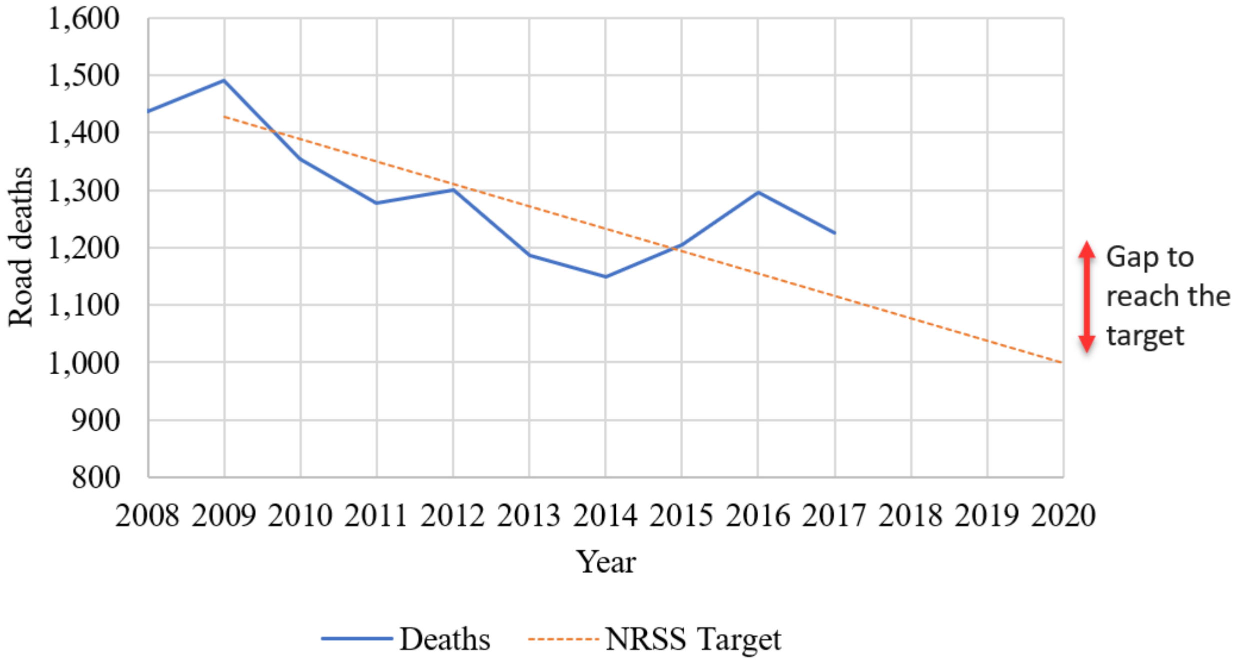
Abstract

Progression towards Safe System goals of zero death and serious injury has stalled in Australia. Historical downward step-changes in road toll were associated with systemic and cultural shifts driven by government regulation (e.g. drink driving, seat belts). The goals of the current National Road Safety Strategy (NRSS) are not likely to be met by 2020, but significant opportunities lay beyond if more systemic approach to road safety strategies can be adopted. This paper discusses potential strategic contributions of Mobility Management (travel demand management, road pricing, urban planning, Mobility as a Service) to the next NRSS goals and points out the evidence necessary for detailed estimation of the next step-change in road toll.

Background

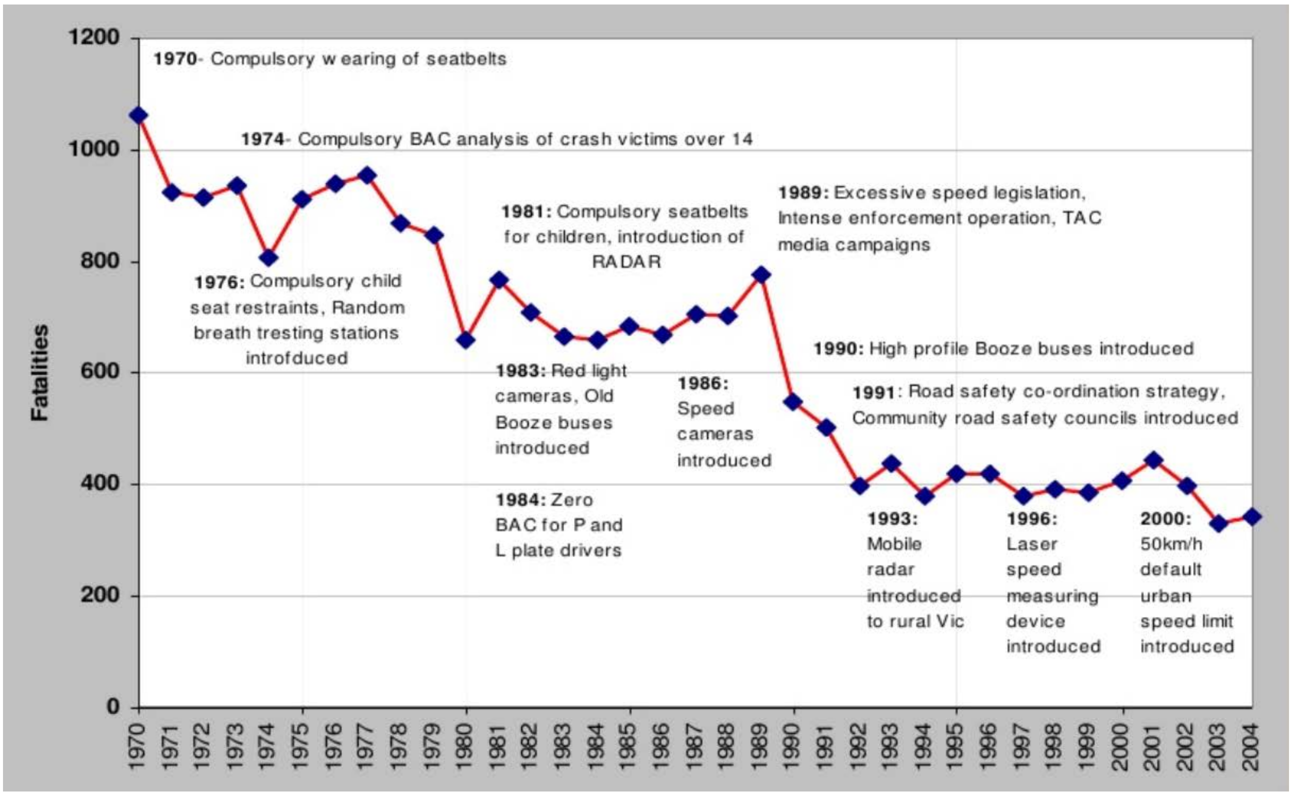
Australia's road safety performance has stagnated despite well-thought out and successful road safety programs targeting high-risk roads and road users (Figure 1).



Source: based on (BITRE, 2018)

Figure 1. Australian road toll vs. NRSS objective

Historically, there have been downward step-changes in road toll when systemic and cultural shifts have been achieved often driven by government regulation. These include seat belt requirements, lower blood alcohol content limits and increased efforts in speed limit enforcement. Figure 2 shows some of these initiatives since 1971.



Source: Ogden (2009)

Figure 2. Historical downward step-changes in road toll

The goals of the current National Road Safety Strategy (NRSS) are not likely to be met by 2020, but significant opportunities lay beyond if more systemic approach to road safety strategies can be adopted. Recent policy research suggests that new road safety ‘actors’ and trends need to be recognized and accounted for in future strategies (Salmon and Lenné, 2015; Hughes et al., 2016; Litman and Fitzroy, 2017).

One group of ‘actors’ can be described as Mobility Management policies. These include such travel demand management policies as mode shift towards public transport and safe active transport, congestion pricing, Mobility as a Service (MaaS), integrated land use management, transport pricing and taxation (Litman and Fitzroy, 2017). Socio-economic changes and polices beyond transport also need to be recognized as influences on the road toll. These changes include economic activity, demographic shifts (ageing), broader drug use patterns, overuse of medication, and workplace changes (Salmon and Lenné, 2015; Hughes et al., 2016).

One of the factors linking these diverse group of ‘actors’ is the amount of travel done by car and other travel modes. Litman and Fitzroy (2017) showed how high vehicle-kilometres travelled (VKT) per capita is linked to poor fatality outcomes. These and other authors were able to draw on multiple international research sources to show that greater proportion of urban travel by public transport is linked to lower fatality rates per 100,000 population. Figure 3 shows a conceptual model of the link between Mobility Management and safety.

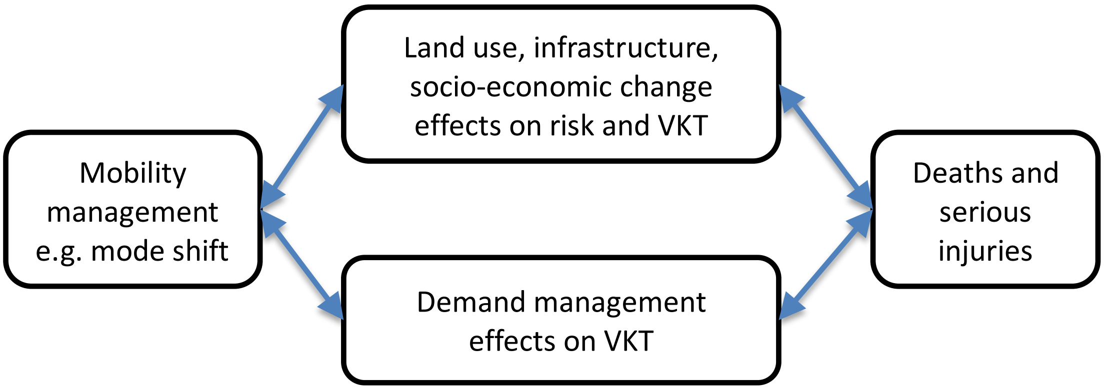


Figure 3. Conceptual representation of Mobility Management effects of road toll

Most of Mobility Management policies are not new to Australia, and in fact are vigorously pursued by parallel transport policies. The socio-economic trends are already studied by relevant disciplines. This paper proposes that greater effort be placed on understanding and accounting for effects of these policies and trends on Australian road toll.

Table 1 shows broad estimates on fatality outcomes expected from mobility changes, based on available overseas evidence. The net effect of these policies could provide a significant step-change in the national road toll. Implementation would require more systemic, one-government, approach than in the past. Especially, collaboration between non-traditional partners would be required under the next NRSS. Engagement with public transport and health sectors would be of greater importance than in the past.

Table 1. Broad estimates of some Mobility Management policies on safety

Mobility Management Policies	**Estimated benefits**	**Methods**	**Source**
Shifting car travel to public transport	One percentage point increase in the share of travel to work by public transport would reduce fatalities by more than 9%	Crash prediction based on data of above 30 cities	(Moeinaddini et al., 2015)
Congestion charge	12% reduction in injury crashes in London's charging zone	Before-after analysis with controls	(Duduta et al.; Green et al., 2016)
Increasing fuel price	20% increase in fuel price was predicted to reduce injury crashes by 2.8% in in Flanders, Belgium	Macroscopic crash prediction	(Pirdavani et al., 2013)
Teleworking	A teleworking scenario is predicted to reduce crashes by 2.6% in Flanders, Belgium	Macroscopic crash prediction	(Pirdavani et al., 2014)
Shifting short car trips to cycling trips	Shifting short car trips to cycling trips had no effect on fatalities in Dutch municipalities	Crash prediction	(Schepers and Heinen, 2013)

Breadth and local applicability of the international evidence is poor due to specific mix and interactions of these policies in each country. To give this field due consideration in the next NRSS, it is proposed that more research be directed to better understanding of the identified 'actors' on modal shift and safety outcomes. Such new research could be applied to provide more robust estimates of reductions in road toll due to Mobility Management in Australia, and provide inputs into the next strategy.

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A SysML-Based Modeling and Verification Method for Vehicle Safety

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Abstract

Vehicle safety is becoming a critical issue in developing autonomous driving technology. For example, failure propagation due to sensor failures on road obstacles will have significant impact on safe operation. Previous studies in safety design used different modeling languages in creating, analyzing, and simulating failure models. In this study, we used the system modeling language (SysML), which is widely accepted language for systems modeling, consistently in modeling component failures and analyzing them to identify failure propagation paths. Among the identified failure paths, critical ones were used to derive safety measures. SysML simulation was also used to verify the safety measures.

1. Background

In autonomous vehicles on roads, a sensor failure and its propagation can result in an accident and thus proper safety designs are needed. In previous studies, different modeling languages were used in creating and analyzing failure models (Wei, Jiao, & Zhao, 2017, Sharvia & Papadopoulos, 2015). In (Ariss, Xu, & Wong, 2011), a method for generating failure models was provided, but it lacked how to utilize the models in safety analysis and verification. In (Wei et al., 2017), deriving failure paths from the model was suggested, but how to use failure paths to secure system safety was not mentioned. To circumvent these issues, we use the system modeling language (SysML) throughout the study of modeling failures, identifying failure paths, and verifying safety measures.

2. Method

Fig. 1 shows the sequence of the activities to be performed and the associated results.

(1) Failure models are constructed using SysML. The models include the structure and behavior of components and failures.

(2) Safety analysis is performed using the generated failure model. The failure paths of a vehicle system are identified from simulation of failure model. Failure paths are ordered sets of components failures leading to an accident of the vehicle.

(3) Safety requirements are derived using identified failure paths.

(4) Safety measures are added to the failure model. Simulation of the resultant model is performed to verify them.

3. Results

In Fig. 1 the rightmost column shows an example of the generated failure models. The SysML models were constructed first to express system structure and faults, and the behavior of the system under normal, component failures, and failure propagation conditions.

Next, failure paths were identified by performing Monte Carlo simulation (initially) 100 times on the failure model. Failure rate information for each component was assigned at the time of failure model creation. The resulting failure paths contain information such as components failure, system failure, and sequence of failure propagation. By analyzing these failure paths, we can derive the frequencies of system normal behavior, system failure, and components failure.

Table 1 summarizes the resultant frequencies obtained from simulation of the failure model with and without the safety measure applied. As a result, the probability of occurrence of system failure is reduced by 0.21, and the probability of occurrence of system failure due to the failure of the local controller is reduced by 0.14.

4. Conclusions

The novelty of the SysML-based study of failure model proposed is that the activities for system design, safety analysis, and verification can be performed seamlessly. There is no need for model conversion for safety verification. It also improves the reproducibility of failure models by providing general and systematic rules for model generation. Some failure paths that are difficult to be derived from the existing method of failure mode and effect analysis (FMEA) were able to be identified using our approach. Furthermore, the calculation of the probability of occurrence of the top event as needed in the conventional fault tree analysis (FTA) method was performed automatically during the simulation.

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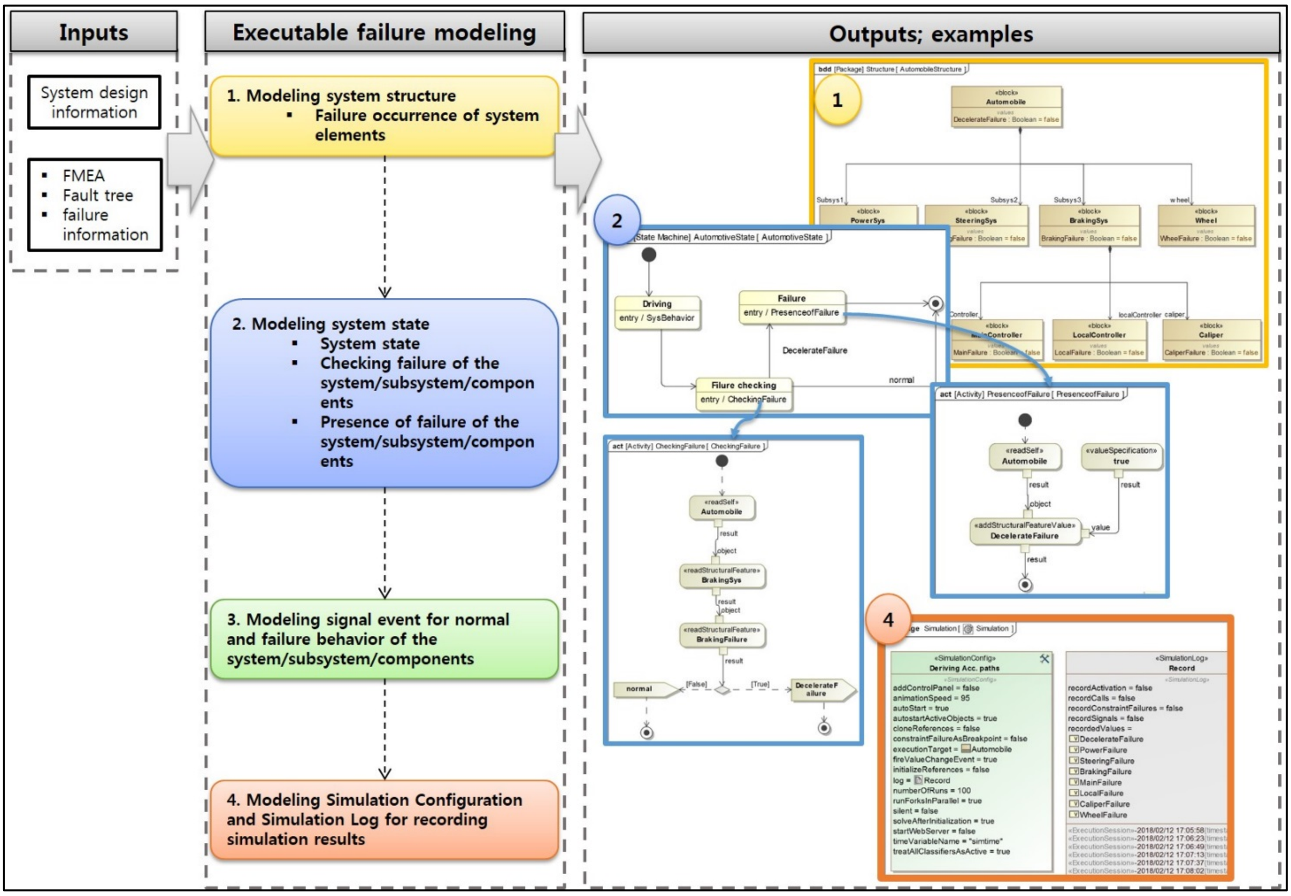

Figure 1. A procedure for generating SysML-based failure model and outputs.

Table 1. Comparison of frequencies before and after applying safety measure to systems failure model.

Category of system behavior	Frequency/probability before applying safety measure	Frequency/probability after applying safety measure	Frequency Difference
System normal behavior	47	60	+13
System failure caused by components or subsystems failures	46	25	-21
Components or subsystems failures without system failure	7	15	
Occurrence of Local controller failure	16	9	
System failure caused by Local controller failure	16	2	-14
Probability of normal behavior of the system	0.47	0.60	+0.13
Probability of system failure	0.46	0.25	-0.21

Streamlining road safety risk mapping and intervention programming on local networks: The Northland Transportation Alliance Risk Mapping Application

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[a]Abley Transporation Consultants

Abstract

Crash risk is only one of the necessary metrics that local authorities require to analyze road safety risk and to plan and prioritize intervention programmes on their networks. Outputs of such analysis is often aggregated and not stored alongside the outputs of other important metrics and frameworks.

Abley Transportation Consultants have developed an interactive application for the Northland Transportation Alliance that combines various risk analyses and metrics. Interactive analysis tools and the ability to overlay different metrics allows for an increased understanding of crash risk and aid efficient and robust planning for intervention programmes.

Introduction

Since 2014 the Northland Transportation Alliance (NTA) has analysed the risk on its network using the urban KiwiRAP risk mapping protocols (Brodie et al, 2013). The outputs have been visualized through an online map viewer. The NTA has previously used this, along with the NZ Transport Agency Safer Journeys Risk Assessment Tool website (Mega Maps) to inform their understanding of risk across the network and the interventions they are planning to deliver.

The websites provide a myriad of risk metrics to direct NTA staff to parts of the network where road safety efforts should be directed. Whilst this information is highly valuable, the NTA sought a consolidated hub of risk metric information with an interactive interface for the tracking of both high-risk locations and interventions. The outcome of the enhanced application and its interactive tools is expected to be improved road safety programming that will ultimately lead to fewer deaths and serious injuries on the Northland road network.

Figure 1. Northland region locality map

Components

Collective and personal risk urban KiwiRAP outputs, injury crashes and performance tracking layers between updates are provided as the base data in the application.

Speed Management Framework

The speed management framework is a single assessment method for determining safe and appropriate travel speeds on road sections within a network and prioritising speed management interventions (Durdin et al, 2016). The metric is calculated using ONRC, urban KiwiRAP personal risk and Infrastructure Risk Rating (Zia et al, 2016). High benefit opportunities based on the difference between posted and safe and appropriate speeds are visualized based on the potential for reducing fatal and serious crashes.

Crash Commonalities

Crash commonalities are calculated for high risk intersections where there is a common cause or movement (Southey-Jensen, 2017). This allows the NTA to quickly assess intersections where there are specific trends in driver behavior or road conditions that contribute to increased crash risk.

Out of Context Curves

Horizontal curves on rural roads where the approach operating speed is out-of-context with the safe negotiation speed of the curve are highlighted along all rural roads.

Interactive tools

An interactive crash filter tool allows the NTA to explore crashes based on codes pulled from the national crash analysis system (CAS). This allows for efficient cross checking between risk metrics, suggested interventions and the characteristics of crashes on specific segments of the network.

Crash statistics are displayed in infographics for urban KiwiRAP intersection and corridor segments. These detail generic crash movements and track crashes per year (indicating trends and the effects of changes in the network). Figure 2 shows crash statistics for a selected corridor detailing the number of crashes for each generic crash movement type and injury crashes per year. This is overlaid with injury crashes used in the analysis.

Figure 2. Northland Transportation Alliance Risk Mapping Application with the crash statistics tool displayed for a selected corridor.

The collated metrics and interactive tools allow efficient and holistic assessment of risk and intervention possibilities at the network level. They aid community engagement, enabling the efficient communication of raw crash statistics and risk, road infrastructure conditions and existing safety modelling all in one.

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Investigating Factors Associated with Hit-and-run crashes in Indian Metropolitan City Using Association rules

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Abstract

Hit-and-run crashes are a serious road safety problem threatening the world especially in developing economies like India. It is considered as crime worldwide and stringent laws prevail to punish the offending drivers. In spite of these, rate of hit-and-run crashes in India is higher compared to developed nations and states such as Singapore (1.83%), California (8.1%), Guangdong (7.7%) and shanghai (4.45%) in china. The recent figures according to the Ministry of Road Transport and Highways (MoRTH), government of India shows that hit-and-run crashes accounts for 11.6% (55,942) of all crashes and number of people died due to hit-and-run crashes was 15.2% (22,962) of total persons killed in the country during 2016.

