Proceedings of the 2019 Australasian Road Safety Conference

Year of Publication: 2019
Publisher: Australasian College of Road Safety
ISBN: 978-0-6481848-2-9
DOI: https://doi.org/10.33492/ARSC-2019

Proceedings Editors

Baldock, M.R.J.[(1)], Grzebieta, R.H.[(2)(3)]

(1) Centre for Automotive Safety Research, University of Adelaide
(2) Transport and Road Safety (TARS) Research Centre, University of New South Wales, Sydney
(3) Victorian Institute of Forensic Medicine, Monash University

Preface

We are pleased to welcome you to the fifth annual Australasian Road Safety Conference, an amalgamation of the Road Safety Research, Policing and Education Conference and the Australasian College of Road Safety Conference. This 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 'Leading the Way - Towards Zero'. Some of the popular topic areas for this year include young and novice drivers; road infrastructure; human factors related to distraction; motorcyclists; cyclists; crash analysis; and speed management. 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 Extended Abstracts 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 2011-2020.

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 2018, 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 196 manuscripts from 253 submissions were accepted as Extended Abstracts.

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 who helped to review a total of 253 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 of 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 2019 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

Conference Organising Committee

Martin Small (**co-Chair**)
Road Safety Consultant
Martin Small Consulting, Australia

Assoc Prof Jeremy Woolley **(co-Chair)**
Director
Centre for Automotive Safety Research,
University of Adelaide, South Australia.

Dr Rob Atkinson
Australian Medical Association
South Australia

Dr Matthew Baldock (Chair, Scientific sub-Committee)
Centre for Automotive Safety Research,
University of Adelaide, South Australia.

Mr Philip Blake
Secretary
Australasian College of Road Safety, South Australian Chapter

Mr David Bobbermen *Safety*
Program Manager Austroads

Mr Eric Chalmers
Chief Executive
Kidsafe ACT

Mr Amit Dua
SA Department of Planning, Transport and Infrastructure.

Mr Jeffrey Dutschke
Research Fellow
Centre for Automotive Safety Research
University of Adelaide

Mr Hugh Gallagher
City of Adelaide

Prof Raphael Grzebieta
Scientific Sub-Committee (Proceedings Submissions Manager)
Emeritus Professor
Transport and Road Safety Research Centre, University of New South Wales, Sydney
Adjunct Professor,
Victorian Institute of Forensic Medicine, Monash University, Victoria

Ms Claire Howe
Executive Officer
Australasian College of Road Safety

Dr Marilyn Johnson
Senior Researcher
Institute of Transport Studies
Monash University, Victoria.

Dr Mark King (Chair, International sub-Committee)
Senior Research Fellow
Centre for Automotive Safety Research Queensland (CARRS-Q)
Queensland

Dr Jamie MacKenzie
Research Fellow
Centre for Automotive Safety Research
University of Adelaide, South Australia

Mr Lauchlan McIntosh
President
Australasian College of Road Safety (ACRS)

Dr Lori Mooren
Research Consultant
Transport and Road Safety Research Centre
University of New South Wales

Mr Charles Mountain
Senior Manager Road Safety
Royal Automobile Association, South Australia.

Mr Stephen Pascale
SA Department of Planning, Transport and Infrastructure.

Mrs Amy Roberts
Premier Event Concepts

Ms Shanna Sheldrick
*Premier Event Concepts (**Conference Manager**)*

Mr Matthew Vertudaches
Traffic Engineer
Royal Automobile Association, South Australia

Mrs Kim Winks
Office Manager
Australasian College of Road Safety ACRS

Conference Scientific sub-Committee

Dr Matthew Baldock **(Chair)**
Deputy Director
Centre for Automotive Safety Research
University of Adelaide, South Australia

Prof Raphael Grzebieta
(Proceedings Submissions Manager)
Scientific Sub-Committee (Proceedings Submissions Manager)
Emeritus Professor
Transport and Road Safety Research Centre, University of New South Wales, Sydney
Adjunct Professor,
Victorian Institute of Forensic Medicine, Monash University, Victoria

Dr Ben Beck
Deputy Head
Pre-hospital Emergency and Trauma Research
Monash University, Victoria

Dr Rebecca Brookland
Research Fellow
University of Otago
New Zealand

Mr Eric Chalmers *Chief*
Executive Kidsafe ACT

Ms Louise Cosgrove
Kids and Traffic,
NSW Road Safety Education

Dr Ralston Fernandes
Principal Research Scientist
Centre for Road Safety,
Transport for NSW

Dr Paul Graham
Principal Scientist
New Zealand Transport Agency

Dr Michelle Hobday
Curtin-Monash Accident Research Centre (C-MARC)
Curtin University, Western Australia

Ms Margaret Howard
Manager Living Neighbourhoods and Travel Behaviour
SA Department of Planning, Transport and Infrastructure

Dr Marilyn Johnson
Senior Researcher
Institute of Transport Studies
Monash University, Victoria.

Prof Lisa Keay
Head
School of Optometry and Vision Science
University of NSW

Mr David McTiernan
National Leader Transport Safety
ARRB, NSW

Dr Eve Mitsopoulous
Principal Road Safety Advisor
Transport Accident Commission (TAC)
Victoria

Dr Bridie Scott-Parker
Senior Research Fellow
University of the Sunshine Coast, Queensland

Prof Teresa Senserrick
Acting Director Postgraduate Research
Centre for Accident Research and Road Safety (CARRS-Q)
Queensland University of Technology

Dr Karen Stephan
Senior Research Fellow
Monash University Accident Research Centre
Victoria

Dr Blair Turner
Chief Technology Leader, Transport Safety
ARRB, Victoria

Dr Angela Watson
Senior Research Fellow
Centre for Accident Research and Road Safety (CARRS-Q)
Queensland University of Technology

Ms Amanda Watson-Tran
Acting Manager, Safety Strategy
South Australian Department of Planning, Transport and Infrastructure

Dr Lisa Wundersitz
Senior Research Fellow
Centre for Automotive Safety Research
University of Adelaide, South Australia

Conference International sub-Committee

Assoc Prof Mark King **(Chair)**
Senior Research Fellow
Centre for Accident Research and Road Safety – Queensland
Queensland University of Technology

Dr Lori Mooren
Research Consultant
Transport and Road Safety Research Centre
University of New South Wales

Mr Phillip Bourke
Acting Team Leader – Future Transport, Infrastructure
Austrade

Mr Rob McInerney
Chief Executive
International Road Assessment Program (iRAP)

Ms Olivia Sherwood and Mr Christopher Karas
Department of Infrastructure, Transport, Cities and Regional Development (DIRD)

Dr Ray Shuey
Strategic Safety Solutions Pty Ltd
Australia

Mr Martin Small
Road Safety Consultant
Martin Small Consulting, Australia

Dr Blair Turner
Chief Technology Leader, Transport Safety
ARRB, Victoria

Social sub-Committee

Ms Claire Howe
Executive Officer
Australasian College of Road Safety

Mrs Shanna Sheldrick
Premier Event Concepts (Conference Manager)

Conference Handling Editors

Dr.	Bianca Albanese	NeuRA Medical Research Institute, UNSW
A/Prof.	Kerry Armstrong	University of the Sunshine Coast
Dr.	Matthew Baldock	CASR, University of Adelaide
Dr.	Lyndel Bates	Griffith University
Dr.	Ben Beck	Public Health & Preventative Medicine, Monash University
Dr.	Soufiane Boufous	TARS Research Centre, UNSW
Dr.	Kate Brameld	C-MARC, Curtin University
Dr.	Rebecca Brookland	Preventive and Social Medicine, University of Otago
A/Prof.	Julie Brown	George Institute Australia
Ms.	Samantha Buckis	Transport Accident Commission (TAC), Victoria
Mr.	Eric Chalmers	Kidsafe ACT
Prof.	Jude Charlton	Monash University Accident Research Centre (MUARC)
Dr.	Kyle Chi Ngok Chow	C-MARC, Curtin University, Perth
Mr.	Sam Doecke	CASR, University of Adelaide
Dr.	Jeffrey Dutschke	CASR, University of Adelaide
Dr.	Rena Friswell	TARS Research Centre, UNSW
Prof.	Raphael Grzebieta	TARS Research Centre, UNSW
Dr.	Julie Hatfield	TARS Research Centre, UNSW
Prof.	Narelle Haworth	CARRS-Q, Queensland University of Technology
Dr.	Michelle Hobday	C-MARC, Curtin University
Ms.	Margaret Howard	SA Department of Planning, Transport and Infrastructure
Dr.	Marilyn Johnson	Institute of Transport Studies, Monash University
Prof.	Lisa Keay	Injury Division, The George Institute for Global Health
A/Prof.	Mark King	CARRS-Q, Queensland University of Technology
Dr.	David Logan	Monash University Accident Research Centre (MUARC)
Dr.	Jamie Mackenzie	CASR, University of Adelaide
Mr.	David McTiernan	ARRB
Prof.	Lynn Meuleners	University of Western Australia
Dr.	Eve Mitsopolous-Rubens	Transport Accident Commission (TAC), Victoria
Dr.	Mario Mongiardini	CASR, University of Adelaide
Dr.	Lori Mooren	TARS Research Centre, UNSW - Sydney
Prof.	Jake Olivier	School of Mathematics and Statistics, UNSW
Dr.	Oscar Oviedo-Trespalacios	CARRS-Q, Queensland University of Technology
Dr.	Jenny Oxley	Monash University Accident Research Centre (MUARC)
Mr.	Peter Palamara	C-MARC, Curtin University, Perth
Dr.	Victoria Pyta	VicRoads
Dr.	Paul Roberts	ARRB
Dr.	Bridie Scott-Parker	University of the Sunshine Coast
Prof.	Teresa Senserrick	CARRS-Q, Queensland University of Technology
Mr.	Keith Simmons	KND Consulting Pty Ltd
Dr.	Karen Stephan	Monash University Accident Research Centre (MUARC)
Prof.	Mark Stevenson	Urban Transport & Public Health, University of Melbourne
Mr.	Joel Tucker	RACQ
Dr.	Blair Turner	ARRB
Dr.	Angela Watson	CARRS-Q, Queensland University of Technology
Prof.	Ann Williamson	TARS Research Centre, UNSW
Dr.	Lisa Wundersitz	CASR, University of Adelaide

Peer Reviewers

Mr.	Raja Abeysekera	Centre for Road Safety, Transport for NSW
Mr.	Hassan Abdous	Road Maintenance & Transportation Organization, Iran
Dr.	Bianca Albanese	NeuRA Medical Research Institute, UNSW, Sydney
Dr.	Joesph Affum	ARRB
Dr.	Trevor Allen	MUARC, Monash University
Dr.	Jiri Ambros	CDV - Transport Research Centre, Czech Republic.
Dr.	Richard Amoh-Gyimah	Main Roads Western Australia
Dr.	Levi Anderson	Griffith Institute of Criminology, Griffith University
A/Prof.	Robert Anderson	CASR, University of Adelaide
Dr.	Fritha Argus	Don Aitken Centre, Main Roads Western Australia
A/Prof.	Kerry Armstrong	University of the Sunshine Coast
Dr.	Behrang Assemi	School of Civil Engineering & Built Environment, QUT
Ms.	Sareh Bahrololoom	Institute of Transport Studies, Monash University
Mr.	Samuel Bailey	Queensland Department of Transport and Main Roads
Dr.	Trevor Bailey	CASR, University of Adelaide
Dr.	Matthew Baldock	CASR, University of Adelaide
Dr.	Mike Bambach	Civil Engineering, The University of Sydney
Dr.	Lyndel Bates	School of Criminology and Criminal Justice, Griffith University
Dr.	Ben Beck	Epidemiology and Preventive Medicine, Monash University
Mr.	Kenn Beer	Safe System Solutions Pty Ltd
Dr.	Ross Blackman	CARRS-Q, Queensland University of Technology
Dr.	Soufiane Boufous	TARS Research Centre, UNSW-Sydney
Dr.	Kate Brameld	C-MARC, Curtin University
Dr.	Graham Brisbane	ARRB
Dr.	Rebecca Brookland	Preventive and Social Medicine, University of Otago Dunedin
Com.	Phillip Brooks	Traffic & Highway Patrol Command, NSW Police Force
Mr.	David Brown	Aust Institute of Traffic Planning and Management
Dr.	Julie Brown	NeuRA, UNSW
Mrs.	Samantha Buckis	Road Safety, Transport Accident Commission
Prof.	Max Cameron	MUARC, Monash University
Dr.	Nimmi Candappa	MUARC, Monash University
Mr.	Jerome Carslake	ARRB
Mr.	Eric Chalmers	Kidsafe ACT
Dr.	Herbert Chan	University of British Columbia, Canada
Prof.	Judith Charlton	Monash University Accident Research Centre
A/Prof.	Samuel Charlton	School of Psychology, University of Waikato
Ms.	Anna Chevalier	Safer Roads Consulting
Dr.	Kyle Chi Ngok Chow	C-MARC, Curtin University, Perth
Dr.	Bruce Corben	Safe Roads
Ms.	Louise Cosgrove	Macquarie University
Dr.	Kristy Coxon	School of Science and Health, Western Sydney University
Dr.	Daniel Demant	Queensland University of Technology
Mr.	Sam Doecke	CASR, University of Adelaide
Mr.	Paul Durdin	Abley Transportation Consultants
Dr.	Jeffrey Dutschke	CASR, University of Adelaide