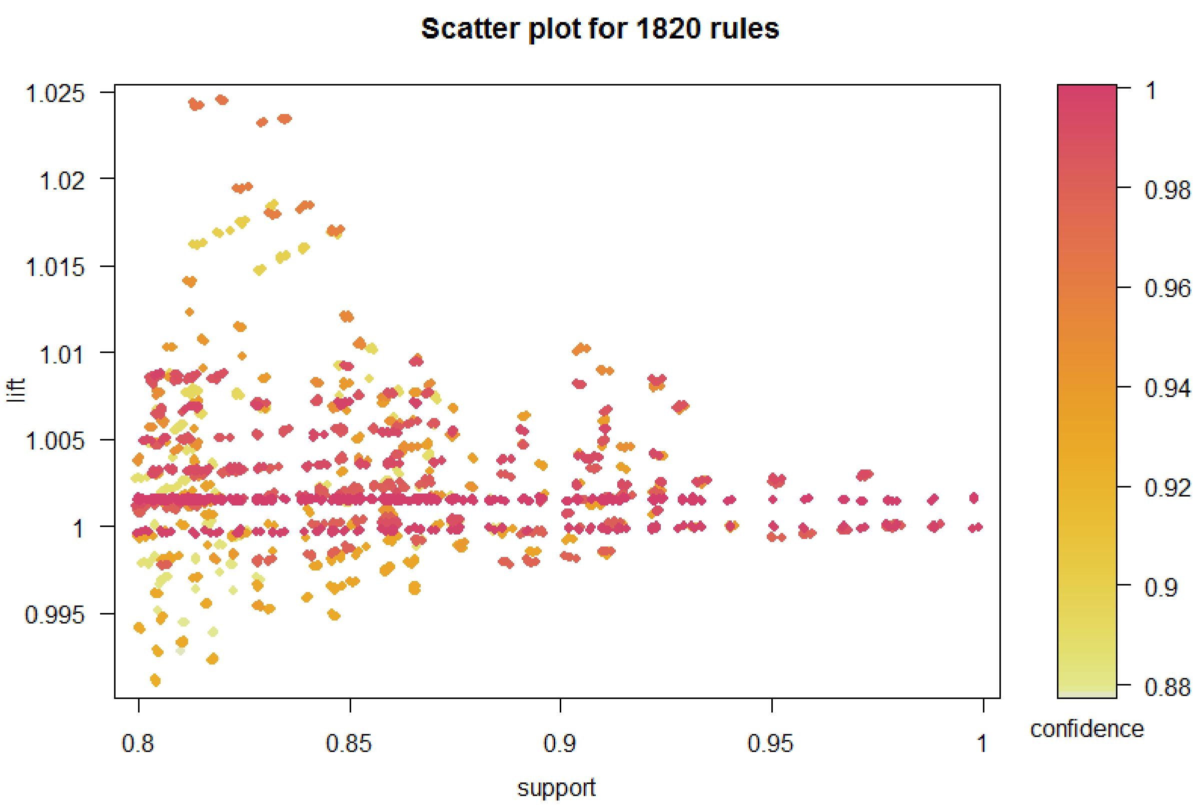
Association rule mining is a popular data mining approach which does not require dependent variable and has the capability in finding complex relationships occurring in large datasets. However, we find research studies relating to associated data mining approach in traffic safety is limited. Apriori algorithm is applied to explore the association rule for hit-and-run crashes.

Hit-and-run crash data for the Chennai metropolitan city was collected from RADMS (Road Accident Data Management System) database. Each crash report includes four types of information (i) Driver and victim information (ii) Vehicle and road information (iii) Environmental characteristics and (iv) Crash information. The dataset includes 670 hit-and-run crashes that occurred in Chennai metropolitan city between January 2015 and December 2016.

Apriori algorithm was applied using the 'arules' package of R software. To identify reasonable and accurate rules, minimum threshold values for the support and confidence was set to 0.8 and 0.5 respectively. This has resulted in generation of 1820 rules. It is very much significant to investigate high support and high lift rules as shown in Figure.1. Higher support indicates higher proportions of times those factors contribute to crashes. In the present case, support >0.9 is considered to be high support rules. Investigating the top 25 high support rules, we find that most of the rules are associated with road characteristics and environmental characteristics. Higher the value of lift represents stronger association between antecedent and the consequent we find 16 rules from the top left corner have high lift values. From the list of rules, all the consequents direct towards Road category = Highways which proves that highways are the prominent sites for the drivers to flee in case of hit-and-run crashes. Among these high lift rules, most of the antecedents contain crash factors, road characteristics and environmental factors.

Crash severity is an important determinant for the drivers decision to stay or flee from the spot of accidents. Top 25 rules which are associated in causing fatal/ grievous injury severity were investigated based on their lift values. In most of the rules, road characteristics contributed much towards fatal/ grievous injuries. Among other factors, environmental characteristics (weather conditions) alone have significantly associated with hit and run crashes in many rules. However, driver and vehicle factors never appeared in any of rules generated.

Figure 1. Scatter plot showing high support and high lift rules.



Network visualization helps in finding the relationship between the antecedent and the consequents for the obtained rules. The Gephi network visualization produced a directed graph with 103 nodes and 1107 edges. Larger sized nodes in the network represent the characteristics or factors which are important in identifying hit-and-run crashes. We find around 10 larger sized nodes and the characteristics of the larger sized nodes were (i) Weather condition= Fine (ii) Severity= Fatal/ Grievous Injury, (iii) Road conditions= Good, (iv) Junction control= No Control, (v) No of Lanes=single, (vi)Traffic movement=Two-way, (vii) Road category= Highway, (viii) License= Valid License, (ix)Primary Cause= Inappropriate speed} and (x) Landmark= Public place. These 10 large sized nodes act as decisive factors for the drivers to flee resulting in hit-and-run crashes.

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Market Basket Analysis of Powered Two Wheeler Crashes in Metropolitan Roads - A case Study from Chennai City, India.

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Abstract

Powered two wheelers (PTW) provide a flexible, faster mode of transport in congested traffic such as cities and other urban areas. These are particularly a growing mode of transportation systems in most of the middle income countries ,such as India, both for its ease of mobility and the price for acquisition. According to the latest annual report by Ministry of Road Transport and Highways (MoRTH) 2015, the number of registered PTW increased by 178% in the past decade, i.e., from 58 Million in 2005 to 154 Million in 2013. Safety is of major concern in PTW usage. Crash reports show that PTWs contribute to about 34% of total accidents reported (MoRTH,2016).In this paper, we propose a method to analyze the characteristics and contributory factors of PTW accidents based on association rules. Crash data obtained from Government of Tamilnadu's RADMS database for the Chennai Urban. A total of 3002 PTW accidents were reported for a two year period between 2015 and 2016.

Measures of the association rules, support and confidence were set to a minimum threshold values of 0.5 and 0.5 respectively. Total of 593 rules were generated. These rules were further analysed based on high lift and high support values. Six rules that were generated based on the high lift values greater than 1.05 , all rules associated either environmental or road characteristics. Top 25 rules were centred around specific characteristics such as male drivers, presence of median separator, public places and exceeding lawful speed. It is to be pointed out that some stronger association rule relating to fatal accidents were also found out. Observing potential patterns from the discovered rules the results provide insights to relationship between risk factors and PTW crashes.

A web-based program to target novice driver traffic offenders under the Traffic Offender Intervention Program in New South Wales, Australia

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Abstract

TOP ONLINE is a web-based traffic offender intervention developed for desktop, tablet and smartphone applications. Here, it is shown that online learning can be used to deliver specific messaging for a common category of offenders – novice drivers. The TOP ONLINE: Novice Driver Traffic Offender Unit provides a targeted, high fidelity program allowing revision of graduated driver licensing concepts and specific restrictions applicable in NSW as well as more general road safety messaging. Offenders enjoy the online content and the flexibility of self-paced learning. However, only half of novice driver traffic offenders are willing to undertake a web-based learning unit.

Background

The NSW Traffic Offender Intervention Program is a major intervention for drivers (Faulks, Siskind & Sheehan, 2018), offered in face-to-face classes only. TOP ONLINE has been developed to augment and extend the Program, in desktop, tablet and smartphone applications (Faulks, 2018). This paper details the development and pilot testing of the TOP ONLINE: Novice Driver Traffic Offender Unit to demonstrate that targeted online messaging is possible to a specific category of offenders.

Description

The unit has three broad components. First, traffic offenders view an introductory video lecture that describes the learning platform and key features. They then view a series of short video lectures on the NSW graduated driver licensing and on general road safety issues, with an emphasis on speeding. A series of assessment questions must be completed during these video lectures. The final component is an optional home study extension to the unit, linking to the Western Australian Office of Road Safety public education resource ’Time With Mum”, which portrays the experiences of a young male novice driver as he goes through a three-month period of driver licence suspension (https://www.rsc.wa.gov.au/Campaigns/Time-with-Mum, see Kantar Public, 2017).

Pilot testing of the TOP ONLINE: Novice Driver Traffic Offender Unit was conducted over June 2017-June 2018. Offenders registered in-class in the week preceding the scheduled road safety presentation, and were asked to complete the online unit prior to the face-to-face class. Otherwise, they had to attend that class as scheduled.

A total pool of 232 novice driver traffic offenders were offered the online program, 132 (57%) registered to participate, and 93 (40%) actually commenced the program (see Figure 1). For those offenders who logged in and started, the trial was highly successful: most (95%) completed (and those who did not complete attended a face-to-face session subsequently).

TOP ONLINE: Novice Driver Traffic Offender Unit
Field trials June 2017 – June 2018

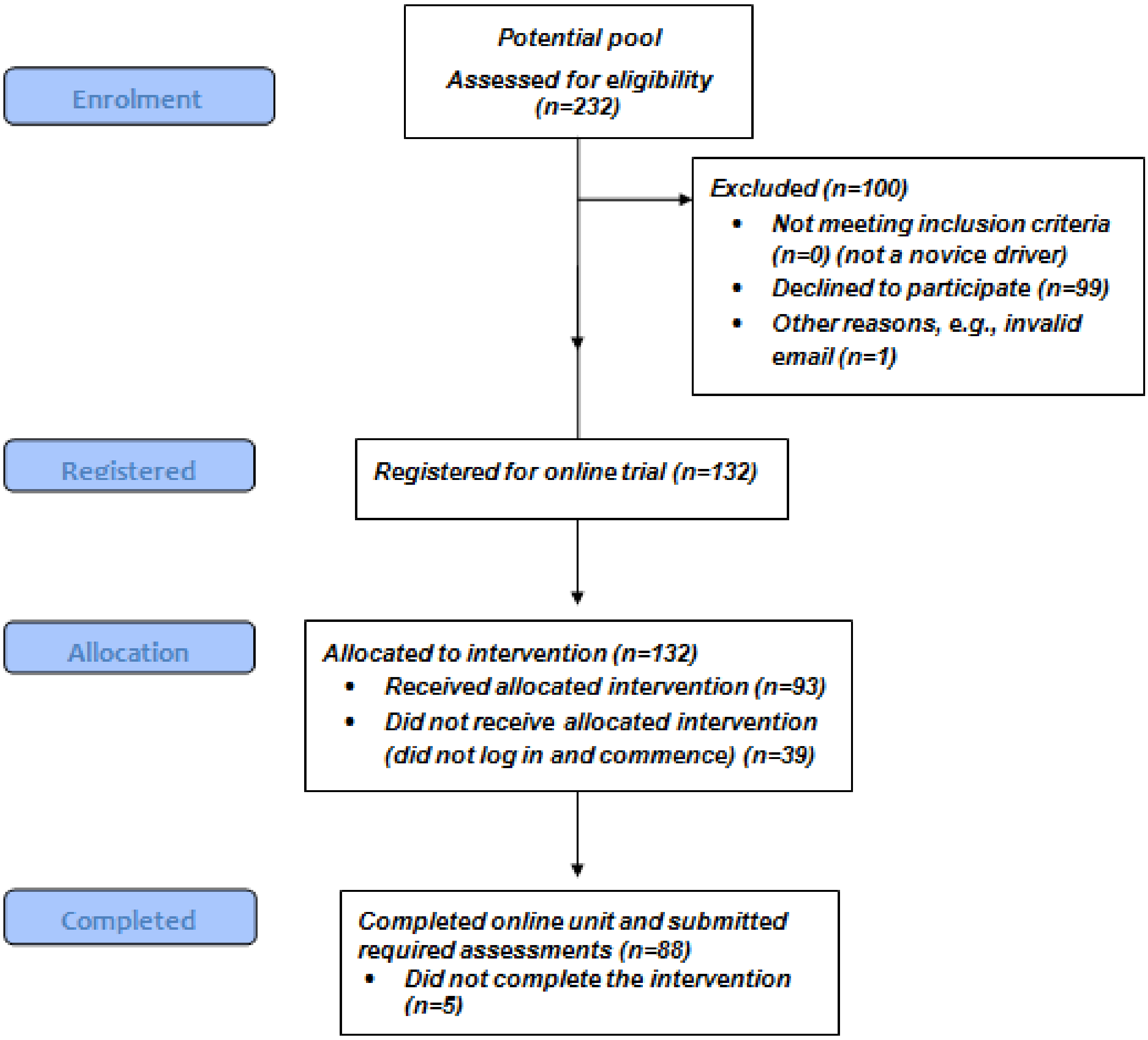

Figure 1. Flow chart for proof-of-concept field testing of the TOP ONLINE Novice Driver Traffic Offender Unit, June 2017 to June 2018

As with an earlier study (Faulks, 2018), the reasons for not accessing the online unit were practical: work, family or social activities intervened, or there were problems with accessing the internet. Again, the availability of the face-to-face class as scheduled also influenced the offenders' decision to access the online unit.

Discussion and Conclusions

An earlier study demonstrated that web-based learning can be integrated into a broader traffic offender intervention program successfully (Faulks, 2018). The development and implementation of the TOP ONLINE: Novice Driver Traffic Offender Unit has shown that providing blended learning opportunities integrating face-to-face, group discussion, home study and online learning can target a specific category of offender (novice drivers); it is anticipated that further types of offences (e.g., driving disqualified or suspended) could also be addressed successfully. But, as the earlier work showed, and this study corroborates, online learning does not suit all offenders.

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Modal shift amongst young adults and the potential safety benefits: A synthesis of evidence

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Abstract

Young adults in Australia are driving less now than young adults did twenty years ago. Victoria and New South Wales, (as opposed to other states), have shown the fastest changes, with the percentage of young adults with a driving license declining around 1% per year. This trend indicates a possible modal shift from passenger car to other alternative modes, including public transport and other active transports amongst young adults. Again, young drivers in Australia are one of the most vulnerable groups when it comes to safety. Around 25% of the drivers who lost their lives in road collisions in Victoria, Australia over the past 10 years, belong to the 18-25 age group. This paper discusses potential safety benefits as a result of this modal shift amongst young adults. Also, the paper proposes that an enhanced understanding of a young adult's decision-making process when choosing a travel mode is required, to ensure the vision of 'Towards Zero' is achieved.

Background

Passenger cars provide great mobility benefits; however they also have potentially undesirable implications - including road collisions. There is the window of opportunity however, as recent research indicates that young people are less likely to get a car license and, even if driving, they drive less (Kuhnimhof, Buehler & Dargay, 2011, Raimond & Milthorpe, 2010 and Sivak & Schoettle, 2011, 2012a, 2012b). Australia is one of the developed countries currently experiencing this decline in youth licensing. Victoria and New South Wales, among other states, have shown the fastest rate of change, with the percent of young adults having a driving license declining at a rate of approximately 1% per year (Delbosc & Currie, 2013). There is a growing focus on research aimed at informing the understanding behind this reduction in the rate of driver licensing among young adults.

It is essential to understand the mode choice/modal shift among young adults particularly if we are to assess the impacts on road collisions (deaths and injuries). Around 25% of the drivers who lost their lives as a result of road collisions in Victoria, Australia over the past 10 years, belong to the age group 18-25, whereas only 10% of Victorian license holders represent this age group (Transport Accident Commission, 2018). Figure 1 illustrates that, despite enormous effort and policy intervention, a significant number of young drivers are still losing their lives, with the rate even higher during the last 3-4 years.

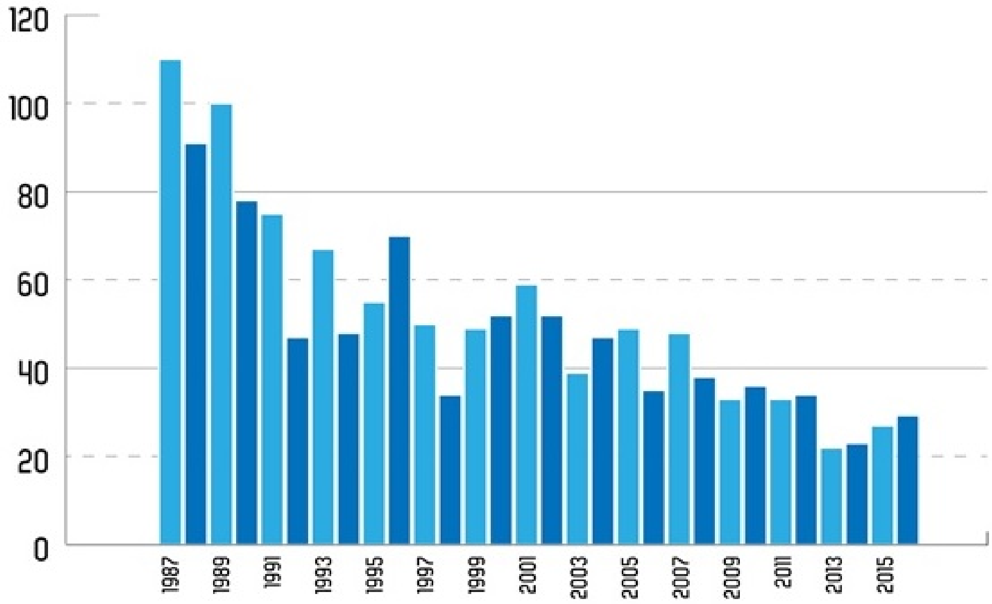

Figure 1: Young driver lives l *Source: Transport Accident Commission, 2018*

Trend indicates a possible modal shift from passenger cars to other alternative modes, including public transport and other active modes of transport, amongst young adults. Research confirms that transit is associated with much lower crash rate, compared with passenger car (Litman, 2017). Therefore, potential safety benefits could be interpreted as a result of the apparent modal shift amongst young adults in Australia.

Research indicates that the choice of travel mode amongst young people may be attributable not just to transport issues, but may be largely impacted by their socio-economic situation (Chatterjee et al., 2018). Thus, this paper proposes that an enhanced understanding of young adult's decision-making process when choosing a travel mode is required, to ensure the vision of 'Towards Zero' is achieved.

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Re-investigation of Roadside Risk Factors Associated with Run-off-road Casualty Crashes in Victoria, Australia

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Abstract

This paper examines the road side design features related with run-off-road collisions on rural undivided roads in Victoria, Australia. Run-off-road casualty crashes comprise around fifty percent of all single vehicle crashes that take place in rural roads with a speed limit 80km/h or above in Victoria. Five-year crash and road design inventory data from Victoria were analysed. A poisson regression modelling approach was adopted to estimate run-off-road crash frequency. Modelling results indicated that narrower hazard offset (clear zone) increased the likelihood of run-off-road casualty crashes. Tight road curvature was a strong and consistent predictor of run-off-road casualty crashes. Findings from the study can lead to more effective safety countermeasures that can substantially reduce the injuries and fatalities associated with run-off-road collisions.

Background

Run-off-road casualty crashes comprise around fifty percent of all single vehicle crashes that take place in rural undivided roads with a speed limit 80km/h or above in Victoria, Australia. Approximately fifty percent of these crashes result in fatalities and serious injuries.

Previous study shows that curves, obstacles and time and amount of clear roadside space contribute to run-off-road crashes and their severity (Montella & Pernetti, 2010 and Petegem & Wegman, 2014). The magnitude of these risk factors is not well documented, particularly in the context of Australia. Previous Australian research quantified the key relationships but was limited by limited data (Jurewicz et al., 2014, Doecke & Woolley, 2011). The current roadside geometry design guidance is largely based on US evidence and had limited validation of its safety in Australia and New Zealand. Greater understanding is needed of the effects of design elements such as curvature, roadside hazard offsets, and roadside barriers on the risk of run-off-road casualty crashes on high speed rural undivided roads.

This paper uses Big Data management and advanced regression analysis techniques to re-examine how road and roadside design features were related to frequency of run-off-road casualty crashes on high-speed rural undivided roads in Victoria. The paper aims to contribute in developing proactive road safety policy to reduce run-off-road injury risk in Australia.

Methodology

Five-year casualty crash and road design inventory data from Victoria were analysed for a sample of 16784 km of rural undivided roads, representing almost the entire state road network of this kind in Victoria. Advanced GIS-based data-basing techniques were used to prepare set of 100 m long road segments containing information about individual roadsides. All crashes into these roadsides were matched with available road and roadside information provided by VicRoads (ANRAM data sets as per Austroads, 2014).

Preliminary analysis was conducted to determine the potentially significant variables to be considered for modelling purpose. The effect of road side hazard offset, curvature, road surface condition and shoulder type were all studied to ascertain the influence each of these has on run-off-road crashes. A poisson regression modelling approach was adopted from different alternatives to estimate run-off-road crash frequency. In addition, a zero-augmented model was also applied to address the zero inflation in crash database. The Akaike information criterion (AIC), the ratio of the 'residual deviance and residual degrees of freedom' and the overall model p-values are used to assess the model fit.

The model purpose was to identify and quantify the key design variables which contribute to run-off-road casualty risk. Validity of crash prediction was a secondary consideration.

Results

The modelling results are presented in Table 1. As zero-inflated model did not improve the overall model's capacity statistically significant findings estimated from Poisson regression model are interpreted here.

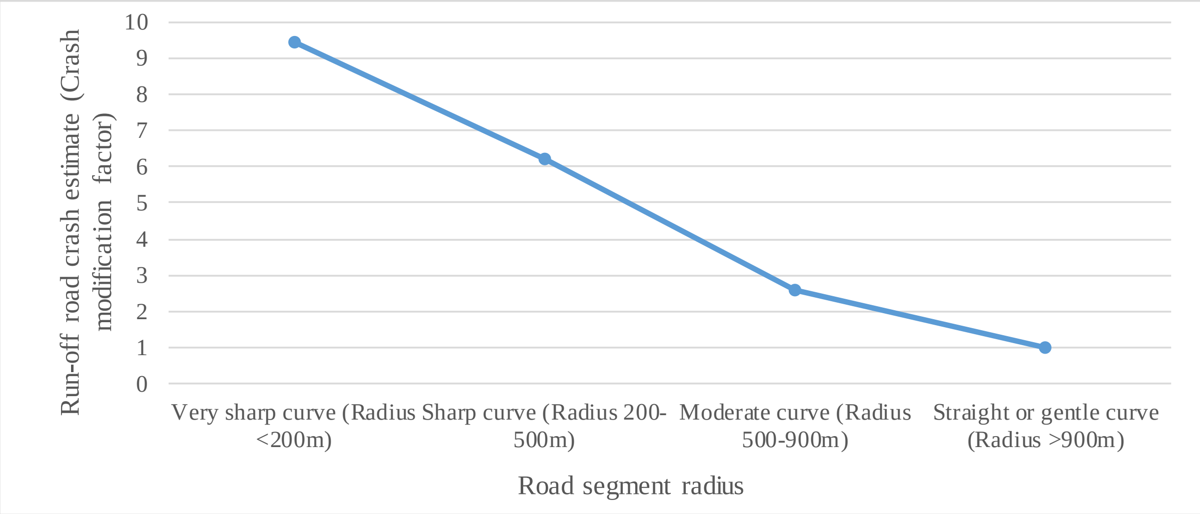
Table 1: Run-off-road casualty frequency CMFs

Predictors		CMFs(Exp(B))	S.E.
Shoulderrumblestrips	Not present	1.23***	0.05788
	Present	1.0	
Curvature	Moderate (R 500-900m)	2.60***	0.05201
	Sharp (R 200-500m)	6.19***	0.06996
	Very sharp (R <200m)	9.42***	0.17367
	Straight or gently curving (R >900m)	1.0	
Road surface condition	Medium	1.10*	0.05729
	Poor	.93	0.20178
	Good	1.0	
AADT		1.42***	0.01989
Roadside hazard distance	(5 to < 10m)	1.14**	0.06521
	(1 to < 5m)	1.68***	0.05682
	(0 to < 1m)	1.22	0.14016
	(>= 10m)	1.0	
Paved shoulder	Not present	1.09*	0.04487
	Present	1.0	
Intersection type	Roundabout	1.24	0.57909
	Other	1.66***	0.05931
	Not present	1.0	

*** = p < 0.01, ** = p <0.05, * = p <0.1

Higher traffic flows increase the frequency of run-off-road casualty crashes. Doubling of AADT leads to 1.4 times higher crash estimate. Curvature is a strong and consistent predictor of run-off-road casualty crashes.

Figure 1 illustrates the relationship between the road segment radius and the run-off-road casualty crash modification factor (CMF, a risk factor).



* All road segments were 100 m long, hence a single curve could comprise several segments

Figure 1: Impact of road segment radius on run-off-road casualty crashes

Absence of shoulder rumble strips increased crash estimate by a factor of 1.23. Medium pavement condition was associated with higher frequency of crashes, compared to good pavement condition. As there were very few cases of 'poor' pavement condition, this effect was not significant.

A narrower road side hazard distance increases the likelihood of casualty run-off road crashes. Figure 2 shows the significant results for run-off-road casualty CMFs. There were few instances of hazard offsets in the 0-1 m range, hence the results were not significant for this category.

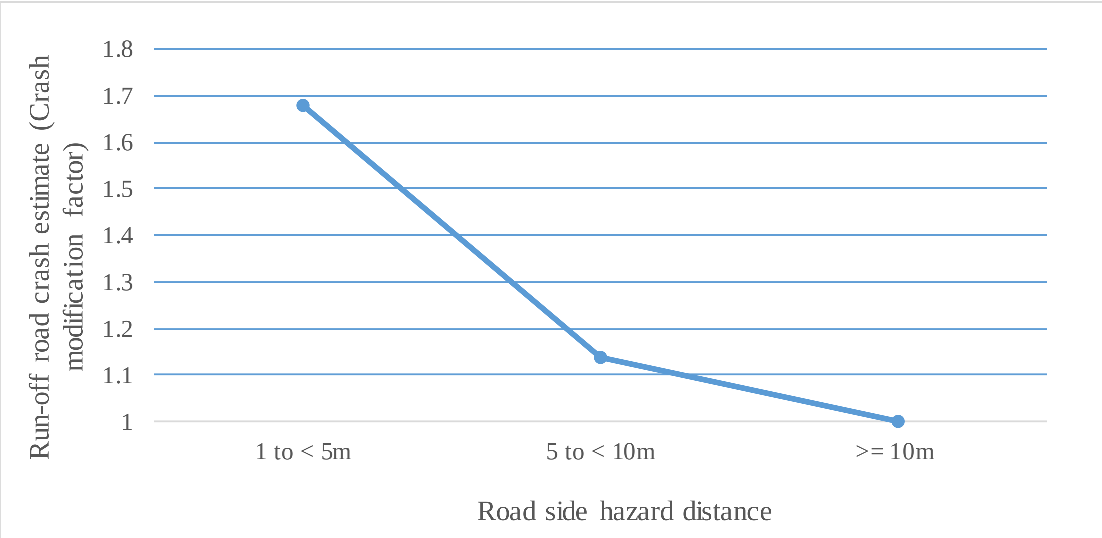


Figure 2: Impact of roadside hazard distance on run-off-road casualty crashes

Presence of a sealed shoulder reduced crash estimate by 0.9. Presence of an at-grade intersection other than a roundabout increased crash estimate by 1.7. Roundabouts were shown to also potentially increase risk, although this finding was not statistically significant.

Other available road variables were tested for their contribution to the run-off-road casualty crash estimate but were found to have any statistically significant effect (e.g. the prevailing type of roadside hazard).

Conclusion and policy relevance

The findings have improved the understanding of the roadside features that contribute to run-off-road casualty crashes on rural undivided high-speed roads. The results may contribute to the review of design practices. Given the cross-sectional nature of the findings, they could be used in mass-action road safety plans such as network-wide standard upgrade programs. The expectation is that such actions would translate to observed reduction in vehicle run-off-road casualty crashes and a consequential decrease in fatal and serious injuries.

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Mobile Phone Distraction: Understanding the Inconsistencies between Simulator and Naturalistic Driving Study Findings

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Abstract

A major current controversy within the driver distraction community is the apparent mismatch between findings on the safety impact of mobile phone conversation found in driving simulators versus real-world naturalistic driving studies (NDS). To this end, the aim of this study was to undertake a critical appraisal of relevant literature and conduct targeted consultations with distraction experts to identify possible reasons for this apparent inconsistency in findings. The methods, results, findings from the study, and their theoretical and practical implications, are discussed.

Background

A current controversy within the driver distraction community is the apparent mismatch between findings on the safety impact of mobile phone conversation (both hand-held and hands-free) found in driving simulators versus findings from instrumented vehicles in real-world naturalistic driving studies (NDS). For example, it has been found that driving performance can be degraded significantly in driving simulators (e.g. Caird et al. 2008); however, with the exception of a recent NDS (Dingus et al. 2016), there is relatively little evidence of significant degradation in safety in naturalistic driving studies (e.g. Klauer et al. 2006). Some naturalistic driving studies have even yielded data suggesting that conversing hands-free on a mobile phone may actually decrease crash risk (e.g. Olson et al. 2009).

In collaboration with Research Centre for Integrated Transport Innovation (rCITI) at the University of New South Wales, in Sydney, Australia, the Australian Road Research Board (ARRB) sought to investigate and explain these inconsistent findings regarding the impact of mobile phone conversations on driving performance and safety. To achieve this, the authors undertook a critical appraisal of relevant literature and conduct targeted stakeholder consultations, via teleconference, to identify possible reasons for the apparent inconsistency in findings between naturalistic driving studies (NDSs) and experimental simulator studies with regards to the impact on driving performance and safety of hands-free mobile phone conversation.

Method

Specifically, this presentation will present the findings from:

1. a targeted review of relevant literature; and
2. consultations, via teleconference, with international experts on driver distraction that were well versed in both simulated driving and NDSs methodologies

Results

The findings from the literature review and expert consultations suggest that there are several possible hypotheses for the apparent inconsistency in findings between NDSs and experimental/simulator studies with regards to the impact of mobile phone conversations. Given the word constraints of this abstract, only four of these hypotheses will be outlined:

- **self-regulation** - in NDSs, drivers have some latitude to decide whether to engage in phone conversation, and therefore may choose not to do so in situations that they perceive to be risky (i.e., to self-regulate) (see for review Cunningham & Regan, 2018). In experimental conditions, however, in which experimenters force participants to engage in phone conversation to understand its effects, participants may be instructed to engage in a phone conversation in situations they normally would not in the real world (and therefore 'force' impaired driving to occur).
- **controlled versus automatised performance** – according to the Cognitive Control Hypothesis (Engstrom, Markkula, Victor, & Merat, 2017), cognitively loading tasks (e.g., a mobile phone conversation) will negatively impact controlled performances (i.e., those performances relying on executive functions such as working memory and attentional effort), but not automatised performances (i.e., those performances that are effortless, generally as a result of repetition). Therefore, it is postulated that, since experimental/simulated conditions often require the driver to perform tasks that rely on executive attention/cognitive control (e.g., responding to artificial stimuli, maximising performance on lane keeping), while real- world crash avoidance may be more governed by more automatised skills, such as braking in response to a looming braking lead vehicle, mobile phone conversations have increased potential to impact performance in the former, but not safety risk in the latter.
- **arousal from cognitive load** - mobile phone conversations may be more naturalistic and arousing in the real-world (compared to phone conversations used as stimuli in experimental conditions), and therefore help maintain alertness and counteract fatigue in NDSs (and, therefore, reduce safety risk) (Reimer & Mehler, 2011; Mehler et al., 2012; Engstrom, 2017);
- **gaze concentration** – cognitively loading tasks induce eye gaze concentration toward the forward central field of view (Victor et al., 2005; Reimer, 2009; Wang et al., 2014 and may therefore lead to a greater chance of a driver detecting a sudden closing-in of a vehicle ahead (Engström et al., 2005; He et al., 2014; Boer et al., 2016). Since crashes in the real-world are most likely to be rear-end crashes, gaze concentration in the real-world may have a greater latitude to help avoid collisions compared to driving in experimental conditions which may present more hazards to drivers in their periphery (such as with peripheral detection tasks).

Conclusions

There are several hypotheses for why there exists a discrepancy between findings regarding the impact of mobile phone conversations on driving performance (in simulated driving studies) and safety risk (in NDSs). However, while the outputs of this research are informative, we acknowledge that this discrepancy is still poorly understood and requires further research.

Even though there have been instances of 'protective' properties (i.e. reduced crash risk) associated with mobile phone conversation presented in NDSs, the general consensus, based on available literature and expert opinion, across both NDSs and simulator studies, is that mobile phone conversation can still be a road safety risk.

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Collaborative Development of an Alcohol and Other Drug Risk Management Resource for Trucking Companies

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Abstract

Heavy vehicles are involved in 18% of road deaths in Victoria, and alcohol and other drugs (AOD) are a preventable risk factor in heavy vehicle crashes. The majority of drivers do the right thing, but a small group who take AOD and drive cause a disproportionate amount of harm.

This extended abstract describes the development of a resource kit to support organisations that employ truck drivers to manage the risk of AOD use in their business.

A key factor in the project's success was broad consultation across Government, subject matter experts and industry representatives.

Background

This project is a component of the Victorian Road Safety Strategy and Action Plan: *Towards Zero 2016 // 2020.*

Heavy Vehicle National Law (HVNL) recognises that truck drivers face pressures that increase their risk of driving while fatigued, and engaging in risky behaviours to meet deadlines and maximise remuneration. Chain of responsibility in the HVNL addresses these issues, and the National Heavy Vehicle Regulator provides guidance and resources to support risk management of speed and fatigue. Therefore, guidance on best management practice is already available for driving hours and speed. However, there is no similar guidance on managing the risks of AOD.

The project aim was to have an impact on road safety by supporting trucking organisations to manage the AOD risk within their business.

Method

Stakeholder engagement

Stakeholder engagement was crucial. The knowledge necessary to deliver this project was held across government agencies and industry, and it was important to capitalise on this. VicRoads initiated an advisory group of stakeholders who:

- Guided the project towards consistency with national heavy vehicle safety frameworks and approaches, and with best practice work health and safety
- Brought subject matter expertise to technical, policy and industry issues
- Grounded the development of objectives and outputs in operational reality
- Guided promotion and dissemination of the resource to industry

Consultation, co-design and development

VicRoads engaged:

- the Australian Road Research Board to interview Victorian companies that employ/contract truck drivers about their AOD policies, how well policy components worked and what would make them more effective.

- a co-designer to better understand end users and how we could meet project objectives and user needs. Consensus converged on a resource kit with a model policy that could be adapted to suit organisations' needs, and resources to support implementation including online training.
- the Alcohol and Drug Foundation to develop the resource kit, taking into account the knowledge gathered earlier in the project.

VicRoads’ legal and work health and safety groups reviewed the policy.

Issues

Many businesses already had an AOD policy, but the content of policies was highly variable. The industry is dominated by smaller operators whose resourcing capacity is limited. Businesses consulted felt that the implementation of policies was their greatest challenge. In particular, addressing breaches could be challenging, and training for supervisors and managers is likely to be beneficial. Guidance on implementation is provided in the resource, and users are reminded there are training programs to support supervisors and managers with strategies and skills to address challenging behaviours and policy breaches.

Dissemination and Evaluation

The resource kit was piloted, revised and then launched. VicRoads’ Strategic Communications team developed a plan to ensure wide distribution among the target group. Evaluation was built into the dissemination plan to measure reach, usefulness and usability. Preliminary results will be available by the time of the ARSC Conference.

Conclusion

Thorough stakeholder engagement resulted in a quality resource built on work health and safety expertise in AOD, and grounded in operational realities. This resource will support trucking companies to manage the AOD risk to their business.

How well can drivers judge the distance when passing bicycles? A controlled photographic study

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Abstract

The evaluation of the Minimum Passing Distance Road Rule Trial in Queensland and earlier psychophysical research questions the ability of drivers to accurately judge the distance to cyclists they are passing. In an online survey, 196 Queensland drivers judged the passing distance in 36 photographs taken from the driver's perspective. Participants were more accurate when the portrayed distance diverged from one metre to a greater extent, when the vehicle was large and when the cyclist portrayed was a male wearing lycra. Accuracy was not influenced by age, gender, whether the participants were cyclists, or reported frequency of passing cyclists.

Background

Minimum Passing Distance legislation aims to improve cyclist safety on shared roads, however, the Queensland evaluation (Haworth et al., 2016) and earlier psychophysical research (Baumberger, Fluckiger, Paquette, Bergeron, & Delorme, 2005; Cutting & Vishton, 1995; Levin & Haber, 1993; Nilsson, 2000) questions the ability of drivers to accurately judge these distances. While previous studies have examined the effects of cyclist, driver, vehicle, road and traffic characteristics on measured and self-reported passing distance, the ability of the driver to judge the distance has not been systematically tested. The current study was a carefully controlled experiment to assess the influences of actual distance, vehicle size, experience in passing cyclists or being passed as a cyclist, and cyclist appearance on judgement accuracy in a safe and legal manner.

Method

Photographs were taken from the driver's eye position in three different sized cars (small - Ford Focus, medium - Holden Commodore, & large - Toyota Prado) of three cyclist types (male in lycra, male & female in casual clothing) at four lateral distances (500, 900, 1100 & 1500 mm).

After each image was displayed for 2 seconds, the participant was asked, "Was the distance between the vehicle and the cyclist…?" with the response measured on a 4-point Likert scale (1 = definitely less than 1 metre, 2 = probably less than 1 metre, 3 = probably more than 1 metre and 4 = definitely more than 1 metre).

The online survey was completed by 196 Queensland drivers (52% female, mean age 40.0 years). Two-thirds held a licence for 10 years or more and a small vehicle was the most commonly driven. Forty-eight percent had ridden a bicycle on Queensland roads in the previous 12-months (hereafter termed 'cyclists'), of whom 60% were male.

Results

The accuracy of judgements of whether the distance was less than or greater than one metre was 72.2% for 500mm, 43.8% for 900mm (less than expected by chance), 67.9% for 1100mm, and 80.2% for 1500mm. The regression analysis indicated the odds of a correct judgement were 1.26 times higher with every 100mm increase in relative distance. Judgements were more accurate for large vehicles (69.0%) than small or medium vehicles (65.3% and 63.8%, ns) and for the male cyclist dressed in lycra than the male or female cyclist dressed in casual clothing. Accuracy was unaffected by age, gender and whether participant drivers were cyclists or not. There was no evidence of experience affecting judgement accuracy, either in terms of similarity between the size of the vehicle in the photograph and the respondent's vehicle or in how often respondents reported passing cyclists.

Conclusions

It is concerning that on about a quarter of the trials participants judged a portrayed distance of 500mm to be more than a metre, and judged 900mm to be more than a metre on more than half of the trials. This suggests that drivers may think they are leaving at least a metre when overtaking but actually are not, and is consistent with earlier visual perception research in natural scenes (but not in traffic scenes). We are planning further, more naturalistic studies to test whether this may contribute to close passing events. Experience as a cyclist or as a driver passing cyclists or with the size of vehicle being portrayed did not improve judgement accuracy, suggesting that explicit feedback regarding actual distance may be needed for improvement to occur.

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The driving exposure of learner drivers in New South Wales: Insight from a smartphone app

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Abstract

Young drivers persist as a major public health problem due to their over-involvement in road crashes in which they and other road users are injured. In New South Wales (NSW), young drivers progress through graduated driver licensing (GDL), logging a supervised practice minimum of 120 hours in the learner phase. While logbooks record some information regarding the Learner's driving exposure, such as distance driven, much remains unknown regarding their driving exposure during this period. A smartphone app is currently being used by a group of learner drivers in NSW, providing unique insight into the nature of the young driver's exposure during this learning phase.

Background

In order to mitigate road crash risks, young drivers in NSW must first complete the learner licence phase which is characterised by minimum practice requirements (120 logbook hours, 12 month duration; Scott-Parker & Rune, 2016). Some insight into driving exposure during the learner phase has been gleaned through recent research (NSW: Bates, Watson, & King, 2008; Queensland: Scott-Parker, Bates, Watson, King, & Hyde, 2011; Scott-Parker, Watson, King, & Hyde, 2011), including the appeal and usability of a gamified app (Fitz-Walter, Johnson, Wyeth, Tjondronegoro, & Scott-Parker, 2017). However, much remains unknown regarding the nature of the learner driver's exposure to different driving contexts.

Method

Since the 27th of August, 2017, Learners have been invited to download the ***Roundtrip Learner Logbook*** iOS app at NSW Customer Service Centres, at the NSW Roads and Maritime Services (RMS) website at http://www.rms.nsw.gov.au/roads/licence/driver/learner/logbook/digital-logbook.html, and via the Apple app store (see Figure 1), as one of three NSW-approved Learner digital logbook apps that can be used as an accepted substitute for the paper logbook. Roundtrip utilises smartphone sensors to automatically capture logbook data for the Learner (including start and end location, start time and end time, minutes of day-time driving, minutes of night-time driving, and weather). Learners are required to manually input the nature of the roads driven upon, the traffic conditions, and how they felt the practice went, at the end of each drive. Learners can also input drives recorded in their paper logbook, particularly if the Roundtrip app was previously unavailable to them (i.e., the Learner gained some of their driving experience before the 27th of August, 2017). As at 10 July 2018, logbook app data was available for 1,936 verified Learners aged 16-19 years (M(*SD*)=16.44(0.75); *n*=1059 females, 54.7%, *n*=2 other, 0.1%, *n*=3 rather not say, 0.2%, *n*=25 nil (did not enter), 1.3%). Learners had recorded 103,482 trips during this time.

Results

On average Learners recorded approximately 31 hours of supervised driving, with an average of 35 minutes of driving, in the Roundtrip app. Mothers provided significantly longer supervision of sons and daughters. Trips completed during the weekend, and during weather conditions that were not fine, were also significantly longer. Regarding the time of day, trips most commonly commenced between the hours of midday and 6pm (47% of all drives, *p*<.001). Further results will be presented at the conference.

Conclusion

The data collected through this pilot project can to inform further research within this domain, and can be used to guide the development, implementation and evaluation of exposure-related interventions for young novice drivers during the learner licence phase. Future work involves investigating how gamification can be added to the app to encourage learner drivers to undertake more diverse practice.

Figure 1. Screenshots of the app

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"a maccas on the left… something on the right": The influence of emotions and passengers upon young driver situation awareness

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Abstract

A breadth of driving experience-related factors (eg., situation awareness skills, SAS), driving exposure-related factors (eg., friends as passengers) and age-related factors (eg., strong emotions) have been found to increase the crash risk of young drivers. The influence of passengers and emotions upon the SAS of 73 drivers aged 17-24 years with a Provisional 1 licence was explored in a cave simulator. Passengers and emotions negatively impacted upon SAS through operationalisation of a surface understanding of the driving environment, rather than a deeper understanding of the nature and mechanisms of driving hazards evident when driving alone and without experiencing strong emotions.

Background

The pernicious problem of young driver road crashes remains despite a plethora of intervention, withyoung drivers at greatest risk of crashing when they first start driving independently. Crash risk is related to driving-inexperience and driving exposure-related factors. To address these risks, graduated driver licensing programs generally allow driving skill acquisition in lower risk conditions (eg., supervised driving as a learner), gradually increasing risk exposure (eg., night-time passenger restrictions) (Scott-Parker & Rune, 2016). Young driver crash risk is related to age also; and young drivers tend to carry their friends as passengers (Scott-Parker, Watson, King, & Hyde, 2012). Moreover, strong emotions – while carrying passengers or travelling alone – increases the likelihood young drivers intentionally drive in a risky manner (eg, speeding) (Scott-Parker, 2017) which increases crash likelihood and severity.

The objective of this study was to explore the influence of passengers, and the influence of strong emotions, on the SAS of young drivers.

Method

Seventy-three drivers (24 males) aged 17-24 years provided verbal commentary regarding to what they were paying attention during a real-world 15-minute day-time driving GoPro clip (see Figure 1) in a cave simulator. After a 10-minute writing task in which strong emotions were evoked, drivers completed a second driving task. Thirty-six drivers completed both tasks in the presence of their friend as their 'passenger'. The SAS of the driver was examined through commentary coding as pertaining to (a) hazard perception (Perception, P, eg., '*100 zone*'); (b) hazard comprehension (Perception/ Comprehension, PC, eg., '*Big sign about entering the motorway*'), or (c) hazard projection (Perception/Comprehension/Projection, PCP, eg., '*We can turn at any time but we need to take care that nothing's coming on my right*'; indicative of comprehensive SAS). SAS exemplified as the proportion of P, PC, and PCP before (Drive A) and after (Drive B) the emotion invocation, and for driving alone and with passengers, was examined.

Figure 1. Example day-time, city, driving footage

Results

There was a statistically significant reduction in the proportion of verbal commentary pertaining to PCP after the emotion invocation. While there was no difference in the proportion of PCP during Drive A, participants carrying friends as passengers experienced the greatest reduction in PCP post-emotion invocation (Figure 2).

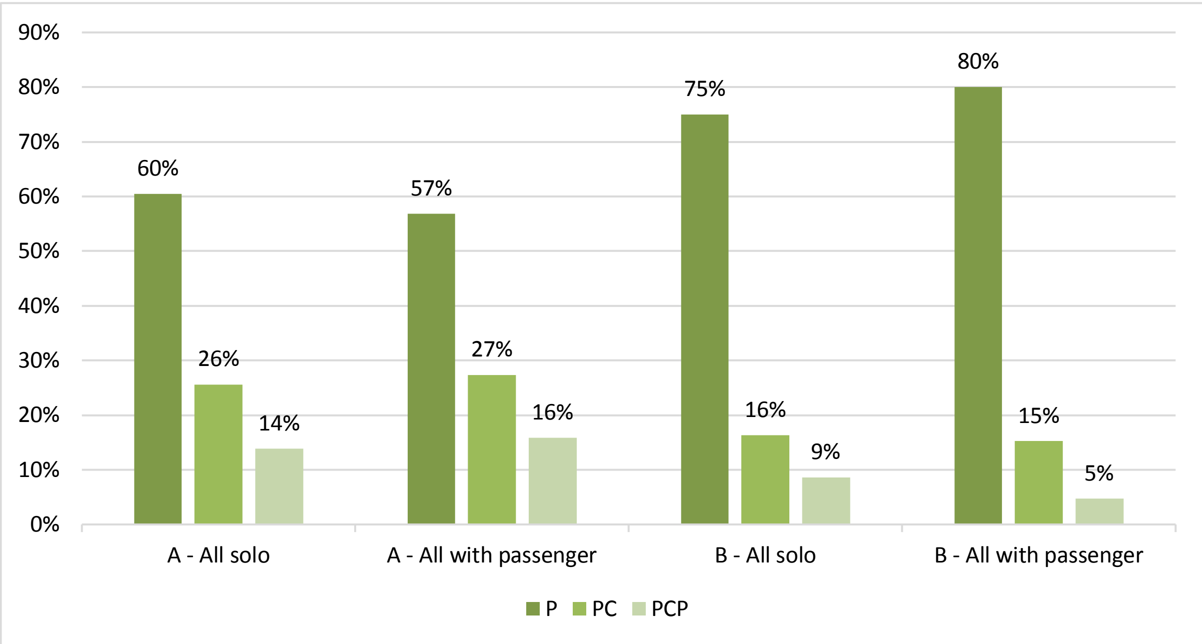

Figure 2. SAS as indicated by Perception, Perception/Comprehension, and Perception/Comprehension/Projection, by drive and by passenger presence

Regarding the emotions invoked, there was a statistically significant reduction in the proportion of verbal commentary pertaining to PCP after the emotion invocation, with participants driving ‘happy’, ‘excited’, and ‘sad’ experiencing considerable reductions in SAS while participants driving ‘angry’ evidenced greater SAS. Carrying passengers further reduced SAS compared to driving alone for all four emotions (eg., ‘happy’, Figure 3; ‘excited’, Figure 4).