Mr.	Martin Elsegood	CASR, University of Adelaide
Dr.	Catherine Ferguson	Edith Cowan University, Western Australia
Dr.	Ashleigh Filtness	CARRS-Q, Queensland University of Technology
Dr.	Helen Fingerlind	NeuRA Medical Research Institute, UNSW, Sydney
A/Prof.	Michael Fitzharris	MUARC, Monash University
Dr.	Judy Fleiter	CARRS-Q, Queensland University of Technology
Ms.	Michelle Fraser	C-MARC, Curtin University
Dr.	Rena Friswell	TARS Research Centre, UNSW-Sydney
Mr.	Bill Frith	Opus Research
Ms.	Robyn Gardener	Accident Compensation Corporation
Mr.	David Gribble	Constable Care Child Safety Foundation
Prof.	Raphael Grzebieta	TARS Research Centre, UNSW-Sydney
A/Prof.	Mazharul Haque	Civil Engineering and Built Environment, QUT
Dr.	Shimul Haque	Queensland University of Technology
Mr.	Peter Harris	Road Safety Audits P/L
Mr.	Simon Harrison	Queensland Department of Transport and Main Roads
Dr.	Julie Hatfield	TARS Research Centre, UNSW-Sydney
Prof.	Narelle Haworth	CARRS-Q, Queensland University of Technology
Mr.	Paul Hillier	ARRB
Dr.	Lily Hirsch	Mackie Research
Dr.	Michelle Hobday	C-MARC, Curtin University
Dr.	William Horrey	AAA Foundation for Traffic Safety, USA
Prof.	Mark Horswill	School of Psychology, University of Queensland
Ms.	Margaret Howard	State Government of South Australia
Dr.	Brett Hughes	Curtin University
Dr.	Kate Hunter	Injury Division, The George Institute for Global Health
Dr.	Timothy Hutchinson	CASR, University of Adelaide
Ms.	Kelly Imberger	Access & Operations, VicRoads
Prof.	Rebecca Ivers	School of Public Health & Community Medicine, UNSW
Mr.	Hinton Jane	Queensland Department of Transport and Main Roads
Dr.	Marilyn Johnson	Civil Engineering, Monash University
Prof.	Ian Johnston	MUARC, Monash University
Dr.	Sarah Jones	Toll Group
Mr.	Chris Jurewicz	Safe Systems, ARRB
Dr.	Auttapone Karndacharuk	Roads and Maritime Services, Sydney
Mr.	Konstantinos Karagiannopoulos	3M Australia
Prof.	Lisa Keay	Injury Division, The George Institute for Global Health
Dr.	Mark King	CARRS-Q, Queensland University of Technology
Dr.	Karen Klockner	School of Human, Health & Social Sciences, CQU
Mr.	Craig Kloeden	CASR, University of Adelaide
A/Prof.	Sjaan Koppel	MUARC, Monash University
Mr.	Brendan Lawrence	MUARC, Monash University
Mr.	Vy Le	Queensland Police Service
Dr.	Matthew Legge	CARRS-Q, Queensland University of Technology
Dr.	Ioni Lewis	CARRS-Q, Queensland University of Technology

Dr.	Xiaomeng Li	CARRS-Q, Queensland University of Technology
Mr.	Carl Liersch	Robert Bosch (Australia) Pty. Ltd.
Dr.	Sara Liu	MUARC, Monash University
Ms	Tori Lindsay	CASR, The University of Adelaide
Dr.	Astrid Linder	Swedish National Road and Transport Research Institute
Dr.	David Logan	MUARC, Monash University
Dr.	Jamie Mackenzie	CASR, University of Adelaide
Dr.	Hamish Mackie	Mackie Research and Consulting Ltd
Dr.	Faisal Magableh	ARRB
Mr.	Fabian Marsh	New Zealand Transport Agency
Mr.	David McTiernan	ARRB
Prof.	Lynn Meuleners	Population and Public Health, UWA
Mr.	David Milling	ARRB
Dr.	Eve Mitsopolous-Rubens	Policy and Programs, VicRoads
Dr.	Mario Mongiardini	TARS Research Centre, UNSW-Sydney
Dr.	Lori Mooren	TARS Research Centre, UNSW-Sydney
Ms.	Christine Mulvihill	MUARC, Monash University
Dr.	Stuart Newstead	MUARC, Monash University
A/Prof.	Sharon Newnam	MUARC, Monash University
Mr.	James Nunn	Loughborough University
Dr.	Steve O'Hern	MUARC, Monash University
Prof.	Jake Olivier	School of Mathematics and Statistics/TARS, UNSW, Sydney
Dr.	Oscar Oviedo-Trespalacios	CARRS-Q, Queensland University of Technology
Dr.	Jennie Oxley	MUARC, Monash University
Mr.	Peter Palamara	C-MARC, Curtin University
Dr.	Michael Pascale	CARRS-Q, Queensland University of Technology
Mr.	Giulio Ponte	CASR, The University of Adelaide
Dr.	Jeff Potter	National Transport Commission
Dr.	Victoria Pyta	VicRoads
Ms.	Rachel Prince	New Zealand Transport Agency
Mr.	Simon Raftery	CASR, The University of Adelaide
Mr.	Martyn Ralph	The George Institute for Global Health, Sydney University
Prof.	Andry Rakotonirainy	CARRS-Q, Queensland University of Technology
Dr.	Intan Suhana Mohd Razelan	Civil Engineering and Earth Resources, Malaysia
Dr.	Gemma Read	University of the Sunshine Coast
A/Prof.	George Rechnitzer	VIFM, Monash Uni & TARS Research Centre, UNSW-Sydney
Prof.	Michael Regan	Civil and Environmental Engineering, UNSW
Dr.	Paul Roberts	ARRB
Dr.	Bridie Scott-Parker	Adolescent Risk Research Unit, University of the Sunshine Coast
Prof.	Teresa Senserrick	TARS Research Centre, UNSW-Sydney
Mr.	Keith Simmons	TARS Research Centre, UNSW-Sydney
Ms.	Andrea Smithson	Western Australia Local Government Association
Dr.	Tanya Smyth	Queensland Department of Transport
Dr.	Zygmunt Szpak	Australian Institute for Machine Learning, Adelaide University
Ms.	Lisa Steinmetz	ARRB
Ms.	Teodora Stefanova	CARRS-Q, Queensland University of Technology
Dr.	Amanda Stephens	MUARC, Monash University

Dr.	Karen Stephan	MUARC, Monash University
Prof.	Mark Stevenson	University of Melbourne
Dr.	Chris Stokes	CASR, University of Adelaide
Dr.	Basuki Suratno	Centre for Road Safety, Transport for NSW
Dr.	Tana Tan	Safe System Solutions Pty Ltd., Melbourne
Dr.	James Thompson	CASR, University of Adelaide
Ms.	Jen Thompson	VicRoads, Melbourne
Ms.	Verity Truelove	CARRS-Q, Queensland University of Technology
Mr.	Joel Tucker	RACQ
Mr.	Blair Turner	ARRB
Mr.	Shane Turner	Abley Limited
Prof.	Divera Twisk	School of Psychology and Counselling, QUT
Dr.	Sergio Useche	University of Valencia, Spain
Dr.	Atiyeh Vaezipour	Recover Injury Research Centre, University of Queensland
Dr.	Akshay Vij	Institute for Choice, University of South Australia
Mr.	John Wall	Office of Raod Safety, Sydney
Dr.	Christopher Watling	CARRS-Q, Queensland University of Technology
Dr.	Angela Watson	CARRS-Q, Queensland University of Technology
Prof.	Barry Watson	CARRS-Q, Queensland University of Technology
Ms.	Natalie Watson-Brown	Adolescent Risk Research Unit, University of the Sunshine Coast
Dr.	Michael White	CASR, University of Adelaide
Prof.	Ann Williamson	TARS Research Centre, UNSW-Sydney
Dr.	Darren Wishart	CARRS-Q, Queensland University of Technology
Dr.	Lisa Wundersitz	CASR, University of Adelaide
Dr.	Tom Whyte	Neuroscience Research Australia, UNSW, Sydney
Dr.	Shamsunnahar Yasmin	CARRS-Q, Queensland University of Technology
Dr.	David Young	Transport Accident Commission, Melbourne
Dr.	Kristie Young	MUARC, Monash University
Prof.	William Young	Department of Civil Engineering, Monash University

ARSC2019 Preliminary Conference Program
(as at 09/09/19 - Subject to change)

	Tuesday, 24 September 2019 Conference Pre-Day
12.00pm	**Registration Open** Foyer M & N
	Pre-Conference Meetings (Invitation Only)
TBC	**Senior Policing/Enforcement Meeting** Room: City Room 3
8.30am - 4.30pm	**Austroads Road Safety Task Force Meeting** Room: City Room 4
	Pre-Conference Event
3.30pm – 5.00pm	**Early Career Professionals Event** Open to all Road Safety Professionals within their first 8 years of professional work Room: City Room 1 and 2 ***Event sponsored by ACT Government***
5.00pm – 6.00pm	**PRE-CONFERENCE NETWORKING FUNCTION** Room: Panorama Ballroom

	Wednesday, 25 September 2019
7.30am	**Registration Open** Foyer M & N
7.30am – 8.30am	**Arrival Tea & Coffee & Exhibition Open** Room: Halls MN
8.30am – 9.00am	**Opening Plenary Session** Room: Hall L MC: **Mr Martin Small** (President, ACRS / Co-chair, ARSC2019) **Welcome to Country** **Uncle Lewis O'Brien** (Aboriginal Elder of the Kaurna People) **Ms Jade Wilson** (Coordinator, Aboriginal Road Safety and Driver Licencing, Department of Planning, Transport and Infrastructure / Ngarrindjeri & Arabuna woman) **Official Opening and Welcome** **The Hon Corey Wingard MP** (Minister for Police, Emergency Services and Correctional Services) **Ms Claire Howe** (CEO, ACRS) **Mr Nick Koukoulas** (CEO, Austroads)
9.00am – 10.30am	**Plenary 1** **Thinking Globally, Acting Locally** Room: Hall L MC: **Mr Martin Small** (President, ACRS / Co-chair, ARSC2019) **Mr Kenneth Svensson** (Special Adviser Traffic Safety, Swedish Transport Administration) **Mr Rob McInerney FACRS** (Chief Executive, International Road Assessment Programme) **Ms Lotte Brondum** (Executive Director, Global Alliance of NGOs for Road Safety) Panel Session: Plenary 1 speakers
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays** Room: Halls MN

11.00am - 12.30pm	**Plenary 2** **Leading Towards Zero** *Session sponsored by Department of Infrastructure, Transport, Cities and Regional Development* Room: Hall L MC: **Professor Narelle Haworth** (CARRS-Q, Queensland University of Technology) **Ms Pip Spence PSM** (Acting Secretary, Department of Infrastructure, Transport, Cities and Regional Development / Acting Chair, Transport and Infrastructure Senior Officials Committee) **Associate Professor Jeremy Woolley** (Director, CASR / Co-Chair, National Inquiry) **Mr Neil Scales OBE** (Chair, Austroads / Director General, QTMR) Panel Session: Plenary 2 speakers plus **Mr Craig Newland** (Director of Policy & Research, AAA), **Ms Gabby O'Neill** (Director of Road Safety, DPTI), **Mr Martin Small** (President, ACRS)						
12.30pm - 1.30pm	**Lunch, Exhibition & Poster Displays** Room: Halls MN						
1.30pm - 3.10pm	**Concurrent Sessions 1**						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Marilyn Johnson*	*Julie Hatfield*	*Teresa Senserrick*	*Bridie Scott-Parker*	*Ralston Fernandes*	*Sam Doecke* *Martin Elsegood*	
Topic	**Cyclists**	**Motorcycles**	**Road Safety Communications** ***Session sponsored by Towards Zero Foundation***	**Novice Drivers**	**Speed Management**	**Crash Data Analysis**	**SAPOL's Road Safety Centre Workshop**
1.30pm – 1.50pm	105 **Mario Mongiardini** The University of Adelaide *Evaluation of the ACT Government's Safer Cycling Reforms Minimum Passing Distance and Allowance to Ride Across Pedestrian Crossings*	59 **Marcus Brown** Beca *Planning for motorcycling – A strategy to manage motorcycle risk on the West Coast of New Zealand*	134 **Teresa Senserrick** Queensland University of Technology *Time to Re-Think Our Approach to Road Safety 158Education?*	15 **Joanne Bennett** Australian Catholic University *Risky Driving: The Role of Cognition in Youth*	40 **Robyn Gardener** Accident Compensation Corporation *Safer Summer – the Public Perceptions and Efficacy of a 4-Year Enhanced Speed Enforcement Programme*	137 **Siobhan Isles** Major Trauma National Clinical Network *Death and severe injuries on NZ roads: Different things to different people*	*Visit SAPOL's Road Safety Centre to tour the facilities and witness an Introduction to Road Safety session.* *Workshop will include a presentation of SAPOL's road safety education session which are provided to the community.* *NOTE: This is an offsite activity. Please gather in room L3 before departure at 1.30pm by foot.*
1.50pm – 2.10pm	166 **Allison McIntyre** Allison McIntyre Consulting *Overview and Outcomes of Victoria's Passing Distance Cycling Safety Public Education Campaign*	69 **Ross Blackman** Queensland University of Technology *Review of Post-Licence Motorcycle Rider Training in New South Wales*	78 **Lucy Filardo** Centre for Road Safety *New approach to road safety advertising in NSW supporting Towards Zero*	81 **Andrew Rasch** Keys2drive *From hindrance to help – parental influence in novice-driver education*	8 **Kelly Imberger** VicRoads *The effect of sanctions on Victorian speeding drivers*	92 **Elizabeth Hovenden** VicRoads *Use of Spatial Analysis Techniques to Identify Statistically Significant Crash Hots Spots in Metropolitan Melbourne*	

	POSTER PRESENTATIONS				158 **Karen Stephan** Monash University Accident Research Centre *Effectiveness of 40 km/h Speed Limits in Reducing Crashes on Melbourne Roads with Strip Shopping and Factors Influencing Effectiveness*	48 **Selena Ledger** ARRB *Accelerometer-based Safety Surrogate Measures*	
2.10pm – 2.15pm	91 **Amit Dua** Government of South Australia *Effectiveness of the Rural Junction Activated Warning System (RJAWS): Case Study-South Australia*	39 **Kenn Beer** Safe System Solutions Pty Ltd *Making Tasmanian roads motorcycle friendly: Lake Leake road demonstration project*	17 **Alexander Jannink** Acusensus *Prevalence of Illegal Mobile Phone Use on Australian Roads*	180 **Renée St. Louis** Monash University Accident Research Centre *Older driver resilience levels and self-reported driving-related abilities, perceptions, and practices over five years*			
2.15pm – 2.20pm	101 **Courtney Bartosak** Department of Planning, Transport and Infrastructure *Painting a different picture of managing speed: the effectiveness of street murals*		167 **Lori Mooren** University of New South Wales *Validating Self-Report Transport Manager Safety Surveys*	41 **Joanne Bennett** Australian Catholic University *Blame of Crash Causation Across Varying Levels of Vehicle Automation*			
2.20pm – 2.25pm	155 **Danilo Messias** VicRoads *Accelerating the supply of safer vehicles through Government fleet*	202 **Chantal Ensbey** Roads and Maritime Services *A Safe Systems Response: Protecting Motorcyclists along the Oxley Highway*	21 **Kate McDougall** Eurobodalla Shire Council *Kings Highway Road Safety Partnership – "Reduce Speed on the Kings Highway" – Road Safety Campaign*	18 **Paolo Perego** Traffic Psychology Unit of Research Universita' Cattolica di Milano *Road crossing behaviour among primary and secondary school students in Tanzania*			
2.25pm – 2.30pm	192 **Matthew Albrecht** Curtin University *Driver behaviour and intersection crashes*	124 **Sewa Ram** School of Planning and Architecture *Optimal Size of Roundabout for Safety Considerations*	34 **Chris Smith** Coomera Road Policing Unit, Road Policing Command *The Crash Investigation Alliance – a Gold Coast based shared responsibility influencing safe roads, safe speeds and safe people*	68 **Pedro Ezcurra** RAA *Understanding Driving Challenges and Engagement Opportunities to Improve Local Driving Knowledge of Newly Arrived International Drivers and Migrants*			

2.30pm – 2.50pm 7	102 **Ben Beck** Monash University *Single-bicycle crashes driving increases in serious injury rates in cyclists*	22 **David Beck** Transport for NSW *MotoCAP: One year on David Beck, Dan Leavy*	181 **Samantha Patterson** Transport Accident Commission *The development of an enforcement campaign within the Towards Zero framework*	156 **Paolo Perego** Traffic Psychology Unit of Research Universita' Cattolica di Milano *Practical Driving Test Anxiety: an analysis of the phenomenon and a resolution proposal*	141 **Haris Zia** Abley Limited *Speed Management? Let's Talk About it!*	190 **Renee Schuster** TAC *The power of linked data in understanding differences between serious injury measures*	
2.50pm – 3.10pm 8	157 **David Logan** Monash University *Development of fatality and injury risk relationships for cyclist-vehicle impacts*	54 **Mohammed Mamdouh Zakaria Elhenawy** Queensland University of Technology *Using Random Forest to Test If Two-Wheeler Experience Affects Driver Behavior When Interacting with Two-Wheelers*	129 **Elisa Ryan** Glenorchy City Council *Full Gear – Community Youth Road Safety Program*	132 **George Vaeau** Accident Compensation Corporation *Developing the Drive Community toolkit: Working with community-based groups to support driver licensing education programmes*	10 **Ian Glendon** Griffith University *Field testing anti-speeding messages*	144 **Long Truong** La Trobe University *Exploring the road safety impacts of public transport: a case study of Melbourne*	
3.10pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays** Room: Halls MN						
3.30pm - 5.10pm	**Concurrent Sessions 2**						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Simon Raftery*	*Matthew Baldock* *Wendy Taylor*		*Karen Stephan*	*Eve Mitsopoulos-Rubens*	*Dr Ray Shuey*	
Topic	**Heavy Vehicles**	**Motorcycle Crashes**	**Symposium 1 - Safe Systems in Universities**	**Speed Management**	**Novice Drivers**	**Symposium 2 - LMIC**	**Austroads Road Safety Research – Are there any stones unturned?**
3.30pm – 3.50pm	6 **Sharon Newnam** Monash University Accident Research Centre *Work-related injury and illness among older truck drivers in Australia: A population based, retrospective cohort study*	147 **James Thompson** Centre for Automotive Safety Research *Motorcycle Crashes Resulting in Hospital Admissions in South Australia: Crash Characteristics and Injury Patterns*	*The missing link: Safe system education for tertiary students* __________ **Jeremy Woolley** University of Adelaide __________ **Wayne Moon** VicRoads Safe System Road Infrastructure Program __________ **Ashim Debnath** Deakin University __________	106 **Fritha Argus** Main Roads WA *Two Decades of Impacts of Road Safety Strategies on Driver Travel Speed Behaviours on WA Road Network*	66 **Trevor Bailey** University of Adelaide *Underlying factors in the take-up of active travel for young adults*	*Effective Advocacy of Road Safety in Low and Middle Income Countries* __________ **Lori Mooren** Safety and Communications Pty Ltd *Introduction and overview of the role of advocacy in supporting road safety leadership* __________	*This session will provide a macro view of the mitigating treatments to improve road safety and the key jurisdictional research and guidance materials available over the last 5 years, particularly in support of the safe system principles.* *Also, Austroads completed a risk mapping process in 2017 along with a system evaluation which directed the areas of greatest focus for*

3.50pm – 4.10pm	119 **Michael Holmes** Transport for NSW *A Review of International Best Practices to Improve Heavy Vehicle Safety in Urban Environments*	164 **Trevor Allen** Monash University Accident Research Centre *Rider, motorcycle and trip-related factors associated with motorcycle injury crash risk in Victoria, Australia*	184 **Chris Stokes** University of Adelaide *Safe System for Universities: linking graduate knowledge with industry best-practice*	214 **Tracey Smith** Queensland Department of Transport and Main Roads *Targeted speed limit reductions for vulnerable road users – case learnings*	182 **Teresa Senserrick** Queensland University of Technology *Are Declines or Delays in Youth Driver Licensing Evident in New South Wales or Queensland?*	31 **Ali Zayerzadeh** Road Safety Pioneers (RSP) *Major Risk Factors Contributing to Pedestrian Crashes in Low and Middle-Income Countries* __________ **Sumana Narayanan** Citizen consumer and civic Action Group (CAG) *Changing Mindsets and Approaches to Road Safety* __________ **Monjurul Hoque Mohammod Arif Uddin** Centre for Injury Prevention and Research, Bangladesh (CIPRB) *Community Engagement in Implementing the Safe System Approach: Learnings from Speed Management and Safe Crossing Demonstration Project* __________ **Christine Anne Paguirigan** Initiatives for Dialogue and Empowerment through Alternative Legal Services, Inc. (IDEALS) *#BuckleUpKidsPH: The Role of Social Media in the Holistic Approach for Child Restraint Systems (CRS) Campaign in the Philippines*	*research and guidance. A number of perspectives will be used to view the information such as time periods, pillars and targeted/ system-wide treatments. Audience will be involved in identifying areas where further opportunities exist as an input to future research programs.*
4.10pm – 4.30pm	33 **Lucy Filardo** Transport for NSW, Centre for Road Safety *Understanding road user attitudes and behaviours to improve heavy truck safety: Findings from recent NSW attitudinal research*	19 **Janet Amey** Waikato District Health Board *Police motorcycle crash reports and linkage with hospital trauma admissions in the Midland Region of New Zealand, 2012-2016*		58 **Joanne Wilson-Ridley** QPRC *Applying safe systems and increasing stakeholder engagement in a community speed education program in Local Government*	128 **Juliet Bartels** VicRoads *myLearners – Supporting Victorian Learner and Supervising drivers through a staged approach*		
4.30pm – 4.50pm	5 **Rena Friswell** University of New South Wales *Management of queuing and waiting for truck drivers by road transport customers*	240 **Siobhan O'Donovan** University of Adelaide *Obesity and age as factors in lethal leg amputation following motorcycle crashes*		80 **Alexander Price** Main Roads WA *Application of Infrastructure Risk Rating (IRR) to Support Speed Limit Reduction in Western Australia*	151 **Jen Thompson** VicRoads *An economic evaluation of Victoria's L2P - Learner driver mentor program*		
4.50pm – 5.10pm		210 **Prasannah Prabhakharan** UNSW *Understanding the Role of Inattentional Blindness in Motorcyclists' LBFTS Crashes*		84 **Jimmy Liakos** Transurban Limited *Dynamic Speed Management in a Managed Motorway Environment*	53 **Zoë Morgan** Eurobodalla Shire Council *Implementing a Learner Driver Mentor Program in a Local Government Area - Y Drive*		

						112 **Le Nguyen** AIP Foundation *Reducing Distracted Driving Behavior among University Students: The Effectiveness of an Empowerment-based Intervention in Cambodia and Vietnam* ___________ **Mark King** CARRS-Q, Queensland University of Technology *Panel Discussion*	
5.10pm - 7.30pm	**CONFERENCE WELCOME RECEPTION** Room: Halls MN						

	Thursday, 26 September 2019
6.30am – 7.05am	The ARSC2019 social walk-and-run *Departing at 6.30am (sharp) from the bottom of the escalators of the North Terrace entrance to the Adelaide Convention Centre*
8.00am	**Registration Open** Foyer M & N
8.00am - 8.30am	**Arrival Tea and Coffee and Exhibition Open** Room: Halls MN
8.30am - 10.30am	**Plenary 3** **Local Government Leadership** Room: Hall L MC: **Ms Mandi Mees** (Executive Leader - Safety, National Transport Commission) **Mr David O'Loughlin** (President, Australian Local Government Association) **Ms Terri-Anne Pettet** (RoadWise Program Manager, Western Australian Local Government Association) **Mr Shane Ellison** (Chief Executive Officer, Auckland Transport) **Mr Chris Davis** (Road Safety Officer, Mildura Rural City Council) **Mr Doug Bradbrook** (Traffic & Road Safety Strategist, Mornington Peninsula Shire Council) Panel Session: Plenary 3 speakers
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays** Room: Halls MN