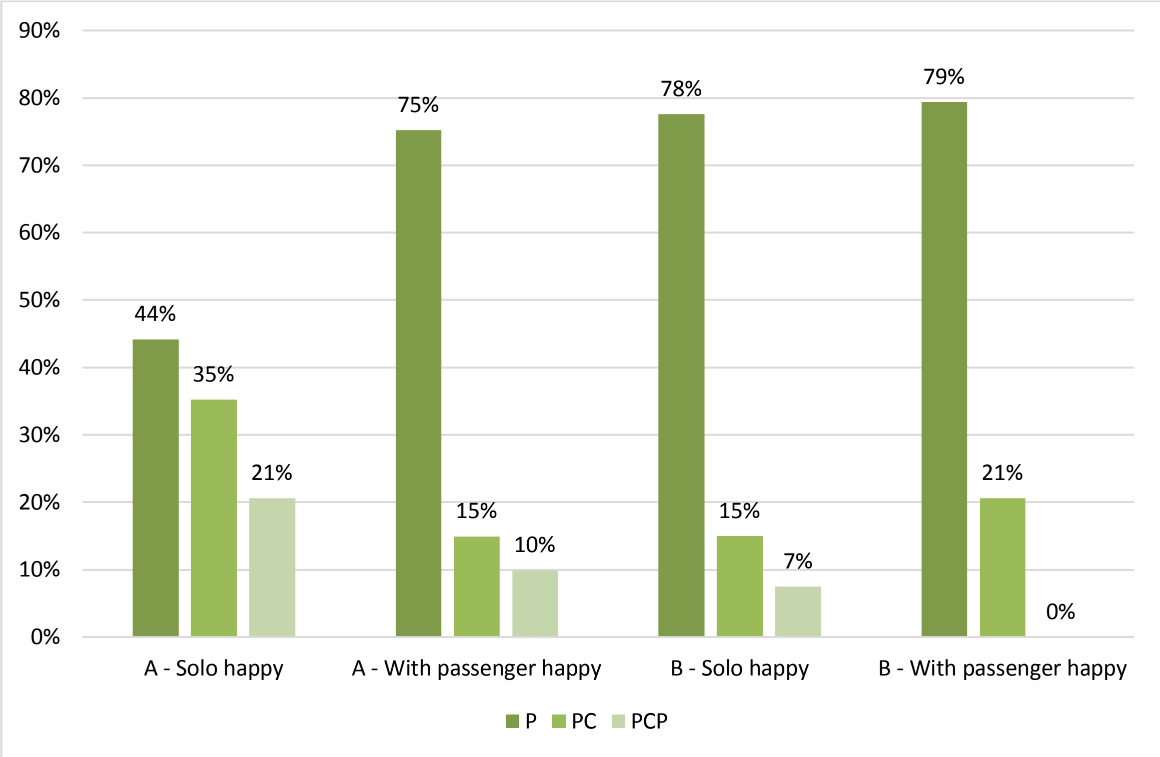

Figure 3. SAS of Happy drivers as indicated by Perception, Perception/Comprehension, and Perception/Comprehension/Projection, by passenger presence

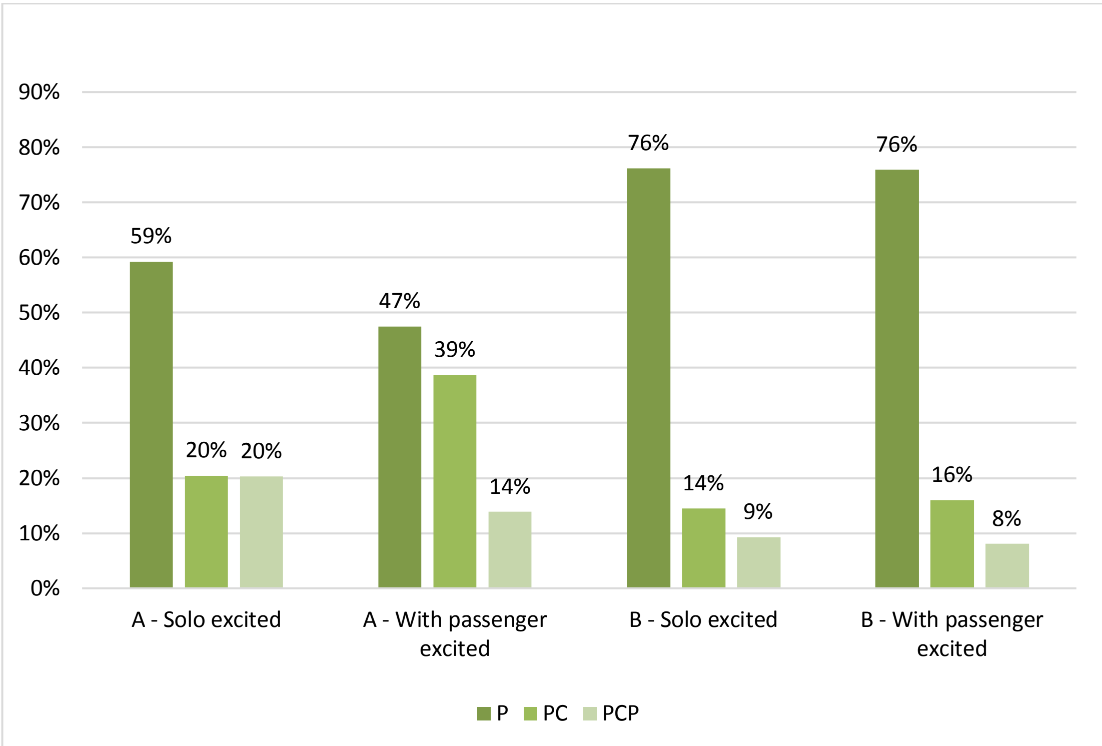

Figure 4. SAS of Excited drivers as indicated by Perception, Perception/Comprehension, and Perception/Comprehension/Projection, by passenger presence

Conclusion

Driving inexperience, evidenced as incomplete and/or inadequate situation awareness skills, place young novice drivers at increased risk of a road crash. Driving with a friend as a passenger, driving while experiencing strong emotions, and driving while experiencing strong emotions and while carrying a friend as a passenger were found to further degrade young driver situation awareness. Effective intervention targeting the increased road safety risks associated with poor situation awareness should explicitly address the negative impact of passenger presence and driving while experiencing strong emotions.

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Situation awareness in young novice ambulance drivers: So much more than driving

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Abstract

The wicked problem of young novice driver road crashes, and the critical role of emergency responders in attending crashes, is well-recognised. What is less well-recognised is that emergency responders may be young novice drivers *and* young novice ambulance drivers. This project explored the situation awareness (SA) demands upon young novice ambulance drivers in Queensland through a synthesis of relevant literature, hierarchical task analysis (HTA) to explicate the complex emergency dispatch/response system, and perceptual exploration of drivers' SA. The findings reveal a plethora of opportunities for inadequate SA to negatively impact the road safety of drivers, patients, and other road users.

Background

Paramedic emergency medical service (EMS) personnel are a critical component of the Australian health system; they respond to over three million emergency calls annually and provide pre-hospital emergency care and specialised transportation (Joyce, Wainer, Archer, Wyatt, & Pitermann, 2009; Maguire, 2014). Australian EMS have a six times' higher risk of fatalities than the national worker average, with more than 85% of fatalities caused by transportation-related incidents involving paramedics driving ambulances (Maguire, 2011; Safe Work Australia, 2007), making it one of the most risky professions in Australia (Maguire, 2014).

Currently in Australia there is no strategic national approach – such as driver training and driver education for new recruits – to reduce EMS road crashes involving an ambulance (Joyce et al., 2009). Driving standards are not included in the Paramedic Professional Competency Standards which form the foundation of current education, training and practice for operational service delivery in Australia and New Zealand (Council of Ambulance Authorities, 2013). As such, driving or key skills for safe driving, such as SA (Salmon, Stanton, Walker, Jenkins, & Rafferty, 2010; Salmon, Lenne, Young, & Walker, 2014), are not normally included in undergraduate programs that are critical for preparing paramedics for practice. Recent changes to the educational pathway to become a paramedic in Australia, from an in-house post-employment model to a university based pre-employment model, has meant that new recruits are now younger (e.g., 24 years versus 27 years on average) and may be in charge of driving an ambulance while still a novice driver (Joyce et al., 2009).

Method

The relevant SA literature was synthesised and a HTA completed to elucidate the nature of the ambulance driving task to facilitate further analyses of the SA requirements during ambulance driving.

Results

The literature revealed a breadth of young novice driver, and young novice ambulance driver, SA and road-safety related concerns, including the reliance on inadequate and/or incomplete driving schemas. The HTA (see Table 1, Figure 1) revealed that the highly complex nature of emergency dispatch, response, and retrieval means that paramedic SA is quite different to 'ordinary drivers'; notwithstanding this finding, SA remains negatively impacted upon by distractions.

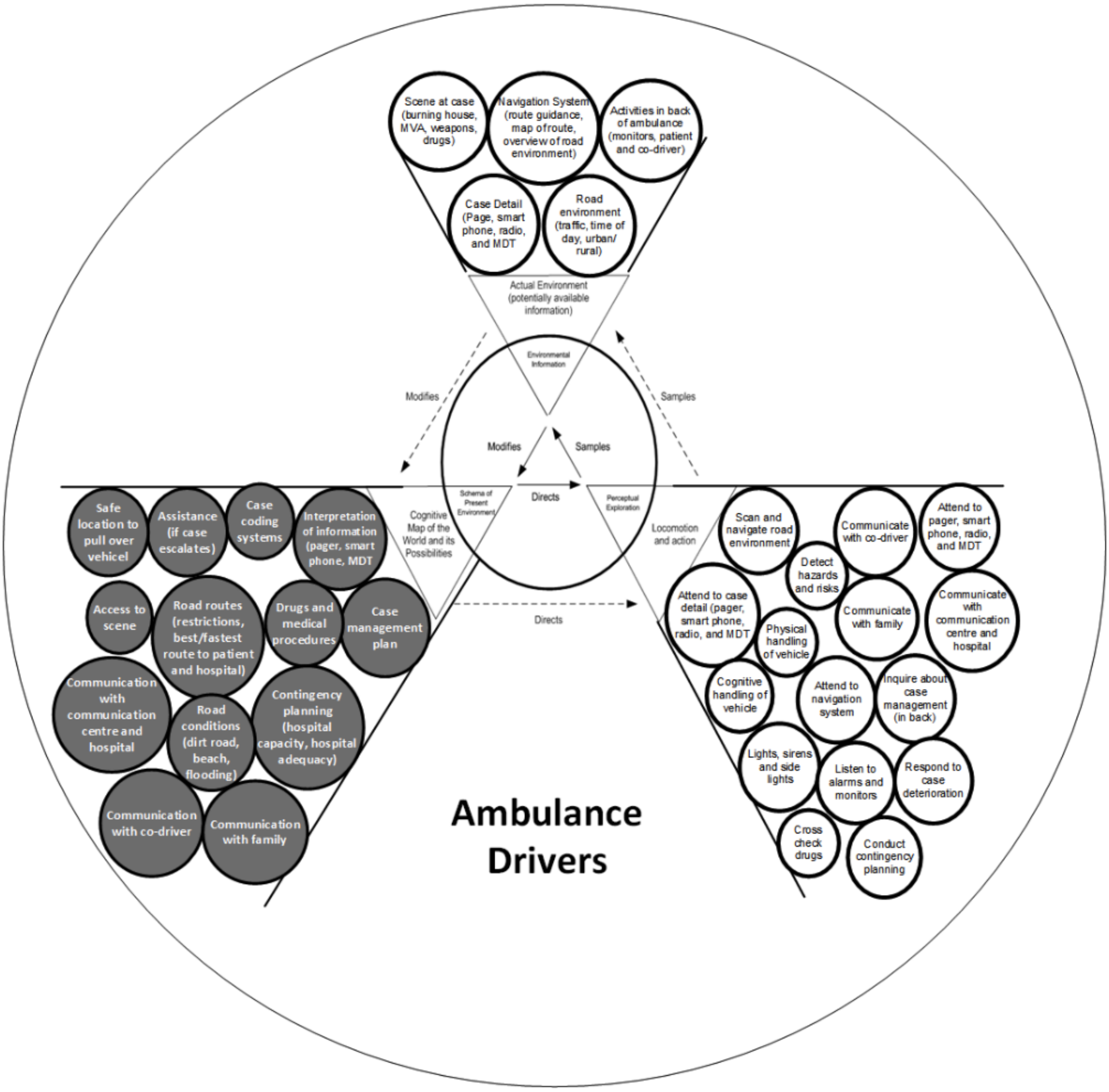

Figure 1. Perceptual exploration of ambulance drivers' situation awareness

Conclusion

Emergency responder situation awareness appears quite different to 'ordinary drivers', suggesting well-developed road-related schema are required *before* young novice ambulance drivers are behind the wheel in a highly-emotive, time-critical situation. Drivers are not simply 'driving'; they are engaged in a breadth of tasks *while* driving (e.g., accessing case details in flux) which, for safety, must rely upon adequate situation awareness skills. As such, training programs for young novice ambulance drivers should specifically target the development and reinforcement of a breadth of SA skills to minimise on-road crash risks.

1 *Table 1. Summary of Concepts and Themes Underpinning Situation Awareness during Ambulance Dispatch*

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
1. Receive alert and access case details	Continuous flow of information from pager including case details, case nature, hospital capacity and case updates. Patient problem based on coding system.	Schemas around coding systems and which information from pager and smart phone upon which to focus. Schemas around contingency planning such as hospital capacity and road routes to case and hospital.	Attend to pager and/or smart phone. If already driving, navigate road environment and physical handling of vehicle.
2. Confirm case details	Continuous flow of detailed information concerning case (e.g., MVA, be aware of dog, patient with violent history, drugs, more than one victim) via MDT.	Handling of continuous flow of information from MDT (e.g., which information poses a risk or requires urgency and which information is non-urgent). Schemas around different case situations and contingency planning (e.g., best route to and from case, which hospital most suited and most likely to have capacity).	Attend to MDT and operate radio. Inquire about further information if needed. If already driving, navigate road environment and physical handling of vehicle.
3. Travel to location	Continuous update on case via MDT. Road direction from navigation system. Road environment including traffic, time of day, location and speed restrictions.	Schemas about management plan of case and drugs required. Consideration to special cases such as children and/or severe cases where more senior staff might be needed. Planning around access the scene, particularly if access is difficult (e.g., locked doors, environmental hazards) and/or difficult road conditions (e.g., dirt roads, flooding, off-road, the beach). Consideration for further assistance (e.g., helicopter) if case escalates.	Attend to MDT and road navigation system. Operate radio and communicate with co-driver. Calculate drug dose and management plan for case. Manual operation (physical and cognitive) of vehicle including lights, sirens and sidelights. Scan and assess road environment and attend to potential hazards.
4. Conduct hazard assessment tasks	Environment and scene at case (e.g., burning house, MVA, weapons, drugs).	Schemas around different case and environmental conditions including severity of case and/or dangerous conditions (from the environment, patient, or other people).	Windscreen assessment: 1. Identify hazards (e.g., where to park vehicle, traffic hazards, positioning vehicle to protect people or as barrier). 2. Identify type of incident (request further assistance if needed)

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
			Update case details and scene, report information back to call centre as approach the scene. Use of mnemonics (e.g., ETHANE) where applicable.
5. Return with patient	Continuous update via MDT (e.g., hospital capacity). Road direction from navigation system. Road environment including traffic, time of day, location and speed restrictions. Activities in back of the ambulance (e.g., case management)	Schemas around hospitals including which might be at capacity (e.g., during busy times), need to bypass smaller hospital if case severe or not able to handle case (e.g., small child). Deterioration of patient and what is most appropriate management plan. Schemas around drugs and other medical procedures required on route to hospital3	Operate and attend to updates from MDT, if necessary interrogate device for more information. Attend to road navigation system. Manual operation (physical and cognitive) of vehicle including lights, sirens and sidelights. Scan and assess road environment and attend to potential hazards. Communicate with family members (e.g., update them on case, reassure them). Communicate with paramedic in the back, cross check drugs, listen to activities including alarms and monitors, query patient handling where necessary. Communicate with call centre and/or hospital staff and update them on case. Conduct contingency planning (e.g., if road is blocked and if a hospital is at capacity).
6. Deal with deterioration and/or cardiac arrest on route	Information from paramedic staff about case deterioration/cardiac arrest. Road environment including traffic, time of day, location and speed restrictions.	Schemas around case deterioration/cardiac arrest. Best and safest place to park the vehicle and most appropriate response to case deterioration/cardiac arrest.	Communicate with paramedic in the back about case, communicate with family members, call centre, and/or hospital. Identify safe location to pull vehicle over and park the vehicle. Respond to case deterioration/cardiac arrest.

Super-ordinate goals	Actual environment (potential available information)	Cognitive map of the world and its possibilities (Genotype schema of present environment)	Locomotion and action (physical and cognitive action concepts – Phenotype schema of perceptual exploration)
7. Return without patient	Continuous update on case via MDT. Road environment including traffic, time of day, location and speed restrictions.		

2 Note. MVA = multiple vehicle accident; MDT = mobile data terminal; ETHANE = exact location, type, hazards, access, numbers, emergency services.

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An exploratory study of professional driving instruction and encouraging the development of a self-regulated safety orientation in novice drivers

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Abstract

Novice drivers' greatest crash risk occurs in the months immediately following the supervised learner period. This research aimed to explore whether elements of professional driving instruction have potential to reduce this risk. Five hundred and forty-four eligible Queensland learner drivers aged 16-19 years completed a voluntary, on-line survey regarding their professional instruction experience, driving behaviour and a motivation inventory framed by self-determination theory. Analyses found professional higher-order instruction predicted self-regulated safety orientations which negatively predicted engagement in risky driving behaviours. Professional higher-order instruction, with strategies encouraging a self-regulated safety orientation, has potential to reduce young novice drivers' risky driving.

Background

Professional driving instruction provides an opportunity to teach, and to instil, safe driving practices pre-independent licensure, albeit there is a lack of evidence to suggest these outcomes typically occur (Beanland et al., 2013; Pressley et al., 2017). Alternatively, the development of higher-order skills has increasing support from research, showing a commensurate reduction in the crash risk of novice drivers (Isler et al., 2011; Senserrick & Williams, 2015).

Higher-order instruction teaches *why*, rather than *what*, to cement learning and higher-order skills to assist transfer of the learning to future driving scenarios (Goodwin et al., 2014; Scott-Parker et al., 2014). For example, rather than providing a limited in-the-moment instruction, such as "increase your following distance" during a night drive, it explains why night driving requires different driving strategies (e.g., "It's harder to see at night so increasing your following distance will allow you to react to other drivers' behaviour"). It is further reinforced by fostering self-regulation of these strategies (Bailey, 2006; Watson-Brown et al., 2018). Self-determination theory (SDT) suggests environments that support self-learning (learner-focused) nurture the development of internally-regulated, positive behaviours, whereas externally-regulated behaviours produce inconsistent driving practices (Deci & Ryan, 2012; Ryan & Deci, 2000).

Higher-order instruction has been examined within the context of parental supervision of learner drivers, however there are limited studies with professional driving instructors (Ehsani et al., 2017; Ehsani et al., 2015; Goodwin et al., 2014; Scott-Parker et al., 2014). This study aimed to investigate the relationships between higher-order instruction, a self-regulated safety orientation, and risky driving behaviours of young novice drivers.

Method

An on-line survey was conducted with 1,647 learner-licensed and P1-licensed drivers aged 16-19 across Queensland to examine their experiences of professional driving instruction, risky driving behaviours, driving confidence, safety orientation, and crashes and police-reported offences. The higher-order instruction measure comprised 16 items rated on how much time the driving instructor spent talking about aspects such as the effects of emotions ("angry or excited") or physical state ("being tired") on driving, and driving differently in different conditions ("at night" and "in wet weather"). The measure of self-regulated safety orientation comprised items rated on how true they were to the responder, including "Being a safe driver makes driving more enjoyable" and "Being a safe driver is boring."

Advertising of the survey was disseminated by the Department of Transport and Main Roads, Queensland schools (via newsletters), and professional driving instructors. Participants were eligible to go into a draw to win an iPhone 7. Multiple regression analyses were employed to analyse the data.

Results

Eligible and complete results were provided by 544 participant learner drivers, of which 67.5% identified as female (n = 367, other n = 3). The length of learner licensure was, on average, 10 months; the median number of logbook hours was 50-59 hours. Professional driving lessons averaged 4-5 lessons.

The regression analyses revealed that a self-regulated safety orientation was a significant negative predictor of risky driving behaviours and was in fact the strongest predictor. This was particularly influenced by items relating to safe driving interest/enjoyment. Perceived competence as a good and safe driver also predicted less risky driving behaviours. Greater pressure and tension experienced by participants predicted more risky driving behaviours.

The strongest predictor of a self-regulated safety orientation was higher-order instruction. The only direct relationship between higher-order instruction and risky driving behaviours was in relation to *inattentive* risky driving behaviours. No significant observations were found regarding *deliberate* risky driving behaviours.

Conclusions

Higher-order instruction provided by professional driving instructors has the potential to assist young learner drivers to develop a self-regulated safety orientation, which in turn can reduce engagement in risky driving behaviours. SDT suggests a learning environment to support the provision of higher-order instruction. The environment is student-centric, autonomy-supportive and fosters perceived competence which encourages the development of a self-regulated safety-orientation (Deci & Ryan, 2012). The results support higher-order instruction - delivered as a complete concept - as a tool to reduce risky driving behaviours.

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A Time Series Analysis of Periodic Heavy Vehicle Inspections and Road Safety Outcomes in Queensland

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Abstract

Heavy vehicle crashes cause significant economic and social costs. Although most crashes are considered to be related to driver errors, the impact of vehicle defects is evident in many crashes (Blower et al., 2010). Hence, different vehicle inspection schemes, including Queensland's certificate of inspection (COI), have been implemented around the world to more effectively manage the safety of heavy vehicles (Keall and Newstead, 2013). This study investigates the trends in and potential impact of COI on heavy vehicle crashes, relying on longitudinal data provided by Queensland's Department of Transport and Main Roads for the period of 2009-2014.