11.00am - 12.40pm	Concurrent Sessions 3							
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**	**Riverbank Room 4**
Chair	*David Logan*	*Jeffrey Dutschke*	*Margaret Howard*	*Judith Charlton* *Renee St Louis*	*Roger Chao*			
Topic	**Road User Response to Innovative Infrastructure**	**Driver Distraction**	**Local Government/ Transport Policy & Planning** ***Session sponsored by AAMI***	**Older Drivers**	**Symposium 3 – The "P Drivers Project"**	**Symposium 4 – Acceptance of Co-operative and Automated Vehicles** ***Session sponsored by the National Transport Commission***	**The story of Nicholas Holbrook Podcast (TBC)**	**Road Safety Educators Meeting – RSERGA**
11.00am – 11.20am	198 **Lily Hirsch** Mackie Research *Te Ara Mua Future Streets – Influences on road user behaviour*	205 **Mohammed Mamdouh Zakaria Elhenawy** Queensland University of Technology *Using Deep Learning to Detect Driver Distraction in the Australian Naturalistic Driving Study (ANDS) Video Data - Preliminary Results*	160 **Christopher Bree Nyko** Transport Accident Commission *Stop, Ask, Listen and Collaborate: Working Towards Zero with Local Government*	50 **Julie Thompson** Transport For NSW, Centre for Road Safety *Evaluation of the NSW older driver licensing reforms*	*The "P Drivers Project": Beginnings, Insights and Opportunities* ——————— **Eve Mitsopoulos-Rubens** Transport Accident Commission *Program development and theoretical framework* ——————— **Julie Hatfield** Transport and Road Safety Research Centre, The University of NSW *Process Evaluation of the P Drivers Program* ——————— **Karen Stephan** Monash University Accident Research Centre *Outcome evaluation of the P Drivers Program* ———————	*The human in the mix: getting people 'on-board' with cooperative and automated vehicles (CAVs)* ——————— *173* **Jodi Page-Smith** Transport Accident Commission *"Car, will you drive my Baby?" - Community attitudes towards autonomous vehicles and associated technologies'* ——————— 45 **Selena Ledger** ARRB *Trialling Automated Vehicles: Who, What and Where? Survey Results from Across Australia and New Zealand* ———————	*This is the story of Nicholas Holbrook, known to his friends as 'Nick'. At just 18, the friendly and outgoing teen was tragically killed in a single car crash on West Lakes Blvd, West Lakes.* *The car, driven by Nick's best mate Phillip, smashed into a tree at speed trapping Nick in the passenger seat.* *While Phillip sustained only minor injuries, Nick passed away in the early hours of Friday, 12 June 2009.* *In this debut episode of our 'Fatal Five' podcast, Nick's parents Glynis and Michael, his brother Sam and the vehicle's driver, Phillip, tell their stories, recounting the horrific crash and its lifelong impact on the 10-year anniversary of Nick's passing.*	**INVITE ONLY**
11.20am – 11.40am	94 **Henry Lim** VicRoads *Delivery of Victoria's Audio Tactile Program*	9 **Kelly Imberger** VicRoads *Development of a distraction safety rating system for the in-vehicle human machine interface*	13 **Tracey Lee Norberg** Goulburn Mulwarre Council *The challenges of coordinating a multi-agency safe systems approach in Local Government Road Safety*	145 **Belinda Maloney** Royal Automobile Association *Merging in the Years Ahead – providing interactive road safety education to senior drivers*				
11.40am – 12.00pm	206 **Raaj Kishore Biswas** University of New South Wales *A systematic review on close-following or short headways: Preliminary findings*	65 **Bernard Carlon** Transport for NSW, Centres for Road Safety & Maritime Safety *The testing and evaluation of a vision based automatic detection system for illegal phone use by drivers in Australia*	175 **Ryszard Gorell** GHD Pty Ltd *Barriers to road safety investment for Rural Local Governments*	165 **Tom Whyte** Neuroscience Research Australia *Comfort accessories for elderly drivers: Influence on occupant injury risk*				

12.00pm – 12.20pm	216 **Peter Kolesnik** Department of Transport and Main Roads *Hold the Red: innovative technology reducing the risk of crashes at signalized intersections*	88 **Giulio Ponte** The University of Adelaide *Exploring the prevalence of in-vehicle distraction in moving traffic: A pilot study*	76 **Elizabeth Hovenden** VicRoads *Safety on Congested Urban Motorways*	36 **Anna Crump** Royal Automobile Association of South Australia (RAA) *Importance of vehicle features and in-vehicle technology in the purchase decisions of older drivers'*	**Eve Mitsopoulos-Rubens** Transport Accident Commission *Implications for youth road safety program development and practice*	*23* **Sherrie-Anne Kaye** CARRS-Q, Queensland University of Technology *Examining Queensland Drivers' Priori Acceptability of Conditional and Full Automated Vehicles* __________ 218 **Clare Murray** Queensland Department of Transport and Main Roads *Connect the Community - Development and Evaluation of a Public C-ITS Awareness Campaign* __________ 113 **Associate Professor Ioni Lewis** QUT *Examining drivers' a priori acceptance of Level 4 automated cars: An exploration of drivers in Australia, France, and Sweden*	*Listener discretion is advised.* *Speakers: Michael & Glynis Holbrook, Phillip Wright, Anne Cooke, Leesa Story, Sergeant Gino Spiniello (Western District Response), Brevet Sergeant, Lauren Kearns (Major Crash Investigation Section), Senior Sergeant Susan O'Connor (Road Safety Section)*	
12.20pm – 12.40pm	159 **Matthew Baldock** Centre for Automotive Safety Research *Evaluating retro-reflective screens to aid conspicuity of tabletop carriages at passive level crossings*	168 **Oscar Oviedo-Trepalacios** Queensland University of Technology *Benchmarking distracted driving against other key risky driving behaviours*	120 **Mark King** Queensland University of Technology *Capacity building in road safety: What do practitioners think?*	169 **Bridie Scott-Parker** University of the Sunshine Coast *SAFER-Senior: A situation awareness and escape route identification skills intervention improving the road safety of senior drivers*				
12.40pm - 1.30pm	**Lunch, Exhibition & Poster Displays** Room: Halls MN							

1.30pm - 3.10pm	Concurrent Sessions 4						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Jeremy Woolley* *Carl Liersch*	*Anna Chevalier*		*Giulio Ponte*		*Matthew Baldock*	
Topic	**Infrastructure**	**Driver Distraction**	**Symposium 5 – Rural and Remote Road Safety**	**Cyclists**	**Symposium 6 - Wire Rope Barriers Project**	**Drink and Drug Driving**	**Austroads Local Government Guide**
1.30pm – 1.50pm	35 **Brayden McHeim** Australian Road Research Board *The safety impacts and program benefits of Safe System Assessments*	170 **Barry Watson** Queensland University of Technology *Should we be talking about addiction when it comes to young drivers and smartphones?*	*How can we improve road safety in regional and remote areas?* __________ 162 **Lisa Wundersitz** University of Adelaide *Regional and remote road safety: A national view* __________ **Paul Rajan** Independent Consultant *Key insights: Improving driver licensing programs for Indigenous road users and transitioning learnings to other user groups* __________ **Melissa Watts** Road Safety Commission *Current initiatives addressing regional and remote road safety* __________ **Terri-Anne Pettet** WA Local Government Association *Working with regional local governments and communities to improve road safety*	178 **Jake Olivier** University of New South Wales *Does the Australian Bureau of Statistics Method of Travel to Work data accurately estimate commuter cycling in Australia?*	*Breaking down barriers as we work towards Zero - on the roads and in the community* *(Safer Roads – Road User Behaviour – Post Crash Data and Crash Analysis)* __________ **Eliza Houghton** Transport Accident Commission (TAC) __________ 90 **David Logan** Monash University Accident Research Centre (MUARC) *Anatomy of a wire rope safety barrier impact* __________ **Nimmi Candappa** Monash University Accident Research Centre (MUARC) __________ **Jessica McGlinchey** Transport Accident Commission	103 **Ben Beck** Monash University *The prevalence of alcohol and other drugs in fatal road crashes in Victoria, Australia*	*With 50% of the crashes occurring on Local Government roads, are all local governments maximising the application of resources to deliver the most effective outcomes? Guidance materials specifically for Local Government will be outlined so that attending local government representatives may get a first-hand and early look at the soon to be published Austroads' Guide for Local Government.*
1.50pm – 2.10pm	189 **Bridget Carden** Abley *Streamlining the development of effective road safety programmes*	220 **Nicole Downing** Queensland Department of Transport and Main Roads *Public sector innovation: an ecosystem-based approach to addressing driver distraction*		195 **Marilyn Johnson** Monash University *Truck drivers on bicycles: insights from the first year of vulnerable road user training for heavy vehicle drivers*		29 **Michael White** University of Adelaide *Does cannabis exacerbate the effect of alcohol on the risk of crashing? A close look at the best epidemiological evidence*	
2.10pm – 2.30pm	209 **Chris Stokes** University of Adelaide *Prioritising harm elimination: The effect of benefit-cost metrics and planning timeframes on perceived benefits*	24 **Paul Roberts** ARRB Group Ltd *The effect of digital billboards at intersections on driving performance*		176 **Julie Hatfield** University of NSW *Riding with children for transport and recreation: Carrier use and safety issues*		87 **Wendy Hodge** ARTD Consultants **Ralston Fernandes** Transport For NSW, Centre for Road Safety *Process evaluation of the NSW Mandatory Alcohol Interlock Program*	
2.30pm – 2.50pm	222 **Lachlan Moir** Queensland Department of Transport and Main Roads *Implementing the Queensland Road Safety Policy*	191 **Oscar Oviedo-Trespalacios** Queensland University of Technology *The impact of 'Do not disturb while driving' and 'Android Auto' on mobile phone use while driving: A mixed-methods approach*		201 **Marilyn Johnson** Monash University *Behaviour, Law and Design: an interdisciplinary approach to improving intuitive road design, the road rules and cyclist safety*		225 **Tanya Smyth** Queensland Department of Transport and Main Roads *Brief Intervention for Queensland's first-time drink driving offenders*	

2.50pm – 3.10pm	14 **Francisco Alburquerque** United Arab Emirates University *Mobility Versus Safety: The Issues Related to Traditional Road Design/Traffic Analysis Approach Illustrated in Two Abu-Dhabi-Based Case Studies*	25 **Paul Roberts** ARRB Group Ltd *The effect of dwell time, location and content on the distraction impact of digital billboards*		96 **Narelle Haworth** CARRS-Q, Queensland University of Technology *E-Scooters: Are they a road safety issue?*		142 **Yeewah Yam** Royal Automobile Club of Victoria *What's needed to improve the Drug Driving issue in Victoria?*	
3.10pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays** Room: Halls MN						
3.30pm - 5.10pm	**Concurrent Sessions 5**						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Christopher Stokes*	*Tia Gaffney*	*Lisa Wundersitz* *Kathryn Collier*		*Paul Roberts*	*James Thompson*	
Topic	**Infrastructure Auditing & Assessment**	**Crash Analysis**	**Novice Drivers**		**Connected and Automated Vehicles**	**Policing**	**Symposium 7 - Cycle Aware**
3.30pm – 3.50pm	149 **Kenn Beer** Safe System Solutions Pty Ltd *Integrating Safe System principles into Road Safety Auditing*	61 **Gage Hodgson** ARRB *Safe System Review of Fatal Crashes in the ACT*	95 **Mary Maini** NSW State Insurance Regulatory Authority *NSW Young Drivers Telematics Trial – methodology, results and potential implications for road safety*		30 **Anna Chevalier** Australian Road Research Board *Early findings from First Australian Connected Light, Privately-owned Vehicle Trial*	77 **Michael Timms** NSW Police Force *Leading Law Enforcement Towards Zero: NSW Police Force Road Policing Strategy 2021*	*Cycle Aware: A training module for novice drivers to safely interact with cyclists* ___________ **Dr Marilyn Johnson** Monash University *What should we be teaching novice drivers about interacting safely with cyclists?* ___________ **Professor Narelle Haworth** CARRS-Q, Queensland University of Technology *Bicycle-motor vehicle crashes: Novice and experienced drivers compared* ___________
3.50pm – 4.10pm	109 **Kenn Beer** Safe System Solutions Pty Ltd *Thailand Rural Road Safety Audit System Toolkit*	86 **Sam Doecke** University of Adelaide *How do we prevent and mitigate crashes? Results from 116 at-scene in-depth crash investigations*	62 **Joanne Bennett** Australian Catholic University *Hazard Perception and Younger Drivers: The Role of Cognitive Function*		99 **Jamie Mackenzie** Centre for Automotive Safety Research *Assessment of rural road line markings for suitability with Lane Departure Warning*	7 **Peter Thompson** South Australia Police *Creating efficiencies in roadside driver drug testing*	
4.10pm – 4.30pm	115 **Monjurul Hoque** **Mohammod Arif Uddin** Centre for Injury Prevention and Research, Bangladesh (CIPRB) *Safety Performance Analysis of Road Signage Across Highway: Experience from Existing Road Safety Audit in Bangladesh*	82 **Martin Elsegood** University of Adelaide, Centre for Automotive Safety Research *Collection and Analysis of EDR Data from Crash Involved Vehicles*	238 **Teal Evans** La Trobe University *Situation awareness and hazard perception deficiencies of young novice drivers, particularly at night*		171 **Gemma Read** University of the Sunshine Coast *Identifying the risks associated with automated vehicles across the system lifecycle*	177 **Michael Keating** Queensland Police Service *Australia's second generational approach to roadside drug testing*	

4.30pm – 4.50pm	89 **Brayden McHeim** Australian Road Research Board *Use of the Safe System Assessment Framework as a Safety Key Performance Indicator*	232 **Michael Hardiman** State Government of Victoria *Proposed Amendments to the Australian Design Rules Pertaining to Mandation of Event Data Recorders in Australian Sold Vehicles*	63 **Joanne Bennett** Australian Catholic University *Road User Hazard Perception Tests: A Systematic Review of Current Methodologies*		163 **Steven Huxtable** VicRoads *Victoria's Automated Driving System (ADS) permit scheme*	11 **Bruce Peel** Queensland Police Service *Building policing legitimacy and strengthening community relationships: On the road towards zero with IM_PACT*	**Dr Jennifer Bonham** University of Adelaide *Cycle Aware: A training Module for novice drivers* __________ *Trialing the Module* __________ *Trial Feedback and Discussion*
4.50pm – 5.10pm	42 **David Williamson** VicRoads *Toward Safe System Infrastructure – Application and Development of Safe System Assessment in Victoria*	125 **Shane Turner** Abley Limited *Making Evidence-based Crash Analysis as Routine as Sidra analysis*			70 **Hendrik Zurlinden** VicRoads *Towards linking driving complexity to crash risk*	224 **Patrick McShane** Queensland Department of Transport and Main Roads *A Corridor Analysis Approach to Selecting Combined Red-light Speed Camera Sites in Queensland*	
6.30pm - 11.00pm	**CONFERENCE GALA DINNER & AWARDS CEREMONY** Room: Panorama Ballroom Including presentation by **The Hon Michael McCormack MP** (Australia's Deputy Prime Minister & Minister for Infrastructure and Transport) of the following awards: The prestigious 3M-ACRS Diamond Australasian Road Safety Award The 2019 ACRS Fellowship Award The Inaugural ACRS Young Leaders Oration Award						

	Friday, 27 September 2019						
8.00am	**Registration Open** Foyer M & N						
8.00am - 8.30am	**Arrival Tea & Coffee & Exhibition Open** Room: Halls MN						
8.30am - 10.30am	**Plenary 4** **Leading Change** Room: Hall L **Ms Samantha Cockfield** (Lead Director, Road Safety**,** Transport Accident Commission) **Mr David Bobbermen** (Chair, Austroads Safety Task Force) **Mr Brent Johnston** (Manager, Mobility & Safety, Ministry of Transport) **Inaugural ACRS Young Leaders Oration Award Recipient** (to be announced at the Conference Gala Dinner and Awards Ceremony) Panel Session: Plenary 4 speakers plus **Dr Nadia Anderson** (Global Public Policy Lead, Road & Traffic Safety, Uber), **Mr Llew O'Brien MP** (Federal Member for Wide Bay, LNP) & **Senator Glenn Sterle** (Shadow Assistant Minister for Road Safety, ALP)						
10.30am - 11.00am	**Morning Tea, Exhibition & Poster Displays** Room: Halls MN						
11.00am - 12.40pm	**Concurrent Sessions 6**						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Mark Stevenson*	*Ioni Lewis* *Jessica McGlinchey*		*Ben Beck*	*Liz Waller*		
Topic	**Infrastructure - Intersections**	**Road Safety Education**	**Symposium 8 - NGOs**	**Vulnerable Road Users**	**Strategy Modelling**	**Symposium 9 - Connected and Automated Vehicles**	**Workshop - Austroads Network-wide Road Design for Road Safety Plans**
11.00am – 11.20am	43 **Paul Mihailidis** Trafficworks Pty Ltd *Innovative Treatment of High-Risk Intersections Towards Zero*	219 **Deborah Evans** Queensland Department of Transport and Main Roads *Gamification, coding and crossing the road: Innovation in school road safety education in Queensland*	*NGOs #SpeakUp for Road Safety* *The agent of change of change in global road safety has been NGOs. There would have been no Decade of Action without the NGOs. Road Safety would not be in the SDGs without NGOs. That's why NGOs must lead the #50by30 campaign to halve road*	4 **Lily Hirsch** Mackie Research *Understanding the Safe System context behind pedestrian road trauma in New Zealand*	27 **Colin Morrison** New Zealand Transport Agency *Modelling New Zealand Road Deaths to 2025*	*Connected and Automated Vehicle Trials* __________ **David Young** TAC __________ **Blake Harris** VicRoads *Telstra and Lexus Australia ACV2 Project*	*The 2019 year will see the release of an integrated and simple method to produce network-wide road safety plans.* *Following the trials that have just been completed, this practice will soon be released as a reference to the*

11.20am – 11.40am	93 **Amit Dua** Government of South Australia *A case study on raised intersection platform on urban arterial un-signalised intersection, South Australia*	104 **Louise Cosgrove** Macquarie University - Kids and Traffic *Using maths and science curriculum to increase understanding of how and why correct, age-appropriate child car seat use improves safety*	*deaths and serious injuries by 2030." (David Ward, President and CEO Towards Zero Foundation). The symposium will provide an overview of current NGO road safety programs and discuss support mechanisms for road safety NGOs.* **Lauchlan McIntosh AM FACRS** Chair, Towards Zero Foundation Previously President ACRS; Chair ANCAP; Chair Global NCAP; Executive Director AAA **Lotte Brondum** Executive Director Global Alliance of NGO's for Road Safety; previously Director, International Development AIP Foundation **Dreena Lawrence-Gray** Chairperson School Crossings, Victoria; Chairperson Roadsafe East, Victoria; previously School Crossing Coordinator City of Casey, Victoria. **Eric Chalmers** CEO Kidsafe ACT; ACRS ACT Chapter Chair; previous experience with Safer Kids Worldwide, management consultant. **Atsani Ariobowo** Manager Global Road Safety Projects, Global Road Safety Partnership	60 **Carl O'Neil** Abley Ltd *A proactive approach to identifying high risk road corridors for pedestrians in Auckland, New Zealand*	56 **Peter Hartzell** SIS, Swedish Standards Institute *ISO 39001:2012 – Road traffic safety (RTS) management systems – Requirements with guidance for use*	**Joanne Vanselow** VicRoads **Andrew Somers** Omni-Aware *Omni-Aware Project* ___________ **Joanne Vanselow** VicRoads *CAV Highway Pilot trial on Victorian regional roads*	*Austroads Guide to Road Design Part 2. The workshop will build on the background outlined at previous conferences and provide an opportunity to see how the methodology utilises the intelligence in iRAP's Vida and Austroads ANRAM systems to quickly give an indication of the geometric attributes, road safety treatments and speed environment that can deliver road safety benefits for all corridors across in the network.* *Also, the soon to be released Austroads Guide to Road Design Part 6 providing a decision making method specifically for road side risk will also be covered which has been designed to harness the current roadside risk mitigation intelligence.* *The method introduces the concept of a NRRIT (Network-wide Roadside Risk Intervention Threshold) and how this can be applied across the whole network using a handful of risk graphs to determine the road authority intervention level.*
11.40am – 12.00pm	52 **Fritha Argus** Main Roads Western Australia *Data exploration and visualisation of crash risk at Perth Metropolitan Intersections*	200 **Janine Ferris** University of Waikato *Adding trains and trams to Safety Town: A government and not-for-profit road/rail education partnership leading the way in NSW*		55 **Shahnewaz Hasanat-E-Rabbi** Bangladesh University of Engineering and Technology *Where Should We Focus for Road Safety Improvement? Case Study of a Pedestrian Crash Investigation Using Socio-technical Approach in Bangladesh*	49 **Ralston Fernandes** Centre for Road Safety, Transport for NSW *Development of Road Safety Performance Indicators in NSW*		
12.00pm – 12.20pm	187 **Adam Wilmot** GHD Pty Ltd *A collaborative approach to introduce innovative technology for Road Agencies*	98 **Sue McMillan** Government of South Australia *Safer School Precincts - The Power of Partnerships in Creating Change*		20 **Will Warner** Transport for New South Wales *Implementing Safe System Treatments in NSW School Zones*	73 **Paul Durdin** Abley *The Folly of Using an Outcome to Predict the Future*		
12.20pm – 12.40pm	229 **Chris Jurewicz** Transport Accident Commission *Risk assessment of rural intersections based on predictive modelling*	199 **Janine Ferris** University of Waikato *"My ideas are important too!": Student perceptions of a critical pedagogical transport safety education experience in rural Australia*		252 **Eric Chalmers** KidSafe ACT *Wildlife crashes – an epidemic?*	179 **Teresa Williams** Road Safety Commission *Community participation in road safety policy development and strategy planning*		

12.40pm - 1.40pm	**Lunch, Exhibition & Poster Displays** Room: Halls MN						
1.40pm - 3.00pm	**Concurrent Sessions 7**						
Room	**Hall L**	**City Room 1**	**City Room 2**	**City Room 3**	**City Room 4**	**Room L2**	**Room L3**
Chair	*Angela Watson*	*Narelle Haworth* *Louise Cosgrove*	*Eric Chalmers*	*Sam Doecke*		*Mario Mongiardini*	
Topic	**Hospital Data and Medical Review**	**Attitudes and Behaviours**	**Workplace**	**Child Restraints** ***Session sponsored by SA Government***		**Connected and Automated Vehicles**	
1.40pm – 2.00pm	221 **Kate Curtis** University of Sydney *The Australia New Zealand Trauma Registry – Transport-related trauma*	37 **Anna Crump** Royal Automobile Association of South Australia (RAA) *Community attitudes towards road safety initiatives in South Australia*	213 **Martin Small** Martin Small Consulting *Deployment of WHS Guidance on Vehicles as a Workplace*	83 **Sam Doecke** University of Adelaide *Child restraint misuse and injury outcomes observed in at-scene in-depth crash investigations in South Australia*		172 **Matthew Albrecht** Curtin University *Western Australian Drivers' Use of And Attitudes Toward Advanced Driver Assistance Technologies*	
2.00pm – 2.20pm	154 **Anna Devlin** Monash University *The Road to Recovery for Vulnerable Road Users Hospitalised for Orthopaedic Injury*	228 **Sue Tucker** *The ESRA2 survey Comparing Australian road safety performance with European countries*	127 **Adrian Stephenson** New Zealand Transport Agency *Shift working driver fatigue programme – a pilot programme to raise awareness and motivate change among employees and employers*	97 **Margaret Howard** State Government of South Australia *Putting child restraints at the heart of a safety culture in remote Aboriginal communities: a (modified) human-centred design approach*		211 **Prasanna Prabhakharan** UNSW *Education and Training Requirements for Drivers of Automated Vehicles in Australia and New Zealand*	
2.20pm – 2.40pm	143 **Yeewah Yam** Royal Automobile Club of Victoria *Exploring policy and support strategies to improve experiences of the VicRoads medical review process*	38 **Claire Dixon** Auckland Transport *Te Ara Haepapa- Maori road safety education programme*	67 **Ross Blackman** Queensland University of Technology *Use of Truck-Mounted Attenuators in Short Term/Mobile Lane Closures: Operator Perspectives in Southeast Queensland*	110 **Fiona Frost** Blacktown City Council *"Would you like fines with that?" Changing attitudes to use of carseats in a low-income community.*		248 **Jeremy Nassau** Transurban Connected vehicle solutions for safer roadworks	

2.40pm – 3.00pm	138 **Ben Horan** McLean Care *Hector VR®: Harnessing Co-Design Principles to Build A Mixed Reality Driving Simulator for Older Drivers*	152 **Mark Stevenson** University of Melbourne *The effects of driver feedback and financial incentives on driving behaviours: A randomised control trial*	208 **Joel Tucker** RACQ *Flashing Lights for Assistance Vehicles – Is Red Best?*			207 **Michael Pascale** Queensland University of Technology *A Human Machine Interface for the Ipswich Connected Vehicle Pilot*	
3.00pm - 3.30pm	**Afternoon Tea, Exhibition & Poster Displays** Room: Halls MN						
3.30pm - 5.00pm	**Plenary 5** **Conference Review** Room: Hall L MC: **Associate Professor Jeremy Woolley** (Co-chair, ARSC2019) **3M Diamond Award Recipient, 2018** **Ms Christine Thiel** (Northern Territory Motor Accidents (Compensation) Commission (MACC)) **Conference Wrap Up** **Associate Professor Jeremy Woolley** (Co-chair, ARSC2019) **Presentation of the Conference Awards for Best Papers/Posters/Presentations** **Dr Matthew Baldock** (Chair, ARSC2019 Scientific Sub-Committee / Deputy Director, Centre for Automotive Safety Research) 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 Award - $1,000 plus certificate + NRSPP Thought Leadership Piece & Webinar - Sponsored by NRSPP 9. People's Choice Award 10. Exhibitor Passport Prizes 11. Lucky Door Prizes **Invitation to ARSC2020** **Mr Chris Brennan** & **Dr Jeff Potter** (Co-chairs, ARSC2020) **Thank you and Goodbye** **Mr Martin Small** (President, ACRS / Co-chair, ARSC2019)						
5.00pm	**Conference concludes**						