Background and Objective

In a twelve-month period ending December 2016, heavy vehicles were involved in 191 fatal crashes with 213 deaths across Australia (BITRE, 2017). These figures mean heavy vehicles are involved in almost 16% of fatal crashes, while they represent only 2.4% of the total number of registered vehicles and 7% of the total vehicle kilometres travelled (BITRE, 2016). To reduce these damages especially by decreasing defect-related crashes, the COI scheme requires any heavy vehicle registered in Queensland to undergo a periodic inspection every 6 or 12 months, depending on the vehicle type. While a few studies (e.g., Elvik, 2002) have found associations between inspections of heavy vehicles and decline in vehicle defects as well as the total number of heavy vehicle crashes, a recent review of the existing literature shows that there is little empirical research about such impacts (Mooren et al., 2014). Accordingly, this research investigates the efficacy and effectiveness of periodic heavy vehicle inspections by examining the impact of the COI scheme on heavy vehicle crashes in Queensland. In particular, this research explores the overall trends in periodic heavy vehicle inspection results and the number of heavy vehicle crashes, especially to reveal potential relationships between inspections and crashes over a five-year period.

Method

Time series analysis is used to address the proposed research objective. Initially both periodic inspection results and crashes are investigated, following an exploratory approach to reveal potential trends, seasonal components and irregularities from different perspectives. Then, an autoregressive integrated moving average (ARIMA) model is fit to the time series data. The model indicates cross-correlations and any potential impact of periodic inspections on crashes. Finally, Holt-Winters' double exponential smoothing (Metcalfe and Cowpertwait, 2009) is applied to forecast changes in heavy vehicle crashes, which are then, compared with the actual observations.

Results and Conclusions

A preliminary investigation shows that: a) the mean inspection failure rate, the total number of crashes and the number of crashes caused by a vehicle defect have decreased, while the vehicles' average age has increased over the five years under investigation, as shown in Figure 1. A regression model fitted to the time series data also shows that the inspection failure rate with a two-month lag, along with the vehicle age, can explain around 39.1 per cent of variation in the number of crashes caused by a vehicle defect, while the estimates for both predictors are statistically significant.

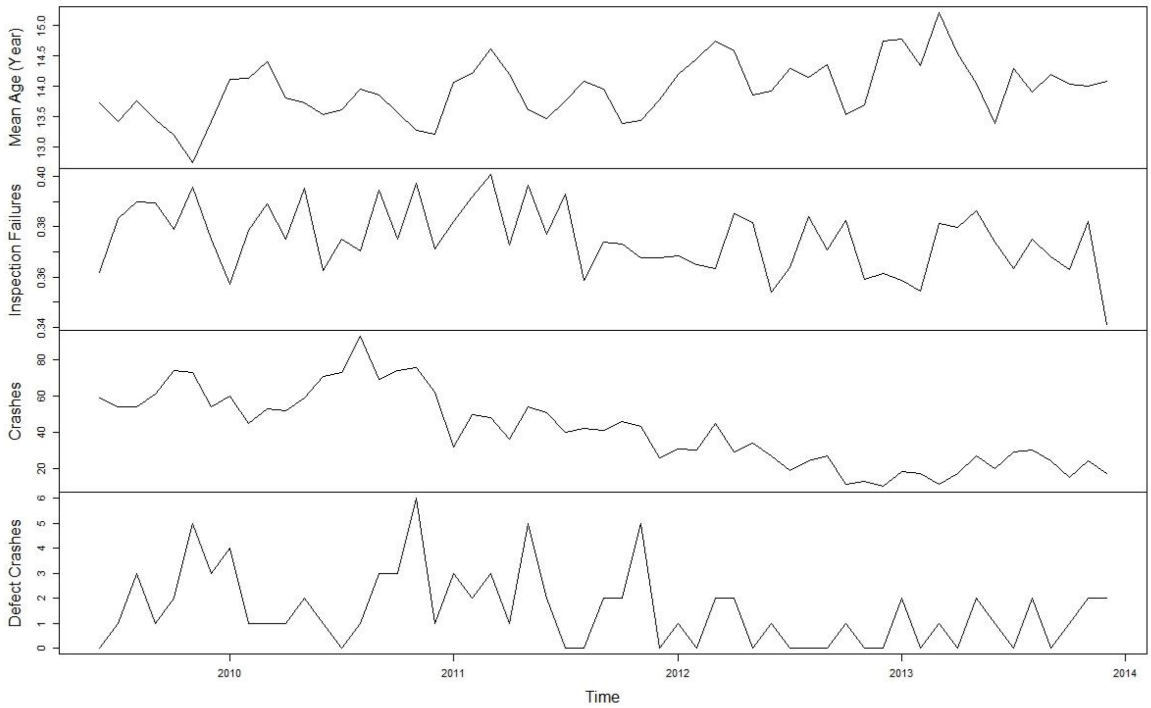

Figure 1. Vehicle age, inspection results and crashes time series

Finally, the results of Holt-Winters double exponential smoothing suggest that the decline of inspection failures and defect-caused crashes (shown in Figure 2) should remain steady for the one-year period after our data set (i.e. 2014-2015), which is comparable to actual observations. These findings have both theoretical and practical implications regarding the effectiveness of vehicle inspection protocols on road safety: inspections do result in reductions in defect-related crashes, and these safety effects are related to the time since the last inspection.

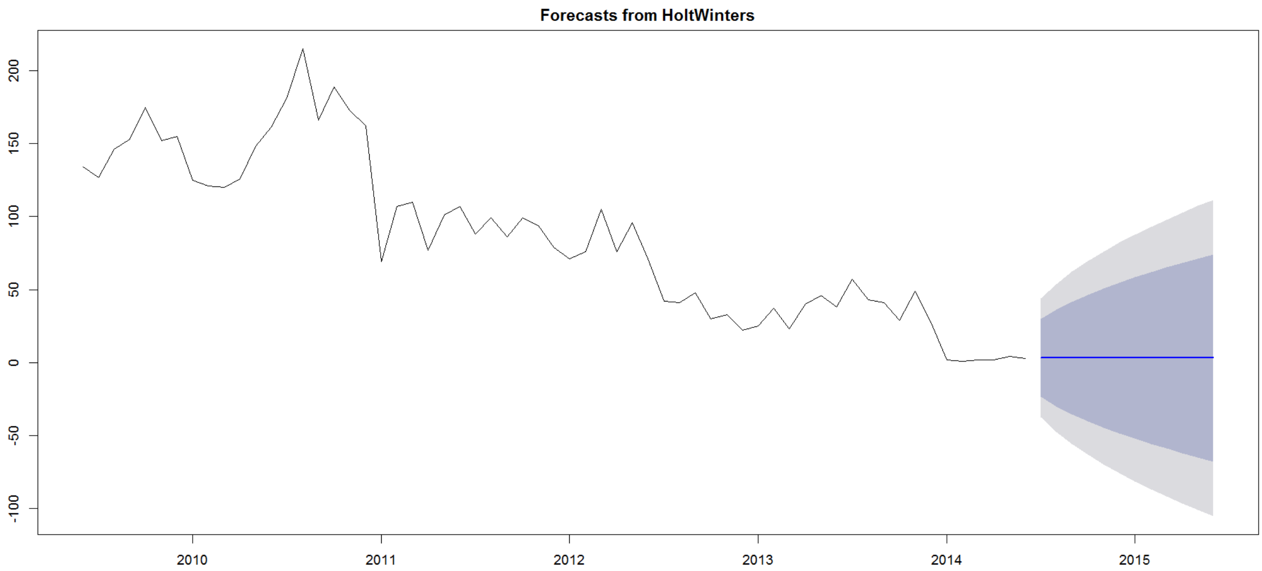

Figure 2. Defect-caused heavy vehicle crash forecasts

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Trial of improved procedures for driver licence tests administered by occupational therapists

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Abstract

VicRoads, ARRB and Occupational Therapy Australia–Victoria Division are supporting the implementation of improved testing procedures for use by occupational therapists trained in driver assessment (OTs) who conduct driver licence tests for people with medical/disability issues. A trial was conducted in 2016–17 to establish the feasibility and OT acceptance of the improved test. Twenty OTs participated in three trial phases using iterative processes to develop 15 compliant routes and test 156 clients, completing feedback forms after each test. Based on the trial outcomes, further improvements were made to test procedures, assessment criteria, route requirements and associated documentation.

Background

OTs specialising in driver assessment conduct on-road practical driving tests with drivers who have a cognitive, psychiatric or physical impairment or require adaptive aids or vehicle modifications. A review of licence test procedures used by OTs found the test documentation available to OTs lacked detail and was partially based on an obsolete probationary licence test. Baseline research identified large variations in test duration and driving task complexity across different test routes and locations.

VicRoads conducted a series of projects to examine current practice with a view to improving the validity, reliability and fairness of OT licence test procedures, harmonisation with other licence tests currently in use in Victoria and test documentation. A draft test manual setting out proposed test procedures, including assessment criteria and test route requirements, was developed by VicRoads for comment by OTs. A trial of the new procedures was conducted in late 2016 and early 2017.

Method

The trial comprised three strands:

i. assessment of drivers wishing to retain an unrestricted licence (‘open area’ tests), using the new assessment criteria but using existing (non-compliant) test routes

ii. open area tests conducted using the new assessment criteria and upgraded test routes

iii. assessment of drivers who chose to accept a licence condition limiting driving to a defined area around their home (‘local area’ tests).

For use in the second strand of the trial, 15 existing open area test routes were upgraded to comply with the new route requirements. Feedback questionnaires were completed by participating OTs, capturing data from each licence test conducted during the trial. Feedback was also collected from OTs who upgraded test routes. Data was analysed using descriptive statistics. Upgraded test routes underwent iterative process improvements with multiple reviews. Errors and non-conformances indicating difficulty in complying with requirements were discussed and consensus reached to resolve issues.

Results

Twenty experienced OT driver assessors participated in the trial. Across the three strands, 156 completed post-test feedback questionnaires were received.

Common feedback themes included licence test duration; standard tasks required in all licence tests; assessment of non-standard (‘client-specific’) tasks; detail required when documenting test routes; and additional test procedures. The upgrade process also identified challenges in complying with standard requirements.

Conclusions

Trial feedback resulted in several test adjustments, including reducing the minimum number of compulsory driving tasks in an open area test route and provision of a formal time allowance for client-specific task assessment if required. The emergency stop and three-point turn tasks were reclassified as client-specific rather than standard tasks. The test manual was enhanced to clarify driving performance assessment, standard test route development, suitability of vehicles for use in licence tests and other test procedures.

The revised test manual has been delivered, together with training to support compliance with the new requirements. Assistance is also available to OTs who need to upgrade or create standard test routes. Implementation of the upgraded test procedures is expected to be completed late in 2018.

Vehicles as workplaces – a new framework for a critical road safety management issue

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Abstract

The paper outlines the similarities in policy and differences in application between the management of road traffic safety (RTS) and of work health and safety (WHS). The application of WHS principles to RTS is discussed and used to develop a new framework for considering road traffic system risks and countermeasures. The development of WHS guidance regarding the use of vehicles in road traffic, based on this framework, is described.

Background

The development and implementation of road traffic safety (RTS) programs based on the safe system approach are increasingly aligned to the principles guiding work health and safety (WHS) programs for many years.

However, RTS and WHS have remained quite separate disciplines. With the support of the Heads of Workplace Safety Authorities, Austroads undertook to develop a guide for duty holders under WHS law, focusing on the use of vehicles in road traffic. The WHS guide adapts best practice RTS management principles to the recognised structures of WHS management.

RTS in the WHS Context

This paper describes the application of three key WHS principles to RTS:

- Safe as reasonably practicable
- Hierarchy of control
- Identification of hazards and risks

Safe as reasonably practicable

Compliance with road traffic law will not necessarily achieve safety on the road (the absence of fatality or serious injury). WHS duties relating to the use of vehicles in road traffic go beyond ensuring compliance with road traffic law.

WHS law defines the factors that duty holders must consider in regard to the use of vehicles in road traffic (see Table 1 below).

Hierarchy of control

Notwithstanding the growing primacy of the safe system approach, considerable priority is still directed in RTS programs to improving human performance. WHS programs refer to a hierarchy of control that gives lower priority to these (less effective) administrative actions (SWA, 2011).

This hierarchy of control can be defined in RTS terms:

- Eliminate the hazards
- Substitute the hazard with something safer

- Isolate the hazard from people
- Reduce risks through engineering control
- Reduce exposure to the hazard using administrative actions
- Use personal protective equipment

Identification of hazards and risks

Application of this hierarchy is based on hazard identification and management processes. Road traffic needs to be considered at two levels. The first level is the road traffic system itself. Until there is a safe system, travel by road is hazardous.

The second level assumes that travel cannot be avoided, and defines the hazards that remain. A taxonomy of hazards was developed with reference to the elements of a sound road traffic safety management system as described in ISO 39001. Each hazard is described as the absence of this element, viz:

- Inadequate journey planning
- Roads providing inadequate protection
- Vehicles providing inadequate protection
- Speed in excess of safe exposure thresholds
- Unauthorised drivers
- Unsafe drivers
- Non-use or misuse of personal protective equipment
- Inadequate post-crash responses

The WHS Guide

The resulting WHS Guide is based on a simple risk management process for organisations (Figure 1), starting with a step for organisations to understand their workers' exposure to hazards.

Table 1. WHS Duties and RTS Considerations

Duty holders must consider (based on SWA, 2016)	**In relation to road traffic, duty holders should consider**
The likelihood of the hazard or risk occurring	The likelihood of exposure to the hazard is extremely high
The degree of harm arising from the hazard	The degree of harm that can arise is extremely high
Knowledge (or what would be reasonable to know) about the hazard, and ways to eliminate or minimise the risk	The hazards and risks commonly experienced in road traffic are well known
Availability and suitability of ways to eliminate or minimise the risk	There are numerous, proven controls to minimise risks
Whether the cost of controls is grossly disproportionate to the risk (only after taking account of the above four matters)	Analyses have shown that the benefits of these controls can far exceed the costs

Table 1. WHS Duties and RTS Considerations

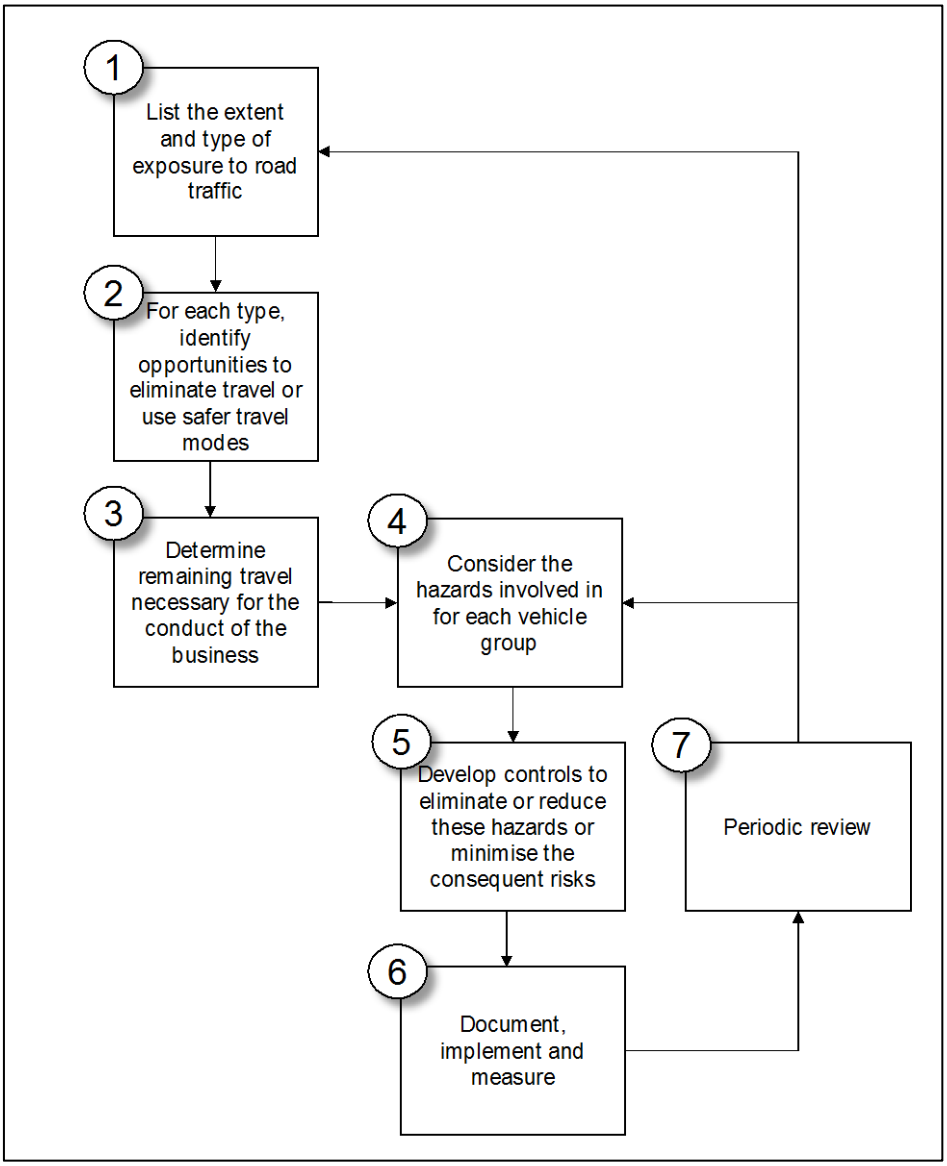

Figure 1. Risk management process

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Beyond BCR:

Ensuring Return on Investment while Strategically Delivering Safe System Outcomes

Shaun Luzan, Bruce Corben

VicRoads

Abstract

The Safe System philosophy demands that risks be dealt with systematically. The Towards Zero Strategy attempts to introduce a systematic and proactive approach to dealing with risk on the road network. Enabling this approach has required changes to the role of Benefit-Cost Ratio (BCR) in project selection, prioritisation and approval. Historically projects have been required to meet minimum BCRs which are calculated using recent crash history. A new approach has been devised to enable Victoria's Safe System Road Infrastructure Program (SSRIP) to deal proactively and systematically with safety risks.

Background

The Safe System Roads Infrastructure Program is a partnership between the TAC and VicRoads to deliver road safety infrastructure throughout Victoria. The TAC has committed $1.4 billion to the program over 10 years, with VicRoads responsible for managing the projects.

An agreement between TAC and VicRoads outlines the funding rule for the program. Over the life of SSRIP (and its predecessor programs) projects have been selected and prioritised based on economic return which has been measured through a BCR calculation. BCRs for SSRIP projects have been calculated based on crash history and human capital valuations of fatality, serious injury and minor injury crashes.

Issue with the Current Approach

BCR requirements have limited the ability of SSRIP to deal proactively and systematically with safety risks. The BCR method used for SSRIP projects has had the following shortcomings:

- benefits can be overestimated as it focuses infrastructure investment on areas with recent crash histories rather underlying trend and inherent risks
- higher values can be produced for projects that deal only with some crash types
- the calculation method does not reflect the actual cost of the most serious injuries and is based on data with known quality problems including under-reporting, potentially incorrect injury severity, crash codes and location.

Figure 1 below demonstrates a number of these concerns. The figure shows how the BCR for a theoretical $1m project can change over time based on a recent history of crashes. In this example, a random increase in crashes would have allowed the project to meet a BCR requirement of 3 in 2005 even through the underlying trend suggests the real value is only 1.5.

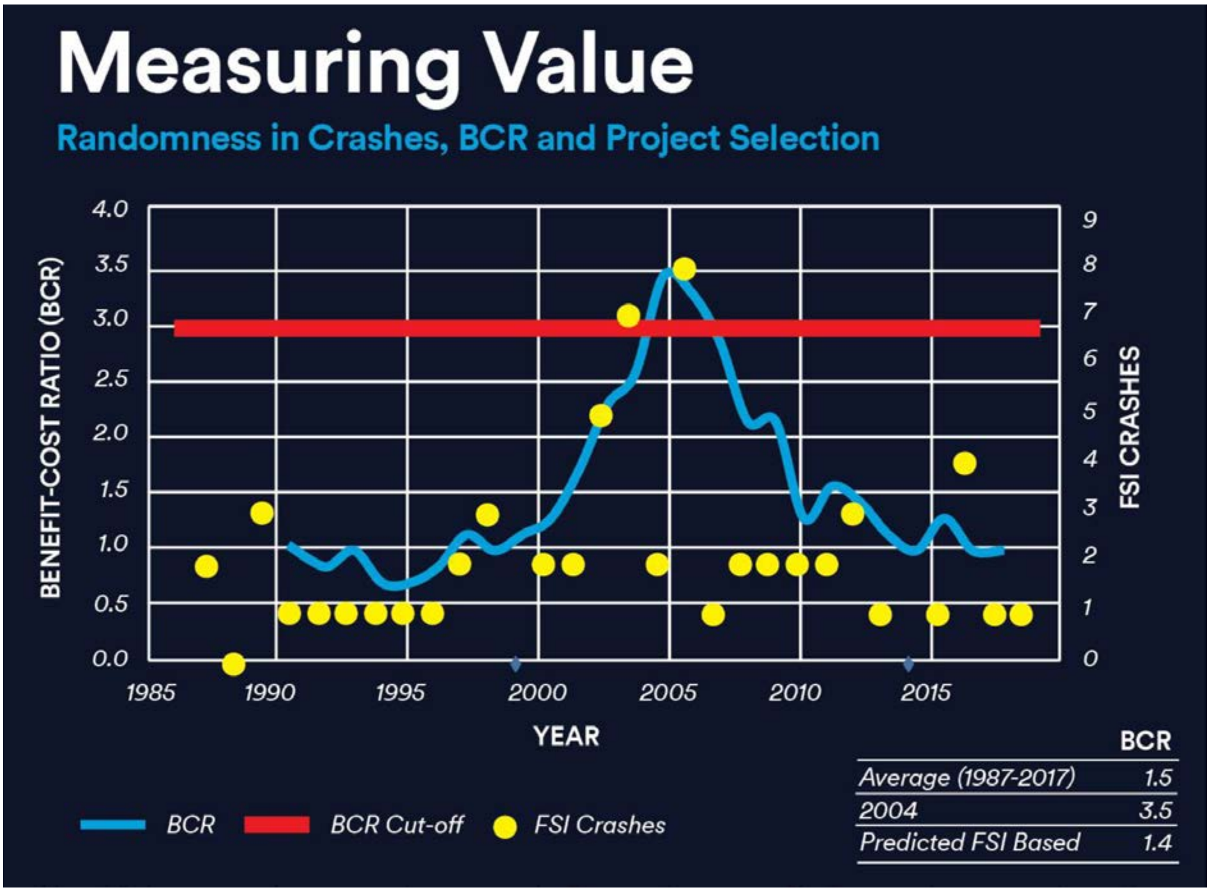

Figure 1. Example of randomness in project selection using traditional BCR

A New Approach

In order to facilitate a proactive and systematic approach to addressing risk across the road network a new approach has been adopted. The key features of this new approach are:

- A program wide BCR requirement
- A program BCR 'cut-off' which the program cannot fall below
- A revised approach to project selection

This new approach is expected to address many of the issues with the current methodologies while providing confidence that a sufficient return on investment is being achieved.