Extended Abstract Number	Author(s)	Topic	Title	Abstract
4	Hirsch, L. Mackie, H. McAuley, I.	Road Environment Crossings (Pedestrian, School, Rail, Rural/Animal) Pedestrians Crash Data Analysis	Understanding the Safe System context behind pedestrian road trauma in New Zealand	In 2016 in New Zealand, pedestrians accounted for 7.6% of road fatalities and 6.6% of serious injuries (Ministry of Transport, 2017). The aim of this research was to understand the Safe System factors associated with pedestrian deaths and serious injuries. A sample of 100 pedestrian fatality and 200 serious injury crash reports from 2013-2017 were analysed to identify the involvement of the Safe System factors in each crash case. The research identified common crash typologies and highlighted the need for improvements in speed management, environmental design, safer vehicles, safety campaigns, and infrastructure design. In addition, the research identified latent high-order system factors that obstruct the mechanisms to effectively address these Safe System issues and which ultimately perpetuate the occurrence of pedestrian deaths and serious injuries.
5	Friswell, R. Williamson, A.	Fatigue Workplace and Work Related Road Safety Fleet Safety	Management of queuing and waiting for truck drivers by road transport customers	Time spent queuing and waiting for loading and unloading at customers' premises can contribute to fatigue risk for long distance truck drivers yet the nature, constraints and effects of practices used to manage queuing and waiting by customers in Australian states that have adopted national fatigue management laws are undocumented. Drivers and company representatives were interviewed to elucidate queuing and waiting management practices. The results suggest drivers can experience poor management of queuing and waiting regularly and customer companies have viewed their role as preventing breaches of the law rather than managing fatigue risk.
6	Newnam, S. Xia, T. Koppel, S. Collie, A.	Older Drivers & Road Users Workplace and Work Related Road Safety Fleet Safety	Work-related injury and illness among older truck drivers in Australia: A population based, retrospective cohort study	This study explores the landscape of work-related injury and disease in the Australian transportation industry. This population based, retrospective cohort study was based on claim data collected from the National Dataset for Compensation-based Statistics (NDS) in Australia. Three key findings were identified: the relative risk of workers' compensation claims increased with age; older truck drivers were not found to have significantly higher rates of musculoskeletal (MSK) or fracture injuries, and; older truck drivers had a significantly larger proportion of neurological injury compared to younger age groups. The findings of this research support the need for context sensitive, multi-domain, interventions targeted at older drivers.
7	Thompson, P.	Drug Testing Enforcement Technologies	CREATING EFFICIENCIES IN ROADSIDE DRIVER DRUG TESTING	Driver drug testing is expensive and how the task is undertaken creates demand on police and the public. South Australia Police (SAPOL) has implemented efficiencies to reduce demand and cost in the drug testing process whilst increasing detections. This paper will present the success of changes implemented in South Australia to improve efficiencies in the roadside drug testing program. The outcomes of these changes have been economic improvements in both capital and operating costs, a reduced demand on police and the public, an increase in detections and a more simplified process to the previous model.
8 (also Full Paper)	Imberger, K. Watson, A. Kaye, S.A.	Speed, Speeding & Travel Speeds Penalty Systems Statistical, Epidemiology and Other Road Safety Research Methods	The effect of sanctions on Victorian speeding drivers See also: https://doi.org/10.33492/JACRS-D-19-00244	Speeding is a major contributor to deaths and serious injuries. To assist in speed countermeasure development, an examination of speeding offenders' characteristics, re-offence and casualty crashes during and after periods of licence sanctions was undertaken. These analyses aimed to determine the effects of the following sanctions: licence bans; the increase in speeding ban periods and demerit points for higher level speeding offences; additional demerit point bans for high-range offenders in addition to a 12-month speeding ban; and the good behaviour bond available as an alternative to licence suspension after reaching the demerit point threshold.
9 (also Full Paper)	Imberger, K. Poulter, C. Regan, M. Cunningham M.L. Paine, M.	Distraction & Inattention NCAP And Consumer Test Ratings	Development of a distraction safety rating system for the in-vehicle human machine interface See also: https://doi.org/10.33492/JRS-D-19-00243	Drivers engage in a wide range of non-driving related tasks while driving that have potential to distract them and compromise their safety. These include interactions with infotainment systems built into the vehicle by vehicle manufacturers. Tasks can include communication, entertainment, navigation and internet browsing. Performing these tasks can degrade driving performance and increase crash risk. Not all infotainment technologies in new vehicles are equal in terms of their potential to distract. This paper documents the findings of a study commissioned by VicRoads to develop a test protocol for rating the distraction potential of new vehicles entering the Australian market. A Road Map is presented with options for introducing it as a consumer or NCAP distraction rating.
10	Glendon, I. Lewis, I.	Speed, Speeding & Travel Speeds Driver Psychology Education – general and other	Field testing anti-speeding messages	On a 60mph section of road that included a 40kph school zone, speed detection devices were installed prior to, immediately after, and further away from variable message signage (VMS) displaying antispeeding messages. Speed data (>250,000 vehicle movements) were collected continuously prior to VMS installation (week1), during message display (week2), and post-display (week3). Speed reductions associated with VMS deployment from week1 to week2 were partially sustained at week3.
11	Peel, B. Green, D. Bennett, S.	Drink Driving Enforcement Programs	Building policing legitimacy and strengthening community relationships: On the road towards zero with IM_PACT	The IM-PACT initiative between the Queensland Police Service and University of Queensland offers a resource efficient problem-solving model founded on three principles: (I) Identification of the problem; (M)essage development; and message delivery (PACT). PACT prompts police to explain the (P) Purpose of an engagement, (A) Acknowledge good habits, convey a (C) Crime message and (T) Thank people for their involvement. With minimal impact on resources, PACT-related Random Breath Testing (RBT) affords opportunity to share responsibility for road safety and crime prevention by both police and the community. This presentation provides the audience with an RBT experience incorporating the PACT message.

13	Norberg, T. Upton, C. Gerakios, S. Louder, D.	Road Safety Strategy Road Safety Programs School Safety Communication and Media	The challenges of coordinating a multi-agency safe systems approach in Local Government Road Safety	Local Governments (LG) face challenges in managing road safety. The biggest is the coordination of numerous stakeholders from multi-agencies, each with their own perspectives and organizational constraints. In GMC the responsibility falls with the Road Safety Officer (RSO). Inhibiting factors for road safety at LG level include: lack of immediate funding stream, strict adherence to engineering guidelines, lack of resources, unrealistic expectation of stakeholders, the “blame” factor and invested interests. This paper will show how the key to a successful safe systems outcome is the RSO’s ability to negotiate an evidence-based solution agreed by all stakeholders.
14	Albuquerque, F.D.B. Awadalla, D.M. Elzaher, A.H.	Road Furniture (Poles, Signs, Etc) Intersections and Roundabouts Safer Mobility Safer Transport & Mobility	Mobility Versus Safety: The Issues Related to Traditional Road Design/Traffic Analysis Approach Illustrated in Two Abu-Dhabi-Based Case Studies	Car transportation is highly inefficient and strikingly unsafe. Hence, policy and design priorities should focus on other, more sustainable transport alternatives. This paper explains how standard road design guidelines may lead to evermore-inefficient road transport. Secondly, the paper shares two recent, road-transport-impacting decisions made in the Emirate of Abu Dhabi. Based on on-going roadside and intersection safety studies, it is concluded that these recent decisions may be negatively affecting road safety. Finally, the paper discusses why such decisions may be classic examples of how mobility improvement may come at the expense of road safety deterioration.
15	Dimeco, A. Bennett, J. Batchelor, J.	Driver Risk Driver Psychology Young Drivers Policy Development And Implementation	Risky Driving: The Role of Cognition in Youth	Youth (aged 15 to 24 years), engage in risky driving more than any other age group. Previous research has established a link between cognition and fitness to drive for older drivers. The present study aims to explore these findings in a youth driver sample. 100 undergraduate students completed a cognitive test battery and drives on a simulator. Results revealed global cognitive functioning, executive function and visuospatial skills were related to risky driving behaviors. However due to being below the recommended 80% cut-off scores could not be developed. Future studies should examine cognitive factors in combination with personality and social factors to identify risky young drivers.
17	Jannink, A. Kells, C. Matthews, A.	Distraction & Inattention General Enforcement Enforcement Programs Enforcement Technologies	Prevalence of Illegal Mobile Phone Use on Australian Roads	This paper presents data and information on the prevalence of mobile phone use by drivers across road networks in Australia with the intent to inform enforcement strategies. The data for this study has been obtained by the deployment of fixed and mobile illegal mobile phone use detection cameras. The cameras surveil drivers at particular points on the road network. We find a consistent and high baseline rate of offending that matches closely results of naturalistic driving studies. We present the proportions of drivers using phones by hand, by vehicle type, by passenger count and by time of day.
18	Peregoa, P. Biassonia, F. Ciceria, M.R. Siebert, F.W. Wiczorek, R.	Hazard Perception Pedestrians Road Safety Across Cultures Early Childhood Road Safety	Road crossing behaviour among primary and secondary school students in Tanzania	Tanzanian police reported that in 2016 over 3,381 people were killed on the roads, another 9,549 were injured in road accidents and 30% of all crashes involved pedestrians. This abstract shows the results of a study conducted in primary and secondary schools in the Arusha Region. The students were asked to identify the areas of interest within several road scenarios representing road crossings. The preliminary data analysis suggests that 90% of 205 subjects, aged 8 to 18, identified only left and right areas of the various images without controlling other areas from which other possible dangers could have arisen.
19	Smith, A. Garvitch, J. Clark, K. Amey, J. Christey, G.	Motorcyclists Crash Data Analysis Data Linkage	Police motorcycle crash reports and linkage with hospital trauma admissions in the Midland Region of New Zealand, 2012-2016	Motorcyclists are vulnerable road users and are over represented in trauma statistics. This study linked Police crash data (held by the NZ Transport Agency) and hospital trauma admissions (held by the Midland Trauma System). We investigated possible under-reporting by Police, as well as analysing the demography of those casualties requiring hospital admission but not recorded by Police. Linkage rates and reporting biases are of interest from a policy perspective as information on motorcyclists admitted to hospital, but not recorded by Police, do not contribute to the policy evidence base.
20	Warner, W. Graham, A.	Speed, Speeding & Travel Speeds Road Environment Pedestrians School Safety	Implementing Safe System Treatments in NSW School Zones	Children’s road safety is one focus of working towards zero, and school zones are provided in NSW wherever a school has a direct road access point. NSW has implemented a suite of school zone safety treatments via a series of targeted programs, since school zones were implemented for all NSW schools in 2003. As a result, school zones are now one of the safest areas of the NSW road network. Fewer crashes now occur in NSW school zones, and research indicates that drivers take particular care.
21	McDougall, K. Wilson-Ridley, J. Goodyer, D. Heldon, C. Castles, G. Owen, B.	Fatigue Speed, Speeding & Travel Speeds General Enforcement Enforcement Programs	Kings Highway Road Safety Partnership – “Reduce Speed on the Kings Highway” – Road Safety Campaign	Saving and preserving lives along the Kings Highway is the major focus of the Kings Highway Road Safety Partnership (KHRSP). The KHRSP is an interstate multi-agency, multi-justictional partnership coordinating road safety programs with members from NSW and ACT policing, ACT Government, Transport for NSW and NSW Local Governments. Acting on the Roads and Maritime Services 2012 Kings Highway Road Safety Review, the Partnership capitalised on a $35m road safety engineering program by designing a coordinated behavioural and enforcement program, implemented from 2016-2018 and it saw a reduction in the rate of road trauma on the Kings Highway.
22	Beck, D. Leavy, D.	NCAP And Consumer Test Ratings Motorcyclists Scooters Personal Protection – Helmets, Clothing, etc.	MotoCAP: One year on David Beck, Dan Leavy	The Motorcycle Clothing Assessment Program (MotoCAP) was launched in September 2018 to improve motorcyclists’ safety by providing riders the ability to choose gear based on its relative protection, which should result in increased availability of more protective gear on the market. One year on from the launch, this paper considers the performance of clothing currently on the market, and how consumers and industry have responded to the program.

23	Kaye S.A. Lewis, I. Buckley, L. Rakotonirainy, A.	Driver Psychology Autonomous Vehicles	Examining Queensland Drivers' Priori Acceptability of Conditional and Full Automated Vehicles	This study applied the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM) to assess drivers' priori acceptability of Conditional (SAE Level 3) and Full (SAE Level 5) automated vehicles (AVs). Queensland drivers' (N = 505) were invited to complete a 20 minute online survey. The findings revealed that the TPB predictors of attitudes, subjective norms, and perceived behavioural control and the TAM predictors of perceived usefulness and perceived ease of use explained variance in future intentions to use Conditional and Full AVs.
24	Roberts, P.	Distraction & Inattention	The effect of digital billboards at intersections on driving performance	The impact on driving performance of digital billboard installations at intersections was evaluated. Lane drift and stopping over the line errors were assessed through video recording of vehicle movements before and after activation of the billboards. While it is very plausible that digital billboards at demanding locations will create enough distraction to negatively affect vehicle control performance, the current evaluation found that, in general, vehicle control performance either improved or was unaffected by the digital billboard's presence.
25	Roberts, P. Meuleners, L.	Distraction & Inattention	The effect of dwell time, location and content on the distraction impact of digital billboards	An experiment was conducted utilizing an advanced driving simulator to investigate the effect of three variables on driving performance: • Dwell time (20, 40 and 60 seconds) • Location (verge versus overhead gantry) • Content (complex versus simple) In general, only the 60 second dwell time did not have a negative impact on driver performance. However, the results also demonstrated a number of complex interactions that can be used to assess the relative safety of existing digital billboard installations and proposals for the installation of new digital billboards.
27 (also Full Paper)	Morrison, C. Albuquerque, E.	Policy Development And Implementation Road Safety Strategy Statistical, Epidemiology and Other Road Safety Research Methods	Modelling New Zealand Road Deaths to 2025 See also: https://doi.org/10.33492/JRS-D-19-00246	New Zealand is developing an integrated road safety intervention logic model. This paper describes a core component of this wider strategic research: a baseline model that extrapolates New Zealand road deaths to 2025. The baseline will provide context to what the NZ Transport Agency is trying to achieve. Several time-series models were investigated; these produced a range of forecasts of road deaths in the New Zealand context. In the final modelling an Autoregressive integrated moving average (ARIMA) model and two differing autoregressive distributed lag (ARDL) models were developed. A preferred model was identified and used to forecast.
29	White, M.A.	Drug Driving Driver Risk Policy Development And Implementation Statistical, Epidemiology and Other Road Safety Research Methods	Does cannabis exacerbate the effect of alcohol on the risk of crashing? A close look at the best epidemiological evidence	Does the co-use of cannabis exacerbate the effect of alcohol on the risk of crashing? A literature search identified eleven epidemiological studies of the effect of cannabis on the risk of crashing, where the recent use of cannabis was indicated by the detection of THC in oral fluid or blood. Ten of the studies also investigated interactions between cannabis and alcohol, but only one claimed to have found an exacerbation effect. That study was of questionable validity. The review concludes that there is no good epidemiological evidence for an exacerbation effect.
30	Chevalier, A. Ledger, S. Vecovski, V. Wright, C. Wall, J.	(ITS - vehicles) Intelligent Transport Systems in Vehicles	Early findings from First Australian Connected Light, Privately-owned Vehicle Trial	This Field Operational Test (FOT) involves 55 consenting members of the public having their light vehicles fitted with cooperative intelligent transport systems (C-ITSs) and telematics equipment as part of Transport for NSW's Cooperative Intelligent Transport Initiative (CITI). CITI is the first Australian large-scale, long-term C-ITS initiative. The FOT included three safety alerts: harsh-braking ahead, intersection collision and red traffic light warnings. Participants were evenly split by gender (52.7% males), the majority aged 40-59 years (67.3%, 37/55), and 94.5% had held their driver licence 10+ years. End-of-study survey findings will be presented, including participants' experience of the human-machine interface (HMI).
31	Zayerzadeh, A. Marouf, H.	Distraction & Inattention Pedestrians Road Safety Strategy Safer Mobility	Major Risk Factors Contributing to Pedestrian Crashes in Middle-Income Countries	Walking, an alternative mode of transport, is encouraged because of its health benefits and the reduction in vehicle use. The WHO global status report on road safety 2018, reports that low and middle-income countries (LMICs) have the worst road safety situation, being twice that of highincome countries (HIC's). Vulnerable road users (VRU's) including pedestrians, cyclists and motorcyclists comprise half of these fatalities. This research investigates the major risk factors which may cause fatal pedestrian crashes. 25 international road safety experts completed pedestrian safety related questionnaires. The results were analysed using Ishikawa and AHP methods and showed that street lighting, crossing facilities and proper land use design were among priorities which should be addressed to improve pedestrian safety.
33	Parnell, H. Graham, R. Pearce, A. Jordan, D. Trigwell, M.	Driver Risk Heavy Vehicles - Trucks, Buses, Hazardous Materials Statistical, Epidemiology and Other Road Safety Research Methods	Understanding road user attitudes and behaviours to improve heavy truck safety: Findings from recent NSW attitudinal research	Crashes involving heavy trucks are often more serious because of their size and weight, regardless of who is at fault. An increase in fatal heavy truck crashes in 2017 as well as construction projects in Sydney led to the need for research to help inform future strategy, policy and communications in this space. Mixed-method attitude and behaviour research was conducted among heavy truck drivers, fleet managers, enforcement personnel and other road users. The findings are discussed.

34	Suharto, S. Smith, C.	Road Environment Road Design Road Safety Audit and Road Safety Review Crash Investigation – including investigation methods & technology	The Crash Investigation Alliance – a Gold Coast based shared responsibility influencing safe roads, safe speeds and safe people	The Crash Investigation Alliance (CIA) is localised shared responsibility between the City of Gold Coast (the City) and Queensland Police Service (QPS). The CIA combines its road safety, traffic engineering, fatal crash investigation and enforcement resources to investigate fatal and serious injury (FSI), separate to ongoing QPS investigations. Benefits of the CIA include escalation of crash treatment selection processes, localised post-crash enforcement strategies and reporting to stakeholders for sites where a FSI crash has occurred. This paper aims to describe the CIA's crash investigation process, post-crash strategies and summarise the investigations undertaken since its inception in August 2017.
35	Turner, B. Moon, W.	Road Environment Road Design Road Safety Audit and Road Safety Review	The safety impacts and program benefits of Safe System Assessments	This paper provides results from a project that was intended to identify the estimated Fatal and Serious Injury (FSI) crash reductions application of from Safe System Assessments (SSAs). A sample of 85 SSAs were analysed based on data extracted from the SSA reports. SSAs were undertaken for three different design scenarios – normal designs, high Safe System alignment designs, and mid level planning Safe System designs. The results indicated that an additional 60-100% saving in Fatal and Serious Injury crashes can be achieved by applying Safe System principles via Safe System assessments.
36	Crump, A. Mountain, C.	Older Drivers & Road Users	Importance of vehicle features and in-vehicle technology in the purchase decisions of older drivers'	Advances in vehicle technology may assist older drivers to remain driving for longer and improve the rate of crashes involving older motorists (Yannis, Antoniou, Vardaki, & Kanellaidis, 2010). Therefore, encouraging the adoption of in-vehicle technology by older consumers is vital. An online survey was used to explore the importance placed on vehicle features by older drivers, and to investigate the uptake of advanced vehicle technologies. The study identified vehicle safety features as the most important purchase consideration for older motorists, followed by the manufacturer's credentials. Most would consider reversing cameras, blind spot monitoring and adaptive cruise control essential features in a new vehicle purchase.
37	Crump, A. Mountain, C.	Road Safety Strategy Road Safety Programs	Community attitudes towards road safety initiatives in South Australia	Community support is essential to achieve National and State-based road safety targets. An online survey was used to explore attitudes towards road safety and enforcement strategies used in South Australia (SA). The study identified that a significant proportion of the community are more concerned now regarding the road toll than they were in the past. Driver distraction and impatience are considered the leading contributors towards the state road toll, and community members believe that visible policing and driver training are amongst the most effective strategies for reducing the number of road crashes.
38	Dixon, C. Elisaia-Hopa, R. Delamere, M.W.	Indigenous Road Safety Community Programs Road Safety Across Cultures Road Safety Programs	Te Ara Haepapa- Maori road safety education programme	Te Ara Haepapa (The Journey) was developed in 2017 to address the high proportion of Maori (indigenous people) involved in deaths and serious injury road crashes in Tamaki Makaurau, Aotearoa (Auckland, New Zealand). It is the only comprehensive Maori road safety programme in Aotearoa delivered via Marae (community meeting places), Kur (schools), Kohanga (pre-school) and community. The programme is delivered within a holistic Maori cultural context by fluent Te Reo (Maori language) speaking staff and covers a wide range of high-risk road safety prevention themes, including child restraint and seat belt use, sober driving, speed and Driver Licensing. This presentation highlights the cultural approach used to successfully engage the uptake of formal Driver Licensing amongst hard-to-reach at-risk young Maori drivers in Tamaki Makaurau in the past two years 2017 and 2018.
39	Hoey, C. Bannon, S. Beer, K.	Motorcyclists Crash Data Analysis	Making Tasmanian Roads Motorcycle Friendly: Lake Leake Road Demonstration Project	Lake Leake Road, a popular Tasmanian motorcycle touring route, also presents as the State's highest risk motorcycle road. To consider optimum risk mitigation strategies: (a) experienced motorcycle riders alongside road safety auditors both examined the road on instrumented bikes that recorded road conditions and the riders' observations; and (b) the results were workshopped with representatives from major stakeholder groups. This method is observed to have both technical validity and social validity by covering all of the elements of the Safe System – Safer Roads, Safer Speeds, Safer Vehicles, Post-Crash Care and Safer People.
40	Gardener, R. Newton, J. Wood, G. Cameron, M. van Lamoen, N. Wentworth, I.	Speed, Speeding & Travel Speeds Communication and Media General Enforcement	Safer Summer – the Public Perceptions and Efficacy of a 4-Year Enhanced Speed Enforcement Programme	Safer Summer is an enhanced speed enforcement partnership between Accident Compensation Corporation and NZ Police. Safer Summer provided tactical social-marketing to complement Police's targeted summer holiday enforcement operations. Safer Summer informed the public of Police's introduction of a reduced speed enforcement threshold over the summer holidays, with the intention of moderating speeds and getting more homogeneous travel flows. Lower speeds were expected to result in safer travel with reduced numbers of crashes and fewer fatal and serious injuries. Share the learnings from this programme using social marketing, advertising, children and poetry to engage the public with Police enforcement.
41	Bennett, J.M. Challinor, K. Modesto, O. Prabhakharan, P.	Driver Psychology Autonomous Vehicles	Blame of Crash Causation Across Varying Levels of Vehicle Automation	The question over "who is responsible" for a crash involving automation has been debated however it is important to ascertain public perceptions in order to guide the development of legal frameworks for managing crashes at varying levels of automation. Undergraduate students responded to a series of vignettes with the automation level manipulated, answering questions about blame. Participants assigned blame to six possible stakeholders (driver, pedestrian, car, government, manufacturer, programmer), with 37.4% blaming the driver in the fully automated scenario. Participants called for either an improvement in or avoidance of automation. These findings have implications for the development of legal frameworks and for trust in autonomous vehicles.

42	Williamson, D.	Road Design IRAP, AusRAP, etc. Policy Development And Implementation	Toward Safe System Infrastructure – Application and Development of Safe System Assessment in Victoria	Safe System Assessment (SSA) is now widely used by VicRoads during the planning and design of road infrastructure projects to assess alignment with Safe System objectives. The methodology closely follows the Austroads framework (Turner et al, 2016). Based on experience and lessons learned when conducting SSAs, VicRoads has developed Safe System Assessment Guidelines which provide enhanced guidance on when, how and who should conduct an assessment. The Guidelines mandate that SSA is to be undertaken on all projects with an estimated cost exceeding $5 million. SSA will also be used to measure safety performance under VicRoads Movement and Place framework.
43	Morris, S. Mihailidis, P.	Intersections and Roundabouts	High Risk Rural Intersection Towards Zero	Intersections pose a significant risk to drivers on the rural road network in Victoria with 41% of total fatal and serious injuries (FSI) occurring at intersections. As such, the Victorian Government has invested $25 million to deliver treatments for over 200 highrisk, high-speed rural intersections. Under the program, government collaborated with road safety consultants in an interactive process to develop and design treatments in a timely manner. The investment is expected to save 17 lives and 177 serious injuries over the average 10-year treatment life with a projected completion date of June 2020. Treatments include side road activated speeds, electronic vehicle activated warning signs, turn lanes and delineation and visibility improvements.
45	Ledger, S.A. Cunningham, M.L. Regan, M.A. Chevalier, A.	Driver Psychology Autonomous Vehicles (ITS - vehicles) Intelligent Transport Systems in Vehicles	Trialling Automated Vehicles: Who, What and Where? Survey Results from Across Australia and New Zealand	To facilitate trialling automated vehicles (AVs), it is important government, industry, and researchers become cognizant of group differences in public acceptance of AVs. The Australian and New Zealand Driverless Vehicle Initiative (ADVI) survey investigated public awareness, understanding and likely acceptance of AVs, and received responses from 5102 Australians and 1049 New Zealanders. Survey results revealed males, younger respondents, Australian Capital Territory (ACT) and inner metropolitan residents are most likely to express interest in participating in trials involving AVs as a partially-automated vehicle driver, or public-transport/ride-share passenger. These findings may inform stakeholders in government, industry and academia planning trials involving AVs.
48	Ledger, S.A. Chevalier, A.	Driver Risk Crash Data Collection Crash Data Analysis Statistical, Epidemiology and Other Road Safety Research Methods	Accelerometer-based Safety Surrogate Measures	A literature review was conducted to identify telematics-detected accelerometer-based safety surrogate measures (SSMs) used in peer-reviewed, published road safety studies. Five types of SSMs were identified, including: longitudinal deceleration, longitudinal acceleration, lateral acceleration, jerk and yaw. Findings for each measure were categorised into those associated with crashes and near-crashes (CNCs) and/or incidents, and those used as SSMs. This presentation will describe these SSMs; discuss the aims, methodology and results of the literature review; and make recommendations for potential SSM definitions and thresholds, and methods for data validation and reduction for use in future on-road driving studies.
49	Fernandes, R. Fry, R. Cavallo, A. Carlon, B.	Policy Development And Implementation Road Safety Strategy	Development of Road Safety Performance Indicators in NSW	Setting evidence-based road safety targets relies on the development of safety performance indicators linked to trauma outcomes. The use of safety performance indicators is an internationally recognised approach to improving road safety management, and are now being developed in NSW. Safety performance indicators will assist in monitoring progress of road safety actions in the Road Safety Plan 2021 and focusing on the key drivers of road trauma so that priorities can be refocused if necessary. They can also assist strategic planning for future activities that will drive further trauma reductions beyond 2021.
50	Thompson, J. Keay, L. Fernandes, R. Fry, R.	Older Drivers & Road Users	Evaluation of the NSW older driver licensing reforms	This evaluation assessed the impact of a set of licensing changes for older drivers that were implemented in NSW in 2008. These changes were designed to balance the safety of road users and the general community with the continuing independence and mobility of older drivers. The evaluation showed that, overall the changes did not negatively impact safety and were generally supported by older drivers and their family members and carers. Opportunities to enhance the current system were also identified.
52	Argus, F. Price, A. Gorell, R. Lajszczak, H.	Intersections and Roundabouts Crash Data Analysis	Data exploration and visualisation of crash risk at Perth Metropolitan Intersections	An issue facing all road agencies is ensuring lives saved per dollars invested are maximised. This isparticularly challenging at metropolitan intersections, where strategic investment choices range between a small number of targeted high-cost treatments and a large number low-cost treatments applied across all metropolitan intersections that share similar characteristics. In order to investigate the above, data exploration and analytics were used to provide insights into the viability of alternative treatment programs. Data visualisation was used to help communicate the data story, which improved understanding and acceptance by our stakeholders and decision makers.
53	Morgan, Z.	Community Programs Road Safety Programs	Implementing a Learner Driver Mentor Program in a Local Government Area - Y Drive	The Y Drive project is a community development project that assists young people reach the required 120 hours driving experience nescessary to achieve their ‘P’ plate licence. The program is aimed at disadvantaged young people who are homeless, Aboriginal, or have no licensed parent or family/carers with a car. Through volunteer mentor support young people are taught to drive correctly, improving road safety, confidence and breaking the cycle of disadvantage with less unlicensed drivers on the road. It also improves life chances by providing connection to work, study and community.
54	Elhenawy, M.M.Z. Larue, G.S. Rakotonirainy, A. Haworth, N.	Statistical, Epidemiology and Other Road Safety Research Methods	Using Random Forest to Test If Two-Wheeler Experience Affects Driver Behavior When Interacting With Two-Wheelers	Drivers are often at-fault in collisions with powered and unpowered Two-Wheelers (TW). In this paper, we propose a framework based on the random forest algorithm to investigate whether TW experience influences driver interactions with TWs. Sixty-nine drivers completed a 10-minute driving simulator session which included five interactions based on common car-TW crash types. The TWs were initially positioned in front of, or at right angles to, the driven vehicle. The proposed framework detected a statistically significant difference between drivers with TW experience and those without despite the small sample size.