One option considered for project selection is average cost per fatality or serious injury (FSI). The average cost per FSI saved can act as a primary metric for differentiating between the worth of individual projects or project options. It is directly aligned with the Safe System philosophy and goal, and avoids the need to confer a monetary value on a life or a loss in health. Instead, it simply aims to reduce, to the maximum extent, deaths and serious injuries for the funds available

Technology and driver education for Indigenous Australians

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Abstract

Multiple barriers have been identified that prevent some Indigenous Australians from obtaining a licence. A scoping review of the literature was conducted to identify interventions that are used to address these barriers. Limited research was identified, none of which assessed the suitability of technological interventions such as PC-based training or driving simulators. Following this, Indigenous community members in regional Queensland were consulted to gain insight into the appropriateness and perceived usefulness of a PC-based hazard perception training intervention. Diverse experiences of drivers and differing preferences to delivery mode and content highlight the importance of driver education interventions to be flexible.

Background

Indigenous Australians can face multiple barriers to obtaining a driver licence (Cullen, Clapham, Hunter, Rogers, & Ivers, 2017). A lack of public transport available in many regional and remote areas means that driving is a necessity for meeting many basic needs including health and education services (Currie & Senbergs, 2007). Young drivers are at an increased risk of crash and serious injury when they begin to drive without supervision (Lee, Simons-Morton, Klauer, Ouimet, & Dingus, 2011; Mayhew, Simpson, & Pak, 2003). Driver education and training may help to reduce this risk, however, little is known about the suitability of technological interventions for Indigenous populations. Unsuitable interventions may present another barrier to licensure for these young drivers' or provide little benefit.

Method

Scoping review

A literature review was conducted to survey the extent of research addressing 1) driver education specifically for Indigenous Australians and 2) technology based driver education for Indigenous peoples of any nationality. Methodology of the review followed scoping review guidelines developed by Arksey and O'Malley (2005).

Indigenous community consultation

Indigenous Australians from a Queensland regional centre were asked to contribute their views. Prior to commencing data collection for this phase of the study, a community elder from a Queensland regional centre was consulted and permission was sought from them to conduct research with their community. Discussions aided the research team in ensuring research methodology that was deemed appropriate by the community elder and the study was approved by an Aboriginal and Torres Strait Islander ethics sub-committee. Yarning at local NAIDOC celebrations was used to assess the suitability of a video based driver training intervention. The intervention was a video viewed on a laptop computer that included an education and training segment designed to train hazard perception skills. Hazard perception training can be useful for novice drivers as they are typically less capable of anticipating hazards and as such experience less time to respond when dangerous situations occur (Horswill, 2016). Members of the research team communicated preliminary research findings through informal discussions with the same community elder.

Results

The scoping review failed to identify any studies that incorporated driver education technologies that had been used with Indigenous people. Seven papers were identified that discussed interventions specifically to aid Indigenous Australians in obtaining a licence. These interventions included training community members to become driver trainers, mentoring programs, classroom education and other programs that provided structure to learners. One paper specifically identified a decision to avoid PC-based activities in favour of group activities.

The consultation process indicated that local Indigenous community members were easily able to identify several barriers that made getting a licence difficult for them. A lack of confidence in their driving skills and a fear of making mistakes were prominent. The PC-based education package was generally viewed positively. An open-minded attitude of 'the more the better' was prevalent, as well as a willingness to try new things. There were some mixed opinions regarding the delivery of the program, with some people preferring the education task be a group exercise allowing for shared discussion, while others liked the idea of having a way to explore driving in private without feeling embarrassed.

Discussion

The use of technology, such as PC-based education, may be appropriate for aiding increases in licensure of Indigenous Australians. However, this in an under-researched area that warrants further investigation. The involvement of Aboriginal and Torres Strait Islander peoples in this study was limited. Future research in this field would benefit from closer community collaboration, including Aboriginal and Torres Strait Islander research team members. In a regional community there was variation in the perceived strengths and weaknesses of an intervention. This suggests that the needs and desires of this group may require an intervention that is flexible to adapt to different methods of use.

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Unmanned Aerial Vehicle based Speeding and Tailgating Detection System

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Abstract

Unmanned Aerial Vehicles (UAVs) offer a considerable potential for road safety stakeholders; they have been already used for tasks such as assisting first responders. This paper reports on a small-scale prototyping effort to use UAVs to measure speeding and tailgating on major urban roads. One hour of UAV footage was acquired and a custom vehicle detection system was programmed. From this, we developed methods to extract vehicles' speed and headways. Validation information was extracted from TMR induction loop present near the testing site.

Background

In recent years Unmanned Aerial Vehicles (UAVs) have become increasingly capable and affordable, to the point they are now a popular hobby for members of the public. For researchers and road safety stakeholders, they offer a large list of potential applications. A significant area of research in the ITS space using UAVs has been integrating them into communication architectures to support Cooperative-ITS (Zhou *et al.*, 2015; Oubbati *et al.*, 2017). Several reviews (Barmpounakis *et al.*, 2016; Menouar *et al.*, 2017) have identified remote sensing as a leading potential use for UAVs, stating that many challenges remain but that the effort required to solve them is worthy given the potential benefit. Barmpounakis *et al.* further noted that computer vision for processing UAV captured video footage is "*the cornerstone of success*" for UAVs. This paper presents research within this latter framework, aiming at developing a low-cost speeding and tailgating detection application.

Method

A video-processing application was developed to extract vehicles from the video captured by the UAV. This application used a HSV colour space transfer, binarisation, a series of morphological operations, and masking in order to extract the road at first, and then to detect vehicles. Kalman filtering was used to improve the tracking of vehicles movements between frames, as both the video frame itself and the vehicles would move. After vehicle detection, headway and speed were computed at first in pixel-space. Conversion to real-space units required data fusion of the drone's telemetry (altitude, speed) and further video-processing (surface features tracking). The post-processing system used the bearing and linear function fitting to estimate, respectively, direction of movement and lanes. Finally, validation of the UAV measurements was conducted with data from a TMR loop sensor located 500 m north of the data collection site was used to gather average speed and headways measured at similar times as the data collection (using 35,602 vehicle observations).

Results

One hour of UAV video footage was captured on 3 February 2017 at a data collection site on Nicklin Way, Sunshine Coast (QLD), using a DJI Phantom 3. The UAV performed five flights between 11:30 and 14:00, using different patterns of altitude (100-120 metres), speed (8-15 m/s), and behaviour (continuous flight, hovering at waypoints). Figure 1 shows a sample output of the vehicle detection application.

Figure 1. Output of the vehicle detection application (uncropped full frame)

About 73% of the vehicles present on the road were correctly detected. This detection rate could be improved by lowering the UAV's altitude. Indeed, despite the camera's HD resolution, we found that flying at altitudes above 100 metres still made vehicles too small for consistent detection. Unfortunately, it was not possible to fly at lower altitudes on the data collection day. The HD resolution also slowed down the processing considerably, preventing any real-time online processing. However, the application proved fairly robust against false-positives (e.g. detection of static objects), although we found palm trees on the median had a tendency to be often detected as vehicles. Those objects were filtered later in the post-processing using the UAV's movements. The average headway measured by the UAV was 3.01 seconds in the gazettal direction (northbound), and 4.66 seconds in the anti-gazettal direction. TMR loop data showed that the average headway measured between 11:00 and 14:00 on weekdays on this road was 4.66 and 4.62 seconds, respectively in the gazettal and anti-gazettal directions. UAV data measured that 41% of the vehicles were tailgating, while the loops gave 51%. Similarly, for speeds we measured average speeds of 55.6 and 52.5 km/h, while the loop yielded 58.5 and 56 km/h. While discrepancies remain, the margin of error is deemed reasonable given the preliminary state of this work. Further, note that the loop data contains many more vehicles than our video sample.

Conclusion

Our work has shown that it is possible to build a video-based sensor platform using UAVs for tracking speeding and unsafe following behaviours on the road. With further work, this could provide an additional way to collect on-road data for road safety research that is easy and quick to deploy. Future work will focus on improving the accuracy of the detection of vehicles using deep learning, investigate other patterns of data collection (e.g. lower flying altitudes), and optimise the application to improve processing time. On-line processing is a long-term goal.

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Safety solutions on mixed use urban arterial roads

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Abstract

Urban arterials and intersections account for a large proportion of high severity crashes in Australia and New Zealand, particularly involving vulnerable road users. Safety gains appear to be slower in these 'mixed use' environments than in other areas. Austroads commissioned research to help identify solutions that might be applied on mixed use arterial roads to improve safety through the provision of Safe System infrastructure.

The project involved assessment of six case studies around Australia and New Zealand. Concept designs were developed for each of the routes based on analysis of safety issues and the likely safety benefits were assessed. This paper presents information on the safety solutions identified, as well as the broader implications from the use of these interventions, including impact on traffic.

Background

Urban arterials and intersections account for a large proportion of high severity crashes in Australia and New Zealand, particularly involving vulnerable road users. Safety gains appear to be slower in these 'mixed use' environments than in other areas. Austroads commissioned research to help identify solutions that might be applied on mixed use arterial roads to improve safety through the provision of Safe System infrastructure.

Method

The project involved assessment of six case studies around Australia and New Zealand. Concept designs were developed for each of the routes based on analysis of safety issues and the likely safety benefits from different treatments. Likely crash reduction was estimated by calculating the combined benefits from packages of treatments. The Safe System Assessment Framework was also used to determine alignment with Safe System principles.

Results and conclusions

Information is provided on the crash reduction benefits for different infrastructure treatments. Implications for other aspects of traffic operation, including traffic flow, is provided for each of these treatments. In addition, general information is provided on the functional classification of roads (using the Movement and Place framework), processes for risk assessment on mixed use arterials, and the extent to which infrastructure improvements can help reach Safe System objectives.

Public Awareness, Understanding and Acceptance of Automated Vehicles: An International Survey of Australian and New Zealand Respondents

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Abstract

This paper reports the findings of a large-scale online survey, undertaken under the auspices of the Australian Driverless Vehicle Initiative (ADVI), to gauge Australian and New zealand public awareness, understanding, and likely acceptance of automated and driverless vehicles. The 90-item survey, developed by the ADVI Survey Working Group, was administered to 5,102 Australian and 1, 049 New Zealand respondents. The items sought community feedback on a number of issues including public concerns with AVs and perceptions towards automated and connected-automated public transport. This paper presents the aims, methods and findings from the survey and the implications of the findings for policy development.

Background

Public acceptance of automated vehicle (AV) technology is critical in order to ensure that drivers utilise the technology and, hence, realise its predicted safety and other benefits. This paper reports the findings of a large-scale (6,152 respondents) online survey, undertaken under the auspices of the Australian Driverless Vehicle Initiative (ADVI), to gauge public awareness, understanding and acceptance of automated and driverless vehicles in Australia and New Zealand.

To date, there have been very few surveys conducted internationally to gauge community opinion about automated vehicles (e.g. Payre, Cestac & Delhomme, 2014; Schoettle and Sivak, 2014) and, to the knowledge of the authors, only three such surveys have been conducted focusing on Australian respondents (Eastlink, 2017; RAC, 2017; Regan, et al., 2017). None, to our knowledge, have been repeated over time to track changes in community opinions. The repeated cross-sectional survey described in this paper was almost identical to the one administered in 2016 by Regan et al (2017; to 5263 repondents) and included a sample of New Zealand respondents. This paper presents the aims, methods and findings from the survey. It contrasts changes in community opinion from this survey and the earlier survey, and between Australian and New Zealand respondents. The implications of the findings for policy development are discussed.

Method

The 90-item survey was developed by the ADVI Survey Working Group, with members from academia, government and industry. Design of the survey is discussed in the conference paper. The items sought community feedback on the following key issues:

- Level of awareness of AV technology
- Sources, and degree, of concern regarding AV-related issues (e.g. cyber security)
- In what driving scenarios and conditions drivers would be most likely to use AVs
- Public perceptions regarding automated and connected-automated vehicles and public transport

The survey was distributed to over 6,152 respondents across Australia and New Zealand through the online survey platform, Qualtrics.

Results

High-level findings included (but were not limited to):

- there was very little change in community opinions over time;
- most Australians and New Zealanders are aware of automated vehicle functions, but very few have experienced them;
- both communities have concerns about many issues relating to fully-automated vehicles (e.g. data privacy); and
- most Australians and New Zealanders are comfortable with automated cars controlling most driving functions. However, many express discomfort with automated cars changing lanes by themselves and following lead vehicles too closely.

Conclusion

This is the second iteration of the ADVI nation-wide survey assessing public opinion and acceptance of AVs in Australia, and the first iteration using New Zealand respondents. It is envisaged that the outputs of this survey will be used by government (e.g. to inform future planning and investment decisions based on awareness levels), industry (e.g. to help tailor their products to the needs of users based on identification of public concerns with automated cars) and academia (e.g. to point to areas for future research).

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Educating upwards – empowering children to be custodians of their safety on the road

Venera Owens, Christine McKenna, Damia Makari

National Roads & Motorists Association (NRMA)

Abstract

The *Towards Zero* goal highlights safe attitudes and behaviours. As these are formed in childhood, school programs can play a role in reducing road trauma. The NRMA Science & Road Safety program, launched in 2014 has educated 213,206 children across 523 primary schools. The program which was completed in schools typically over eight weeks was evidence-based, curriculum linked and designed by educators and road safety experts. Education resources were provided to students and teachers, an interactive road safety show was used to deliver memorable learning to students, parents and teachers. Parents were included in the program to deliver whole of school learning.

Background

By the time children commence schooling many have assumed the responsibility of everyday road safety tasks such as putting on a seatbelt, exiting a car and fitting a bike helmet.

Concerned by data that suggested 50% of children were incorrectly restrained (Brown, Hatfield, Du, Finch & Bilston, 2010) and that half of young cyclists aged 0-19 years involved in a crash were not wearing a helmet (Bambach, Mitchell, Grzebieta & Olivier, 2013), the NRMA created a road safety program for primary school students. The program's objectives were to increase students' ability to discriminate between safe and unsafe behaviours, to know and apply safe strategies and to be empowered to speak up when they saw unsafe behavior amongst family and friends.

The program

The NRMA Science & Road Safety program was aligned to best practice in school road safety education (Principles for School Road Safety Education: Government of Western Australia, 2009). It featured elongated learning, educator created student workbooks for use across the program, teacher education resources, interactive road safety shows that presented students with real world scenarios they could relate to, pre and post-program student surveys which teachers' administered during class time and a teacher online evaluation which was used to refine the program as it developed. Parents were integrated into the program using a variety of means to build a whole of school road safety program.

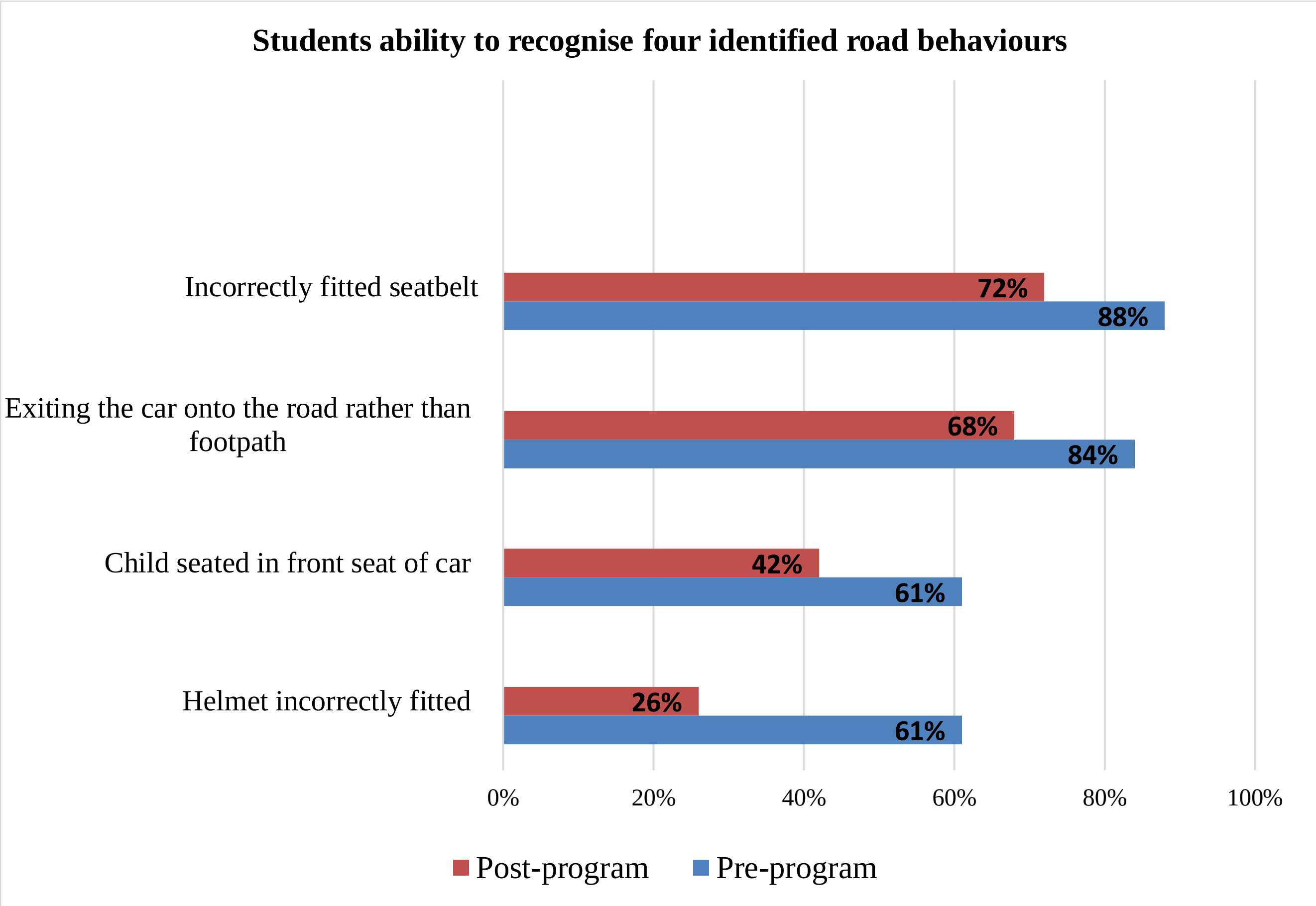
The program focused on teaching students how to identify unsafe behaviours and taught them safe strategies to implement on the road. A key element was the explicit teaching of how to correctly fit seatbelts and bike helmets. The road safety shows enhanced the students' visual learning and helped them to remember and embed the road safety messages. The show's presenters were trained educators who used science demonstrations to help children understand the forces acting on them in motion.

Evaluation and Results

The program ran from 2014 to 2017 and educated 213,206 students across 523 schools in New South Wales and the Australian Capital Territory.

Four behaviours were identified as impacting on children's safety (Figure 1). Analysis of pre (n = 26,312) and post (n = 7,676) student data collected online from 2015 to 2017 found an average overall percentage increase in their ability to identify safe behaviours of 56% across the four behaviours.

Figure 1: Changes in students' knowledge before and after completing the program



Additional data was collected from 1,436 students from August to December 2017 indicating that 61% of students had applied a safety strategy and 50% had shared a safety strategy with their family or friends.

Data collected from 444 teachers in the period August 2016 to December 2017 found that the program had increased teachers' knowledge, skills and confidence to teach road safety (Table 1).

Table 1. Teacher online feedback survey administered after the program

Question 1: As a result of this program do you as a teacher have more…	**Yes**
• knowledge about child road safety?	89%
• knowledge about the science behind road safety?	91%
• have more skills in teaching road safety in the classroom?	90%
• confidence in explaining the WHAT, HOW and WHY of road safety to children than before?	92%

Conclusion

The NRMA Science & Road Safety program met its objectives to increase students' ability to recognise unsafe behaviours, to apply safe strategies and to share their knowledge with others. In addition, the program helped teachers, who are central to quality school road safety education increase their knowledge and skills. NRMA will continue to deliver this program within schools in an effort to reduce the road toll.

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Managing Vulnerable Road User Safety in Urban Environments during Construction of Major Transport Infrastructure Projects

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Abstract

Australia is experiencing an unprecedented infrastructure boom in its largest capital cities through the construction of major transport infrastructure projects. Delivering these projects involves a significant logistics task of transporting millions of tonnes of excavated spoil and construction materials throughout urban road environments using heavy vehicles.

Introducing heavy vehicle traffic to road environments shared by popular urban modes of transport such as cycling and walking has the potential to increase road safety risks. This paper provides an overview of the safe systems approach developed on two major transport infrastructure projects to manage road safety during construction.

Background and Context

Introducing significant heavy vehicle traffic to urban areas presents numerous challenges to the road network, particularly with respect to the safety of vulnerable road users (VRUs). The UK's Transport Research Laboratory (TRL) documented these challenges following the high incidence of VRU fatalities involved with heavy vehicles servicing projects during London's recent construction boom (TRL, 2012). Their findings led to the development of the Construction Logistics and Community Safety (CLOCS) and Fleet Operator Recognition Scheme (FORS). Each scheme aims to create a holistic framework for the management of work-related road risk through improving vehicle safety, driver training and education, and traffic and logistics management.

Current and future projects in Australia are of similar scale and complexity, introducing construction heavy vehicles to CBD and inner-urban regions of Sydney and Melbourne where VRUs are over-represented in casualty crashes. Introducing construction heavy vehicle traffic to road environments currently shared by popular urban modes of transport such as cycling, walking and motorcycling, can introduce undesired road safety risks due to the incompatibility of heavy vehicle design for urban roads and the unprotected nature of VRUs.

Safe System Approach during Construction

Drawing from the success of CLOCS and FORS and contextualizing these learnings for the Australian environment, Transport for NSW (TfNSW) and Melbourne Metro Rail Authority developed holistic management frameworks, by applying the safe systems approach to road safety, to ensure the safety of public road users interfacing with the construction heavy vehicle traffic generated from the Sydney and Melbourne Metro rail projects (TfNSW, 2016; Victorian State Government, 2016).

Each project has focused on improving heavy vehicle safety standards and technology on the project; heavy vehicle driver training and competency; raising public road safety awareness of sharing the road safely with heavy vehicles; alternative methods to spoil removal and developing risk-informed construction traffic and logistics plans coupled with increased assurance and enforcement of haulage operations.

For example, recent engagements with the construction road transport industry has seen innovative improvements made to urban heavy vehicle design to minimise vehicle blind spots and fit underrun protection as depicted in Figure 1. Collaboration between industry and government has allowed for development and widespread promotion of TfNSW's Be Truck Aware campaign reaching over 4.4 million people in NSW in 2017.

Early engagement and collaboration with road safety agencies within government, VRU groups and the heavy vehicle industry has supported the development and application of the safe system's elements. This has demonstrated the collective desire to improve road safety standards for the immediate project that have long lasting benefits to the industry and community.

Figure 1. Construction heavy vehicle fitted with blind spot technology and side underrun protection

Lessons Learned and Future Considerations

Future long-term major projects should embed a safe system approach to road safety into construction delivery, particularly where road transport operations have the potential to impact public safety. Early engagement and collaboration with industry, government and regulatory authorities is crucial to ensure successful implementation. Considering the pipeline of major infrastructure projects about to commence, establishing the safe system now provides benefits not only during major project delivery, but to local and state governments, industry and all road users, creating a safer road transport system during and beyond construction.

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Understanding lane encroachment using a LIDAR measurement device

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Abstract

This study described the development of a device for measuring the lateral passing distance to vehicles. The device was evaluated in both laboratory and field settings. In the lab, the device was shown to consistently and accurately determine the distance to static objects and a moving vehicle. In the field, the device was deployed onto the side of an urban road to detect the number of vehicles which encroach into a bicycle lane. Comparisons to a video recording at the same location showed that the device was able to determine the number of passing vehicles encroachments into the bicycle lane.

Background

A range of traffic safety infrastructure applications and laws are being developed, and frequently implemented, which aim to laterally separate vehicles from hazardous objects and each other. Examples of these applications include audio tactile line marking (ATLM) and safety barriers. Often, identifying the performance and any issues associated with these applications require the measurement of vehicle lane positioning and/or lateral offset. Presently, obtaining such data can be expensive; it requires expert equipment, such as the use of infra-red traffic loggers (TIRTLs), or collection and labour-intensive processing of video data (Mackie 2009).

There are numerous applications where an inexpensive and easy to deploy lateral distance measurement device would be useful for conducting preliminary evaluations before larger data collection exercises, or for the inexpensive evaluation of smaller projects. This study describes the development of such a device, along with the evaluation of the performance of the device in the measurement of vehicle encroachment into a bicycle lane.

Device description

The Centre for Automotive Safety Research (CASR) has designed and built a relatively small and lightweight device that can measure the distance to any objects that pass by (see Figure 1). The device is intended to be installed on the side of a roadway and will record the number of vehicles which pass as well as the distance at which they pass. By noting the relative distance to line markings of note (e.g. bicycle lane or centre line), the number of vehicles which encroach past this line can be determined.

The device is comprised of the following parts:

- A single beam LIDAR distance sensor
- A microcontroller with data logger (records distance data to an SD card)
- A 6000 mAh battery
- An on/off switch

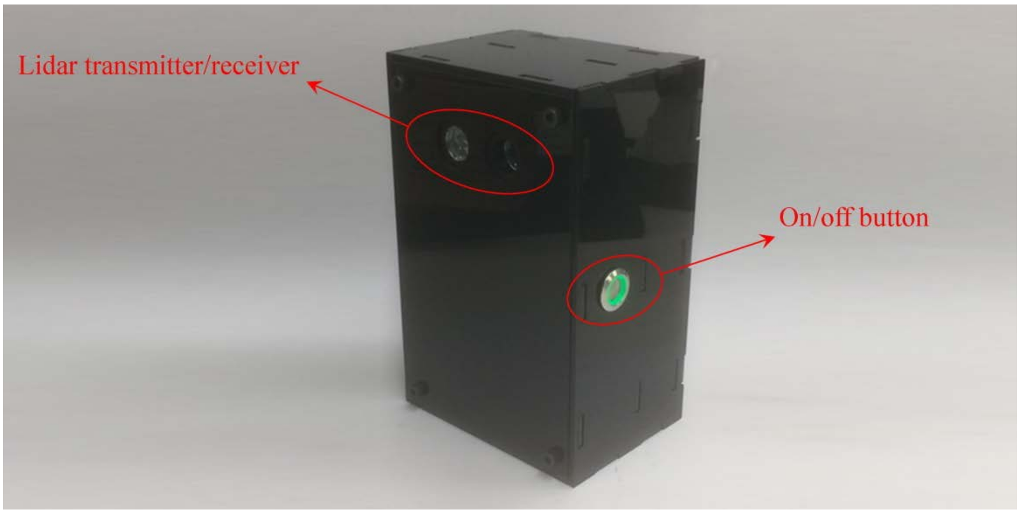


Figure 1. LIDAR lane position and lateral offset measurement device

Method

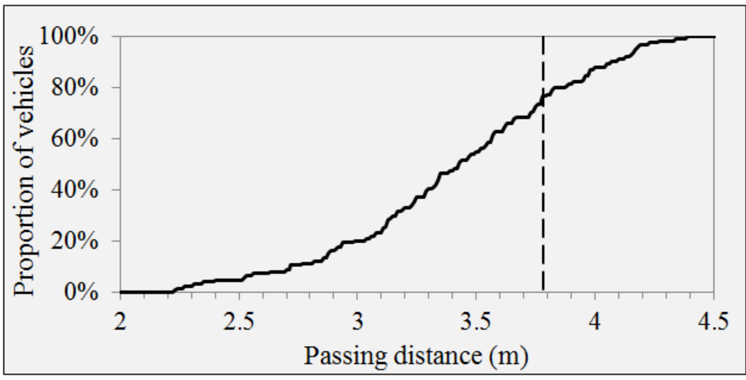
The device was tested in both a laboratory and field settings. In the lab, the accuracy of the device was tested by measuring the distance to a target board to a passing vehicle.

In the field, the device was deployed on the side of an urban road at a location where vehicles often enter a bicycle lane as they are rounding a bend. A video camera was also deployed at the same location to record the number of vehicles which enter the bicycle lane. The recorded LIDAR data and video footage were compared to a) determine the proportion of passing vehicles captured by the device and b) the accuracy in identifying vehicles which encroached into the bicycle lane.

Results and conclusions

The lab results confirmed that the LIDAR device was able to consistently record accurate distances and detect the presence of a passing vehicle.

The field results showed consistency between the data collected using LIDAR and the video. Both methods identified the same number of passing vehicles and a similar distribution of vehicles passing inside, along, or outside the bicycle lane separation line (Figure 2). A benefit of the LIDAR method was the ability to produce a higher resolution, quantitative distribution of passing distances, as observed in the cumulative distribution function in Figure 2.



Position	LIDAR	Video
Inside	85	81
On line*	14	21
Outside	25	22
Sum	124	124

**For the Lidar measurements, a vehicle was estimated to be on the separation line if within 80mm of the measured distance to the 80mm wide separation line.*

Figure 2. Cumulative distribution function of passing distance measurements of vehicles using LIDAR (left, the dashed line represents the distance to the bicycle lane separation line). Numbers of vehicles passing inside, along, and outside the bicycle lane separation line (right).

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Safer Vehicles: Is our own house in order?

Michael Timms

Traffic and Highway Patrol Command
New South Wales Police Force

Abstract

Traffic and Highway Patrol Command (THPC) is responsibile for road policing in New South Wales. There are some 1,400 people in the command and vehicles owned by THPC workers represent a private vehicle fleet of well over 2,000 vehicles.

This project represents a health check on the safety of vehicles owned and driven by those civillian and police employees and their families, as well as their awareness of the safer vehicles pillar.

Background

Speaking at the annual state Road Policing Conference in August 2017, Mr Bernard Carlon, Executive Director of the NSW Centre for Roads Safety, said that only one third of light vehicles on NSW roads are rated at 5-Stars by the Australian New Car Assessment Program (ANCAP).

About the same time as Mr Carlon's address, separate incidents occured where THPC members were injured in road crashes whilst travelling to work.

Aim

This gave rise to these question of whether our workers an d their loved ones have the highest level of occupant protection when driving those 2,000+ private vehicles.

It is in the interests of all employers to reduce crash severity regardless of whether workers are on or off duty.

Method

This study used an 11-question survey accessible via Survey Monkey, promoted in the command's monthly newsletter and followed up by an email to staff. For the first 10 questions, respondents could select from one of the pre-defined answers. The last question was a free text field where respondents could share any personal experiences.

The survey was open for 16 days in late 2017. Responses were voluntary and anonymous.

Results

The survey received 172 responses, seven of which came from civillian staff. This was a pleasing figure as it equates to around 20% of the workforce considering absences over the period.

The results suggest that road policing professionals are more aware of this safey system pillar than the wider community.

Findings include:

- 57% of respondents drive a private vehicle that is 5-Star rated, far above the 1/3 figure for the overall NSW light vehicle fleet
- For 60% of respondents, at least one vehicle is 5-Star rated
- In the 55 households with driving aged children, 61% of households, children of workers always drive or mostly drive a 5-Star vehicle
- In 82% of cases, vehicle safety was a factor in deciding what car to buy
- 30% of respondents cited cost as a barrier to purchasing newer, safer vehicles
- 3% of respondents were not concerned with the issue of vehicle safety

Only a quarter of respondents drive a vehicle that is older than the average age of the Australian vehicle fleet of 10 years (www.abs.gov.au) noting that 14% reported being performance/classic car owners.

The most highway patrol officer paygrade is over $100,000 per year. Even so, cost was cited as a barrier to the purchase of a newer, 5-star rated vehicle.

Some 80% of respondents who are parents have discussed vehicle safety with their driving-aged children.

Discussion and Conclusions

The findings of this survey were reported to THPC members in the command newsletter. If the result is that our workers upgrade their vehicles then it would be a win-win: workers would reduce injury outcomes in a crash and the command would see a reduction in crash-related workplace absences.

Large firms and government departments could improve work and road safety through this type of process that aligns safe systems with corporate safe driving policies. Employers can also show leadership and buy only 5-star vehicles. THPC demonstrated this by rejecting the ANCAP 2-Star Ford Mustang for highway patrol service. This policy may have influenced THPC workers in their purchasing decisions and could be explored further.

Traffic and Highway Patrol Command does have its own house in order with a workforce that is championing the case for safer vehicles. The broader challenge is bridging the gap between road policing professionals and the wider community to drive up the take-up of 5-star vehicles.

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Using ANRAM to Assess the Impacts of Network-Wide Road Safety Interventions: Development and Experience of the SSRIP Planning Tool

Shaun Luzan and Anthony Kaissidis

VicRoads

Abstract

VicRoads has developed a program planning tool (the SSRIP Planning Tool) utilising the Australian National Risk Assessment Model (ANRAM). This tool allows planning teams to quickly and easily predict the benefits of broad programs of safety treatments across the State's entire arterial road network. The tool is being used by the Safe System Road Infrastructure Program (SSRIP) to inform the future direction of the program. A number of scenarios have been run to demonstrate the value of the tool.

Background

ANRAM is a tool that enables us to calculate fatal and serious injury crash risk based on road infrastructure, speed, traffic flow and crash history (ARRB, 2018). VicRoads have been using ANRAM at a project level for a number of years using an online tool which has now been adopted by Austroads. In order to utilise the ANRAM model for program level decision making a new tool has been developed. The user is able to filter the road network based on any of the ANRAM input variables, the current ANRAM results and other factors such as VicRoads region. The ANRAM model can then be run on this selection to determine the effect a program of work, for example speed reduction, would have on Fatalities and Serious Injuries.

How the Tool Works

The SSRIP Planning Tool works by leveraging the base-case calculations already performed in the ANRAM tool. Whenever the base-case calculations are run in the ANRAM tool, a mix of the input and result data is copied into the SSRIP Planning Tool database. The user is then able to use a web front-end to select the fields and the values they wish to filter on, and the treatments they wish to perform on that selection. The model is then run only over the filtered sections and the results are sent as a CSV file to the user via email.

Unlike the ANRAM tool, the SSRIP Planning Tool does not allow the modification of individual segments. Due to this, only the selection and treatment inputs need to be captured in the database in order to define the model parameters. This allows the model's source data table to be heavily optimised for reporting, instead of needing to worry about access for transactional data. This optimisation, combined with the need to only report using CSV files and not PDFs, allows the SSRIP Planning Tool to demonstrate significantly higher performance when compared to using the ANRAM tool for the same task. While an ANRAM report for a several hundred kilometre section of road could take many hours to run, the SSRIP Planning Tool will produce a report in a few minutes.

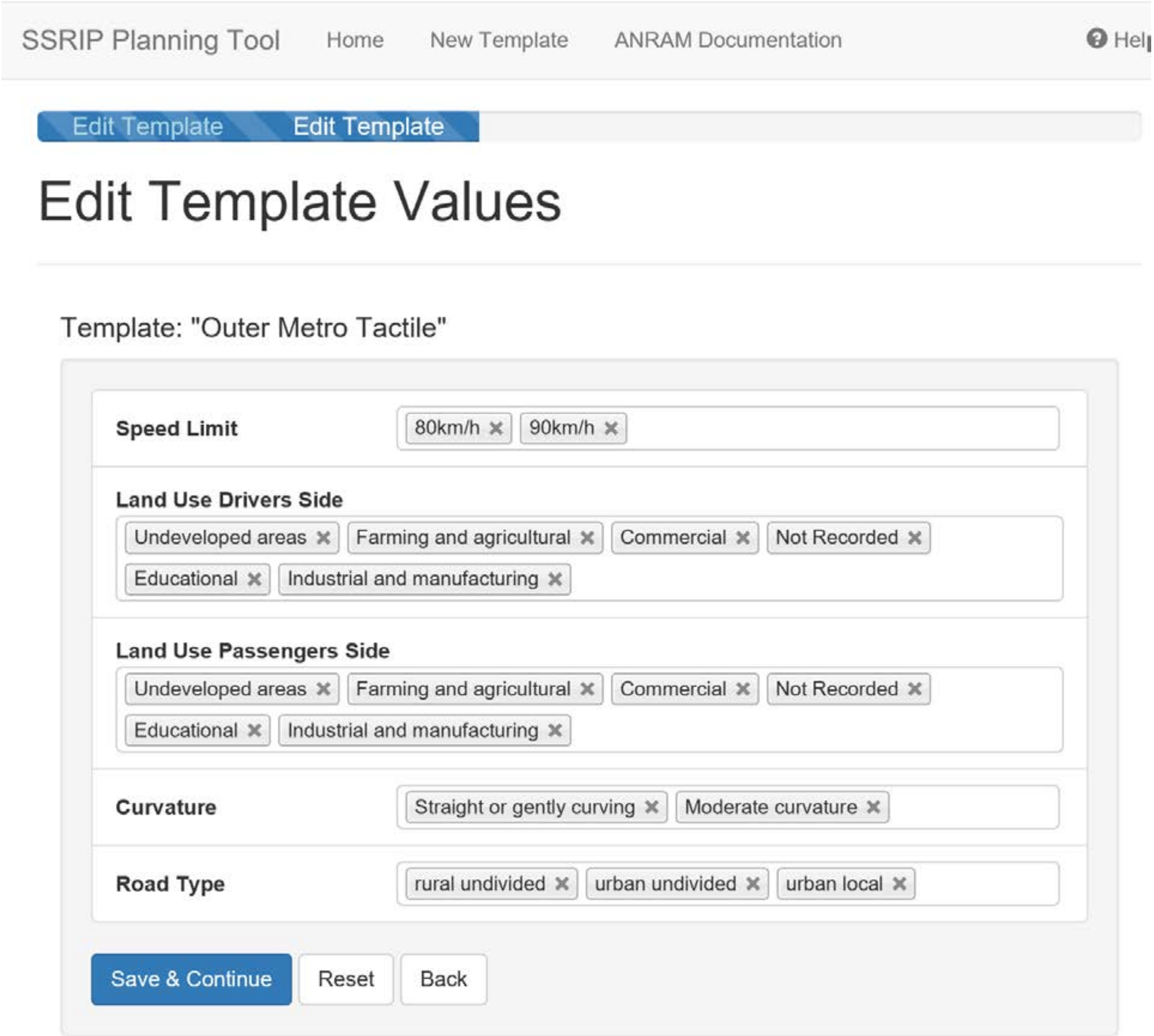

Figure 1. Example SSRIP Planning Tool Template

Applications of the Tool

The SSRIP Planning Tool has been used to investigate the impacts of a range of program and policy options including:

- Changes to speed limits
- Widespread application of Audio Tactile Line Marking
- Pavement condition improvements
- Barrier programs
- Network wide shoulder sealing

The tool's ability to quickly and easily provide a high level assessment of benefits allows users to test ideas which would otherwise be dismissed on nothing more than assumptions

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Connected Roads – Enabling tomorrow's technologies today

Konstantinos (Kosta) Karagiannopoulos

3M Australia Pty Ltd

Abstract

The typical road infrastructure consists of visual cues, as human drivers predominately use their vision to navigate around and drive their vehicles on the road. In a similar manner, most advanced vehicles today -as well as the ones currently designed for the future- also rely on cameras and sensors that help the vehicle 'see' the world around it. Human drivers will most likely co-exist with Connected Autonomous Vehicles on the roads for many years to come, possibly decades. This paper will look at the importance of designing road markings today for both types of drivers of tomorrow.

Background

There has been plenty of research around the human vision and how bright traffic signs, pavement markings and other traffic cues need to be to adequately stimulate the brain and create an appropriate response from the driver so they can safely navigate the roads at day or night and under most conditions.

The main problem in doing the same thing for Connected Autonomous Vehicles is fragmentation. Fragmentation between vehicle manufacturers, camera manufacturers, technologies, country Standards etc. Various bodies have already been formed on a global scale to help tackle this, but as with anything new it will take some time before things start to settle.

As vehicle manufacturers work in improving the capabilities of their vehicles on the roads by utilizing newer and more accurate sensors, smarter programming and various types of Artificial Intelligence the various Road Authorities can also assist with the integration by upgrading their traffic infrastructure.

To overcome the differences between how humans and machines 'see' and perceive the world a hybrid solution is required to accommodate both types of drivers; a type of infrastructure that is visible and understandable by humans as well as machines, is cost effective, easy to maintain and readily deployable.

The importance of Pavement Markings for all types of drivers

When it comes to the human element the numbers are clear. Although most crashes happen during the day, most deadly accidents occur at night with poor road markings being a major contributor. {2}

A particularly disturbing statistic when looking at deaths from common crashes on the roads, the one that consistently stands out in Australia -by a large margin- is the 'Single vehicle run-off road' (2008-2015). {1}

The relationship between brightness in pavement markings and crash reduction can be seen in the figure below (Paul J. Carlson, Raul E. Avelar, Eun Sug Park & Dong Hun Kang, 2015)

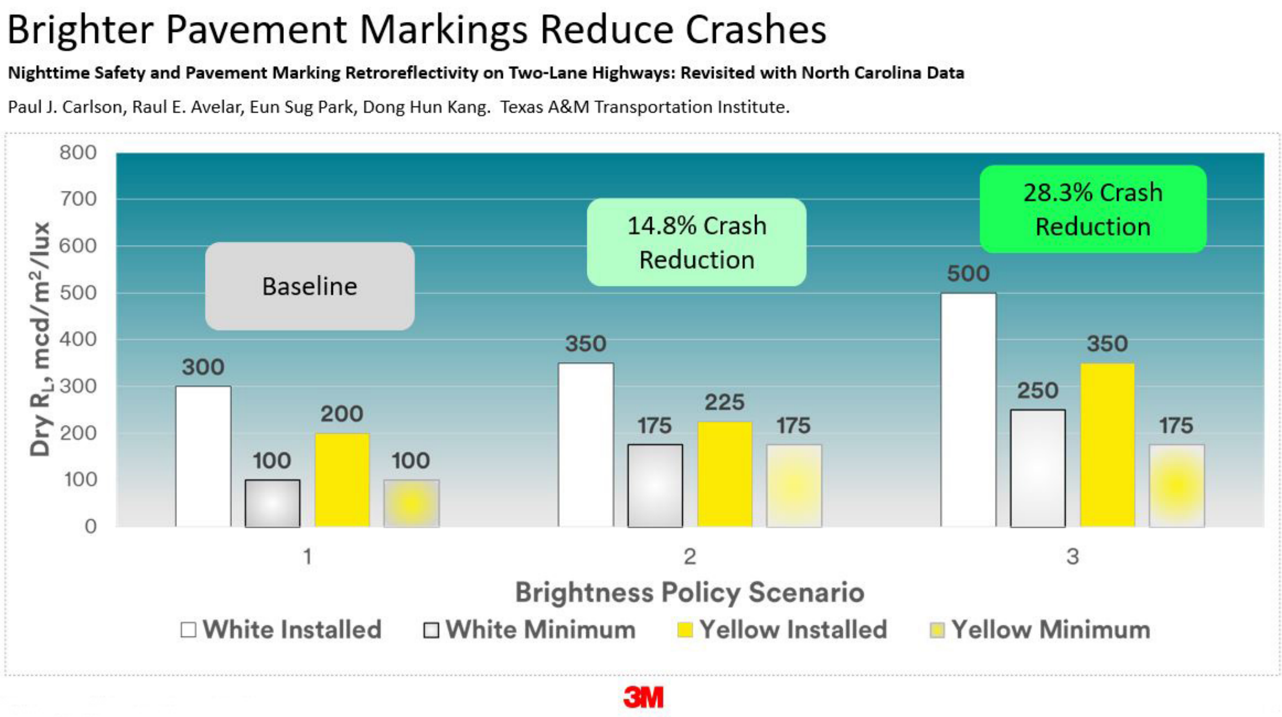

Figure 1. Pavement marking brightness vs crash reductions

In a similar manner, road markings are proving to be just as important for vehicles. A recent study by ARRB to test and better understand the Driver Assistance Systems on a multitude of modern vehicles found that "line markings ARE IMPORTANT". (ARRB, 2018, Connected and Automated Vehicle Trials, Austroads Webinar).

Whilst the design and performance parameters of those markings is currently being explored by various companies and industry experts, a common pattern seems to emerge.

Pavement Marking features for optimal machine reading (detect and register):

- Day-time visibility: **High luminance contrast ratio**
- Night-time visibility: **High retroreflectivity**
- Dry vs Wet scenarios: **Wet recovery**, Mixture of **dry & wet retroreflective elements**
- All scenarios: **Wider lines**

Discussion

To achieve the ultimate goal of eliminating crashes, injuries and deaths Connected and Autonomous Vehicles need to be able to safely navigate our road networks and for that to happen all parties in the industry need to work together. The sheer number of competitors as well as the speed that the technology advances means that a small fragmentation in the industry is probably unavoidable, possibly leading to the development of more than one Standards globally.

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PrepL: Redesigning Queensland's learning and assessment for learner drivers

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Abstract

A new, online learning and assessment program, *PrepL*, has been developed to replace the existing learning and assessment requirements for persons commencing Queensland's Graduated Licensing System. In this program, road rules and safety content is delivered through modules in an interactive learning experience which prioritises customer learning and road safety benefits. PrepL is anticipated to deliver enhanced learning outcomes and process efficiencies for Queensland's new drivers.

Background

The education of new drivers with safe behaviours and attitudes for driving is a critical factor in road safety. Typically in Queensland, formal driving and road safety education of new drivers begins when commencing the process of applying for a learner driver licence. This process requires pre-learners to study a written guide to the road rules and pass a theoretical test. However, customer research undertaken by Queensland's Department of Transport and Main Roads (TMR) revealed opportunities to improve the current learner driver licensing learning and assessment process.

Customers reported high levels of dissatisfaction with the traditional approach to learner licence testing which was perceived as outdated. Under this system, learning tended to focus only on what was needed to pass the test, rather than comprehensive learning for safe driving. The test also neglected the development of higher-level cognition skills, such as situation assessment and response planning, which are crucial to safe driving (Fisher & Dorn, 2017; Pollatsek, Vlakveld, Kappé, Pradhan, & Fisher, 2011). Lengthy processes and waiting times for applicants also increased the burden. Advances in educational theory and technology since the development of Queensland's learning and assessment model around 40 years ago also offered the opportunity to address these issues by providing an online, interactive learning experience with enhanced outcomes for pre-learner drivers.

Rethinking Queensland's learner driver learning and testing approach

Accordingly, TMR developed an online training and assessment program which supports broader learning for road safety benefits. The new program, *PrepL*, delivers road rules and safety content through a modularised approach, structured around logical topics and groupings. Introductory modules which shape good driving behaviours and attitudes provide context for the entire learning experience. More technical information, such as the road rules and why they exist, is gradually introduced, all with an overarching road safety framework. This delivers a more comprehensive learning experience than previously available, in which learners may proceed at their own pace, ensuring one concept is grasped before proceeding to the next one.

PrepL aligns with the current approach in that it requires a pre-learner driver to obtain fundamental knowledge prior to being allowed on the road. However, it is expected that the interactive and discovery-based learning environment will result in a deeper understanding of the road rules and safe driving requirements than previously achieved. Process efficiencies are also anticipated through greater convenience and accessibility with online delivery.

Conclusions

PrepL is an online learning and assessment program replacing the current testing requirements for pre-learner drivers. This represents a major update of Queensland's learner licence assessment process, and an opportunity to more effectively engage with Queensland's new driver population. With young novice drivers at increased risk on the road, providing enhanced learning and assessment methods has the potential to contribute to reductions in road fatalities and injuries among this group. Preliminary results from school-based pilots are positive. Ongoing evaluation and monitoring will determine any benefits for driver knowledge, safe attitudes and behaviours. It is expected that PrepL will be introduced into Queensland's licensing system in 2018.

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Toward a performance-based approach to the Queensland Alcohol Ignition Interlock Program: the impact of performance record on risk of recidivism

Samuel Bailey[a], David Soole[a], Vanessa Cattermole-Terzic[a] & Sussan Osmond[a]

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Abstract

Drink driving is a significant contributing factor to road trauma. The Queensland Alcohol Ignition Interlock Program (AIIP) aims to reduce drink driving recidivism among problematic offenders and has been evaluated to measure its effectiveness. Results of this evaluation revealed a significant reduction in drink driving recidivism associated with interlock fitment, but an increased risk from 55 days after removal, compared with those still suspended from driving. In addition, poor interlock use performance data was found to be predictive of a greater risk of future reoffending. These findings will inform future policy development to optimise the effectiveness of the AIIP in Queensland.

Background

Drink driving is a significant contributing factor to road trauma. An analysis of alcohol impaired motorists in 2015 found that alcohol was a factor in 23.5% of all fatalities on Queensland roads, representing a 10.5% increase from the previous five-year average (Department of Transport and Main Roads, 2016). Thus, despite considerable gains over recent decades, it appears a number of motorists continue to drink and drive and more innovative approaches are required to modify their behavior.

In 2010, the Queensland AIIP was introduced as a sanctioning option for selected high-range and repeat drink driving offences. After serving their court-ordered disqualification, eligible offenders are subject to an interlock sanction period (IPER), whereby they must either relicense on a conditional licence and fit an interlock to a nominated vehicle for at least 12 months, or 'sit out' the interlock period for 24 months, during which time they are not permitted to drive.

Method

Data from 27,371 offenders involved in the program were analysed using Cox proportional hazard regression, controlling for a number of covariates. Differences in risk of recidivism were assessed between offenders with an interlock fitted (intervention group) and those who 'sat out' the interlock period (comparison group). Moreover, differences in risk of recidivism were examined as a function of interlock use performance (e.g., breath test results, refusals, or attempts to circumvent) for a subsample of 2,916 offenders whose performance data was available.

Results

In total, 11,076 offenders fitted an interlock (40.5% of the sample). Findings revealed that the intervention group had a significant 90% reduction in hazard of drink driving recidivism compared to the comparison group while the interlock was fitted (see Table 1). However, consistent with previous research (see review by Willis, Lybrand & Bellamy, 2004), this impact quickly dissipated upon removal of the interlock, with the positive impact lasting approximately two months after the removal of the device. Indeed, the intervention group had a significant 35% increase in likelihood of reoffending in the year following the IPER period, compared to the comparison group.

An investigation of the 2,916 offenders with interlock use performance data showed 51.5% had one or more faults in their last service period (approximately four months). As Table 1 shows, those with at least one fault had a 73% greater hazard of reoffending, compared to those with a ‘clean’ performance record, following the removal of the interlock. This finding is also consistent with previous research (Marques, Voas & Tippetts, 2003).

Table 1. Summary of Cox regression results (final model with covariates)

			95% CI	
	B (SE)	**Exp(B)**	**Lower**	**Upper**
Intervention versus comparison groups				
First-year post-disqualification (interlock fitted)[abcdef]	-2.31 (0.26)	**0.10*** **	0.06	0.16
Second-year post-disqualification (interlock fitted < 55 days)[cf]	-1.00 (0.25)	**0.37*** **	0.22	0.60
Second-year post-disqualification (interlock fitted > 55 days)[cf]	-0.61 (0.10)	**1.85*** **	1.53	2.24
First-year post-IPER (interlock fitted)[bcf]	0.30 (0.09)	**1.35** **	1.13	1.62
Faulted versus clean performance record				
Post-interlock removal (fault)[c]	0.55 (0.16)	**1.73*** **	1.27	2.34

Superscript denotes which covariates were included in the final model: [a] gender, [b] age, [c] prior offending, [d] index offence, [e] time interaction, [f] relicensed.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Conclusions

The findings highlight the substantial impact of the AIIP on drink driving recidivism while interlocks are installed, however provide limited evidence of their long-term impact upon removal. Moreover, poor performance while the interlock was fitted was found to be predictive of increased risk of recidivism. Both findings are consistent with previous research. The finding that interlock fitment is associated with an increased risk of recidivism compared to the non-fitment group from 55 days post interlock removal extends findings from previous research. The study will inform future policy decisions for the program in Queensland.

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A new proactive approach to speed limit setting in Queensland

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Abstract

The Speed Limit Review process in Queensland is conducted according to the Department of Transport and Main Roads' *Manual of Traffic Control Devices, Part 4: Speed Controls*. The current process is mainly reactive and uses a complex methodology, comparing the crash rate of the road section to the 'critical crash rate'. It is also heavily reliant on the experience of practitioners to judge the level of road risk. The new SLR process combines proactive road infrastructure risk assessments with refined crash risk assessments to provide more tangible guidance to practitioners and recommend safer speed limits on high risk road sections.

Background

The current Speed Limit Review (SLR) process outlined within the Queensland Department of Transport and Main Roads' (TMR) *Manual of Traffic Control Devices, Part 4: Speed Controls (MUTCD Part 4)* is recognised as being reactive and is typically initiated as a response to community requests.

Additionally, it is considered that the current SLR process does not adequately consider the crash and infrastructure risks associated with a road corridor. As such, this project seeks to revise the existing method for undertaking SLRs by incorporating current international best practice. It is anticipated that the revised SLR process will also better align with the Safe System framework.

New Speed Limit Review Process

TMR's Safer Roads team in Land Transport Safety Branch has developed a new SLR process for Queensland that utilises an Infrastructure Risk Rating (IRR) and Crash Risk Rating (CRR) to assess road safety risk along a road corridor and identify segments of the road network that require appropriate speed management interventions. The method has been previously adopted by New Zealand Transport Agency to proactively determine Safe and Appropriate Speeds.

Infrastructure Risk Rating

IRR is an assessment of the overall risk associated with the road and roadside infrastructure along an individual homogeneous road segment. IRR could be considered similar to models such as AusRAP and Netrisk, insofar as it attempts to proactively assess road segments to identify road infrastructure risk. However, IRR is based on only seven road attributes so is not as refined as other models, but the fewer data requirements and the less complex assessment methodology is less labour intensive, minimising assessment time and costs.

Crash Risk Rating

The CRR is an analysis of the crashes that have occurred along a road segment. The crash rate is calculated and compared against risk thresholds to assign a 'Low', 'Medium' or 'High' CRR.

Road Risk Metric

The new SLR process combines the reactive CRR and proactive IRR for road corridors to identify the overall Road Risk Metric (RRM) as outlined in Table 1.

Table 1. Road Risk Metric (RRM) matrix

		Infrastructure Risk Rating				
		Low	**Low Medium**	**Medium**	**Medium High**	**High**
Crash Risk Rating	**High**	High	High	High	High	High
	Medium	Medium	Medium	Medium	Medium	High
	Low	Low	Low	Medium	Medium	High

As can be seen in Table 1, roads that have a High RRM are considered to either have a history of fatal and serious injury crashes, or the road infrastructure represents a high risk to the road user, or both. Overall, roads with a High, Medium and Low RRM represent 12.9%, 25.5% and 64.6% of road network analysed, respectively. Roads identified to have a High RRM are roads that are considered suitable for speed limit reductions.

Conclusions

Queensland's new SLR process is expected to enhance the ability for practitioners to assess risk along road corridors and recommend safer, more appropriate speed limits on roads with high crash and/or infrastructure risk.

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Integrating safe system principles throughout TMR's business

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Queensland Department of Transport and Main Roads

Abstract

Queensland Department of Transport and Main Roads (TMR) has developed a Road Safety Management Plan (RSMP) to embed safe system principles and culture throughout the organisation. The Road Safety Management Plan is designed to put road safety at the forefront and will result in road safety-focused decision making and network level thinking.

The RSMP will facilitate the implementation, within TMR, of a Safe System approach to managing road safety. Senior leadership commitment and the supportive framework provided by the National Road Safety Strategy, the Queensland Road Safety Strategy and Action Plan are necessary to its success.

Background, Method and Conclusions

The Queensland Road Safety Strategy 2015–21 is the first time a Queensland Government has committed to a vision of zero road deaths and serious injuries. The strategy is firmly based on Safe System principles and is framed by the guiding vision that no person should be killed or seriously injured on Queensland's roads.

Safe Systems guiding principles are centered on human physical frailty, that people make mistakes and the transport system must accommodate for these, without resulting in death or serious injury. The four pillars featured in Safe System philosophy are safe roads and roadsides, safe speeds, safe road users and safe vehicles. Queensland's safe system approach encourages transport users to be alert and compliant, while aiming to reduce the severity of crashes through protective infrastructure treatments, speed reductions, improved driving behaviours and vehicle safety features.

The supporting Road Safety Action Plan 2017–19 delivers and supports significant long-term improvements to the safety of Queensland's road transport system, especially through strategic investment in infrastructure safety, safer road users and capacity building work. While there are dedicated road safety programs to deliver on many of these actions, the majority of TMR's business activities prioritise other outcomes. Opportunities exist to prioritise the delivery of safety improvements through these business activities.

ISO 39001 Road Traffic Safety is an international standard, providing a tool to help organisations reduce the incidence and risk of death and serious injury related to crashes. This standard identifies elements of good road safety management practice, focusing on road safety management objectives and targets, and guides the planning of activities that will help realise road safety goals by using a Safe System approach.

Figure 1 Safe System approach (Department of Transport and Main Roads QLD, unpublished, adapted from WA Government, 2008)

In 2016, TMR identified the requirement of a road safety and management plan and policy to help steer the department towards its vision. The primary aim of the RSMP is to provide direction to achieve safety outcomes and benefits of strategic importance, working towards Vision Zero. It will influence the organisational setting, business process and implementation of projects, as well as research activities.

The RSMP involves reviewing existing TMR processes to ensure that Safe System principles and approaches are embedded in all department activities, at all stages of a road lifecycle, including planning, design, construction, operation, maintenance, error correction, hazard reduction/elimination, major upgrading, renewal and program management.

In 2017, Queensland's road toll resulted in 247 fatalities and over 6,000 hospitalisations. The trend over the past 5 years suggest we will fall well short in achieving our target reduction of less than 200 fatalities and 4,669 hospitalisation by 2020.

The RSMP will instill into all relevant TMR policies and strategies the focus on minimising crash severity outcomes through embedding the Safe Systems approach across the transport infrastructure investment programs. Collectively working towards alignment with ISO 39001, Road Safety Management will further aid in TMR's achieving its objective of *delivering road infrastructure and technology treatments to effectively reduce the risk of road trauma on Queensland's road network.*

Implementing a RSMP will require road safety professionals to work with other subject matter experts, owners of organizational policies, business processes, systems, technical standards and guidelines to review existing business activities. Through this collaboration further opportunities will be identified to deliver safety outcomes within current investments. Implementing this plan will change the way TMR delivers road safety outcomes and further enhance the organisational road safety culture and capability of the department.

A fresh approach to distracted driving: implications for policy

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Abstract

Distracted driving due to mobile device use is an increasing contributing factor in road crashes globally. In Queensland, a high proportion of drivers report using their phone illegally in the car, despite being aware of the risk for driving. A 'design-thinking approach' was applied to gain further understanding and develop policy options on this issue. A complex ecosystem of driver behaviour influence, and five driver profiles with differing device interactions and propensities for risk were identified. This new information regarding influences on driver behaviour will guide engagement to inform development of new safety solutions for driver distraction due to mobile device use.

Background

With known detrimental effects on driving performance and crash risk, distracted driving due to mobile device use is recognised as a serious and growing global public health concern with individuals providing a variety of reasons for this dangerous behaviour (WHO, 2011; Footprints 2018) (see Figure 1). Disturbingly, around 70% of Queensland drivers use their phones illegally in a range of ways, and despite knowing the risks for road safety (Atchley, Atwood, & Boulton, 2011; Footprints, 2018).

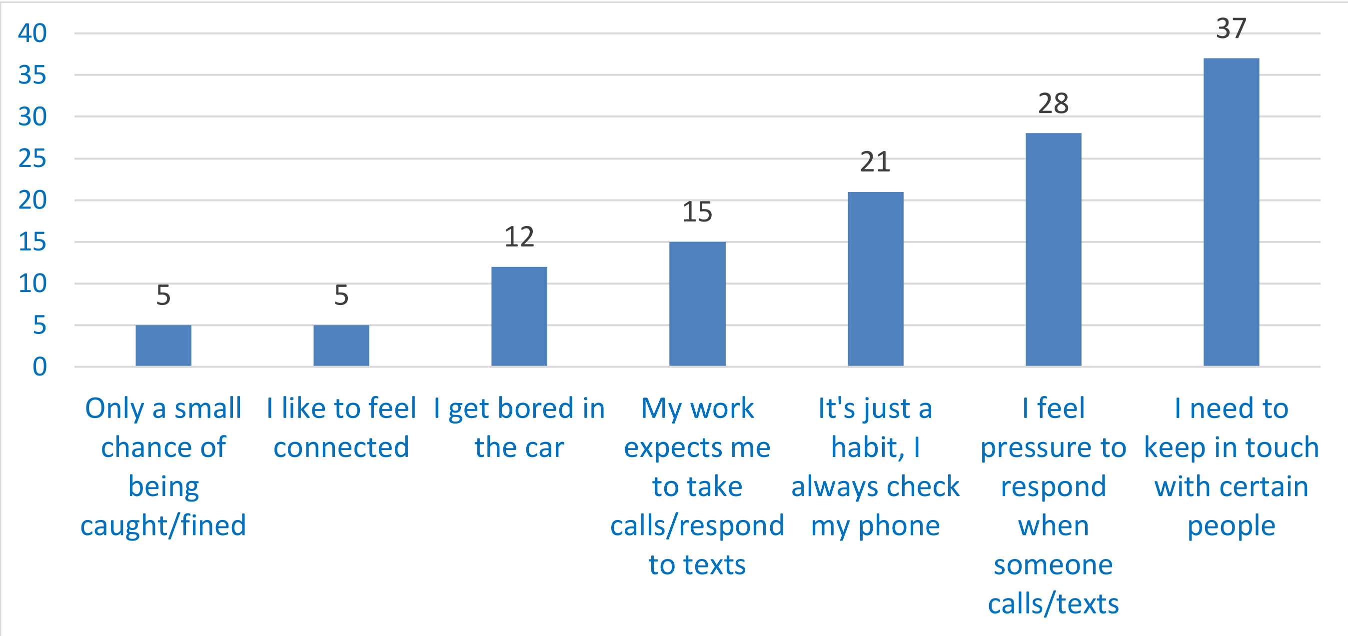

Figure 1. Reasons for illegal mobile phone use (%), Queensland 2018

In Queensland during 2011-2016, driver distraction-related road casualties increased by 31%, and distraction was the largest overall contributor to casualties, despite being likely underreported (Department of Transport and Main Roads [TMR], 2017). Data shows that distraction is a serious 'fatal five' contributor to road trauma, and one of two fatal five contributors on the rise – the other being drug driving (TMR, 2018) (see Figure 2).

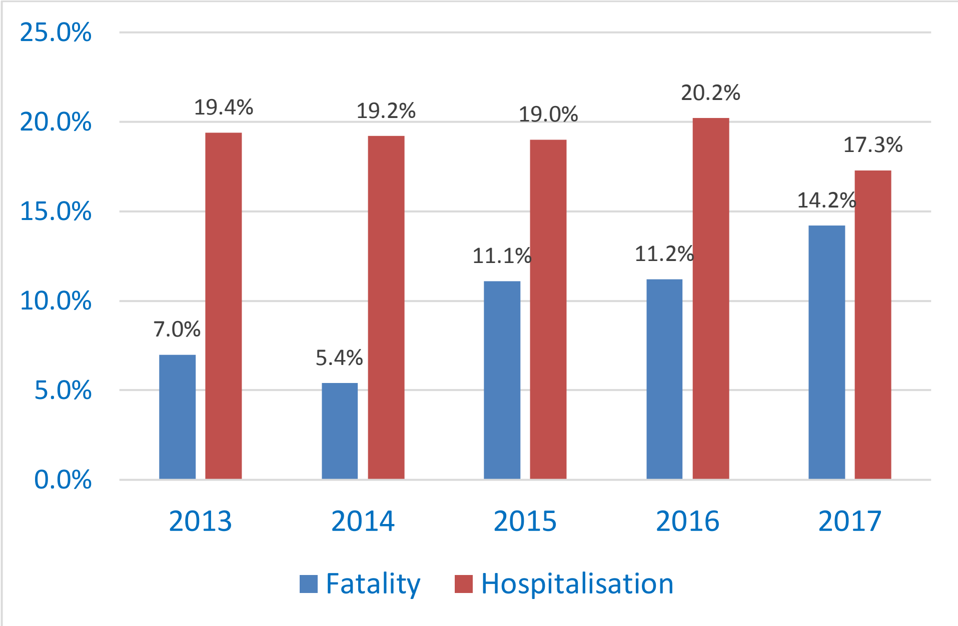

Figure 2. Proportion of casualties as a result of crashes involving distracted/inattentive drivers or riders in Queensland

Internationally and in Australia, distracted driving safety countermeasures range from enforcement, legislation, awareness campaigns and employer policies, however there is a high level of inconsistency in their application and little data regarding their effectiveness (WHO, 2011). Unfortunately, crash data suggests that improved understanding of the issue of mobile device use while driving and new safety strategies are urgently needed.

Systems and design-thinking: a new approach for policy development

Much of the existing literature and research in the field of driver distraction has been prepared by traditional road safety academics and specialists, however the problem of mobile device use while driving continues to challenge policy makers worldwide. Recognising the need to generate new thinking and solutions that are also resilient to technology updates, TMR employed a fresh approach to develop policy options for managing this safety issue. In this approach, systems and design-thinking methodologies were applied to further understand the complex interactions between behavioural influences, and drivers and subject experts were engaged to co-create policy solutions.

Who are the distracted drivers and why are they distracted?

It was identified that there is a broad and complex ecosystem influencing and reinforcing the risk/reward decision and engagement in using a mobile device while driving (see Figure 3 and Table 1). This suggests that a 'systems approach' is needed to significantly impact driver behaviour.

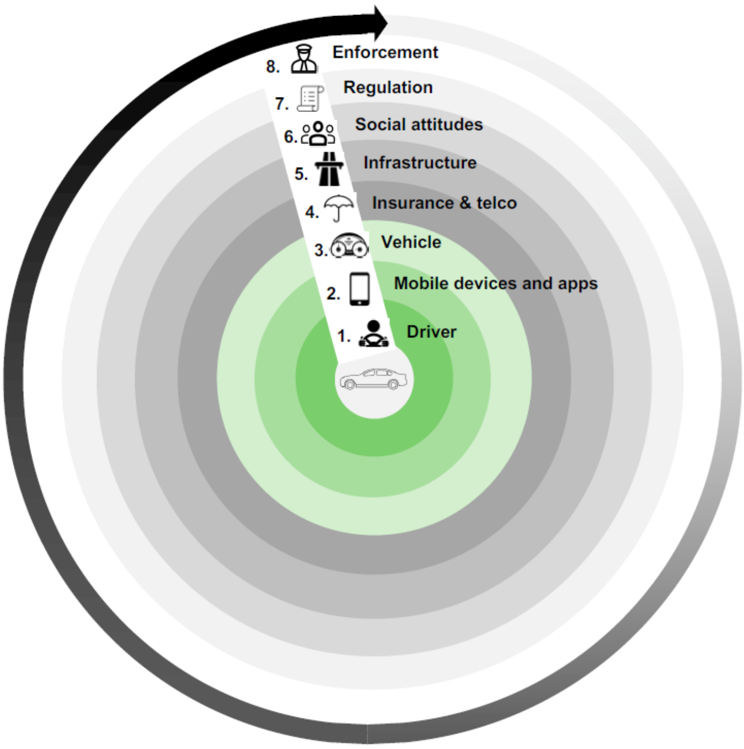

Figure 3. The driver distraction ecosystem

Table 1. Elements of the driver distraction ecosystem

System element		**Role in the system**
1	Driver	The driver is ultimately responsible for making the decision to engage in the distracting behaviour. They make a decision based on their assessment of the percieved risks and benefits.
2	Mobile devices and applications (incl. manufacturers)	The immediate enabling technology that facilitates the distracting behaviour. Also includes the organisations that manufacture and set the design agenda for the technology.
3	Vehicle (incl. manufacturers)	The immediate environment in which the driver makes the decision to engage in the distracting behaviour. May also play a role in facilitating the behaviour (for example, Bluetooth®, voice-activated commands). Also includes the organisation that manufactures and set the design agenda for the technology.
4	Insurance and telecommuinciation companies	These companies are part of the periphery environment and may have a role in influencing either the driver's ability to engage in the behaviour (for example, telcos restricting data signals) or influencing the decision making process (for example, insurance companies discounting premiums through the use of telematics technology).
5	Infrastructure	The surrounding physical infrastructure on and through which vehicles are used (for example, roads, bridges, intersection, signage).
6	Social attitudes	The opinions and preferences that are held by people known to the driver (for example, family, friends, work colleagues and managers) and society more broadly.

7	Regulation	Defines acceptable behaviour regarding the use of mobile phones while driving.
8	Enforcement	The range of measures taken to implement the legal consequences of failure to comply with the regulation (for example, detection methods, fines, licensing restrictions).

In addition, five driver profiles, characterised by their differences in type of device interaction, risk appetite, behavioural motivations, and age, were identified.

Conclusions

Identifying a complex ecosystem surrounding distracted driving highlights the need for a holistic approach to safety countermeasures on this issue. Characterisation of groups of drivers who engage in illegal mobile device use provides direction for new safety measures targeting specific distracted driver groups. It is recommended that a new strategy targeting driver distraction due to mobile device use should be anchored in a clear policy approach with reinforcing initiatives across the entire ecosystem to address a range of driver groups. Building on the present findings, further stages of the project will seek to engage with key stakeholders, such as telecommunications companies, automotive industry and mobile device manufacturers, to develop a suite of effective solutions for driver distraction.

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