55	Hasanat-E-Rabbi, S. Hoque, M.S. Akter, J. McIlroy, R.C. Plant, K.A. Stanton, N.A.	Pedestrians Policy Development And Implementation Road Safety in Developing Countries Crash Investigation – including investigation methods & technology	Where Should We Focus For Road Safety Improvement? Case Study Of a Pedestrian Crash Investigation Using Socio-technical Approach In Bangladesh	Pedestrians, the most vulnerable road user group in road-transport system, are over-represented (about 49%) in road fatalities in Bangladesh. In traditional approaches to road crash investigations, only drivers' speeding and recklessness have been identified as the causes of road crashes. Some other factors e.g. poor road design, vehicle body modification etc. have also been ascertained as secondary causes in small number of investigations by local road safety experts. In this study, a socio-technical systems approach has been employed to investigate a pedestrian crash occurred in Dhaka with an aim to unveil the other factors at higher levels of the road safety system.
56	Hartzell, P.	Road Safety in a Global Perspective Workplace and Work Related Road Safety	ISO 39001:2012 – Road traffic safety (RTS) management systems – Requirements with guidance for use	ISO/TC 241 has developed ISO 39001:2012, which is an important and integral part of the work of the United Nations Road Safety Collaboration/UNRSC and Decade of Action for Road Safety 2011-2020. Reference will be made to parts of ISO 39001 – for information, clarification, purpose and application. Examples of good practice of ISO 39001 will be presented. ISO 39001 is designed to work on its own, parallel or integrated with other ISO MSS, management system standards, in any size or type of private or public organization, to develop a structured and effective Road Traffic Safety/RTS system to save lives.
58	Wilson-Ridley, J.E. Hogg, T. Rzesnicki, E.	Speed, Speeding & Travel Speeds Community Programs Road Safety Programs General Enforcement	Applying safe systems and increasing stakeholder engagement in a community speed education program in Local Government	Analysis of crash data for QPRC network from 2013-2017 identified speed as the top contributing crash factor in 30.9% casualty crashes. QPRC revitalized its speed education program in 2016. A methodical and evidence-based process was adopted for site identifications for courtesy speed checks, a regime of data collection was deployed to evaluate the results and safe systems reviews were implemented for assessing and treating speed locations. Results consistently achieved reductions in 85th speed percentiles on urban roads with the program expanding to country roads. Increased community engagement has been noted along with enhanced involvement of local stakeholders including NSW Police.
59	Brown, M. Scarlet, D. Crofts, A Zmijewski, B.	Road Environment Motorcyclists Road Safety Strategy	Planning for motorcycling – A strategy to manage motorcycle risk on the West Coast of New Zealand	The relative scarcity of motorcycle crashes can result in limited sample size on which to base decisions. This can lead to use of limited or outdated historic information and over focussing of effort on random incidents and locations. By reviewing motorcycle crash records, site features, rider feedback and asset management data it is possible to identify combinations of common underlying risk characteristics for route screening. By interrogating route-wide asset data, a risk-based treatment strategy comprising of a combination of reactive and proactive locations and treatments were determined.
60	Harris, D. Smith, D. Tse, I.	Crossings (Pedestrian, School, Rail, Rural/Animal) Pedestrians Crash Data Analysis Data Linkage	A proactive approach to identifying high risk road corridors for pedestrians in Auckland, New Zealand	Auckland Transport commissioned the development of network-wide proactive risk model to prioritise pedestrian crossing improvements across Auckland. The location of fatal or serious (FS) pedestrian crashes were compared to the location of pedestrian generators, community facilities and road/roadside attributes. Strong relationships were found between FS injury crashes and three road/roadside attributes. A model was developed to identify roads which were high or moderate risk to pedestrians, with 2.3% of the road network prioritised as high-risk accounting for 23.1% of FS pedestrian crashes. Auckland Transport can now apply this model to prioritise pedestrian crossing improvements across the Region.
61	Hodgson, G. McTiernan, D. Imants, P. Chevalier, A.	Road Safety Strategy Crash Data Analysis	Safe System Review of Fatal Crashes in the ACT	The ACT Justice and Community Safety Directorate engaged the Australian Road Research Board to undertake a Safe System review of ten years of fatal crashes in the ACT. The review identified common fatal crash factors across Safe System pillars (roads, speed, vehicles, people, and post-crash care) based on crash data and reports from the Australian Federal Police and Roads ACT. The method developed allowed analysis of crash factors and identification of crash patterns to determine 'gaps' in the System that likely contributed to the cause and/or severity of each crash. Using this, countermeasures were developed to address these gaps across the Safe System pillars.
62	Moran, C.A. Bennett, J.M. Prabhakharan, P.	Driver Psychology Young Drivers Hazard Perception	Hazard Perception and Younger Drivers: The Role of Cognitive Function	Hazard perception is a complex cognitive process that is consistently linked to crash involvement. While research has focused on older populations for which cognitive declines are associated with poorer hazard perception, this study is the first to investigate the cognitive correlates of hazard perception in younger drivers. Ninety-eight undergraduates completed a hazard perception test and battery of cognitive tests. Cognitive function was positively related to hazard perception accuracy and response times; with inhibitory control, visuo-spatial skills, executive functioning and overall cognitive status important predictors of hazard perception. Future research could lead to training programs aimed at improving hazard perception in younger drivers.
63	Moran, C.A. Bennett, J.M. Prabhakharan, P.	Hazard Perception Novice Driver/Rider Licensing Driver/Rider Training	Road User Hazard Perception Tests: A Systematic Review of Current Methodologies	Hazard perception has been linked to crash risk with novice/younger road users poorer at hazard perception than experienced/older road users. Hazard perception testing is included in many licensing systems. This systematic review synthesises studies of hazard perception test methodologies in order to determine best practice. A search resulted in 48 studies that contained a hazard perception test methodology (video, static image, simulator, test-drive) and discriminated between road users (car drivers, motorcyclists, bicyclists, pedestrians) based on age and/or experience. Despite a high degree of heterogeneity, results suggest current driver hazard perception testing could be enhanced, with specific recommendations made for motorcyclists and vulnerable road users.

65	Wall, J.P. Sakar, S. Lewandowski, V. Hayes, P. Legg, S. Banyer, G. Gavin, A. Jansen, A. Higgins-Whitton, L. McCaffery, T. Willoughby, J. Carlon, B.	Distraction & Inattention Driver Risk Policy Development And Implementation Road Safety Strategy	The testing and evaluation of a vision based automatic detection system for illegal phone use by drivers in Australia	Naturalistic driving original studies have shown a range of crash risks associated with hand-held mobile phone use. One study found that mobile phone use during or shortly before a casualty crash increased the risk of the crash occurring by four times. Hand held phone use is illegal in Australia but until now enforcement options have been limited to direct intervention by a police officer observing illegal mobile phone use. In 2018, Transport for NSW (TfNSW) embarked on a project to find a camera technology detection solution for this road safety issue.
66	Bailey, T. Wundersitz, L. Raftery, S.	Young Drivers Novice Driver/Rider Licensing	Underlying factors in the take-up of active travel for young adults	Since at least 2000, declines in young adult driver licensing have been observed in several overseas countries and in some Australian jurisdictions. This study investigates driver licensing trends in South Australia since 2009 for those aged 17-24 years, in comparison to other age groups and equivalent Victorian data. Importantly, the trends are examined in relation to gender, location of residence and socio-economic status. The findings will have implications for future planning around safe active travel, shared vehicle use and public transport initiatives.
67	Blackman, R. Debnath, A.K.	Driver Risk Temporary Road Works Crash Avoidance and Crash Severity Reduction Workplace and Work Related Road Safety	Use of Truck-Mounted Attenuators in Short Term/Mobile Lane Closures: Operator Perspectives in Southeast Queensland	Truck-mounted attenuators (TMAs) are deployed to provide positive protection for roadworkers and reduce the impact of vehicle intrusions into work zones. The aim of this research was to explore operational issues and perceived effectiveness of TMAs from the perspective of TMA operators in Queensland, Australia. Participants perceived TMA deployment procedures as sufficient overall, but concerns were expressed about lack of driver awareness, inappropriate driver behaviour, and consistency of deployment. In the first research focusing directly on driver behaviour and TMAs in Australia, the interviews revealed TMA operators' perspectives on risks and hazards associated with TMA use, as well as the supporting safety measures deemed most effective.
68	Ezcurra, P.T. Murphy, T. Mountain, C.	Driver Risk Community Programs Driver/Rider Training Education – general and other	Understanding Driving Challenges and Engagement Opportunities to Improve Local Driving Knowledge of Newly Arrived International Drivers and Migrants	There is strong public opinion regarding tourists and international drivers posing a high risk on South Australian (SA) roads. While there is little information and publicly available data about international drivers' involvement in SA crashes, there are experiences, stories and anecdotes that indicate road safety is an issue for them due to their limited local knowledge. International drivers settling in SA were surveyed to understand their pain points, challenges and interests after driving on the state's roads. The study investigates how they prepared to face the roads in SA, what are their most stressful situations and their recommendations for others.
69 (also Full Paper)	Blackman, R. Haworth, N. Biggs, H. Wishart, D.	Motorcyclists Road Safety Strategy Driver/Rider Training	Review of Post-Licence Motorcycle Rider Training in New South Wales See also: https://doi.org/10.33492/JRS-D-19-00069	Fully licensed motorcyclists represented over two thirds of riders killed on New South Wales (NSW) roads from 2010 – 2014. An ongoing need to address crash risks among this cohort is recognised and there is strong support for post-licence rider training (PLRT) among rider advocates and stakeholder groups. This research examined the PLRT environment in NSW to assess the extent to which NSW PLRT courses targeted identified rider skills and competencies. A desktop review of available courses was supplemented by interviews with training providers. A wide range of courses was identified, most of which appeared to potentially support rider risk management.
70 (also Full Paper)	Zurlinden, H. Baruah, A. Gaffney, J.	Hazard Perception Data Linkage	Towards linking driving complexity to crash risk https://doi.org/10.33492/JRS-D-19-00070	Complementary to classical road safety approaches aimed at improving infrastructure, there is growing evidence about the relationship between motorway crashes and traffic conditions. Unstable or congested flow can drastically increase cognitive workload for motorists which, combined with reduced freedom to perform needed maneuvers (e.g. lane changes), increases crash risk. While these conditions are usually described by macro factors such as average traffic speed, modern vehicle detection technologies allow analysis of individual vehicle behaviors (micro level). This paper discusses the value of refined detection and analysis methodologies to develop Intelligent Transport System based road safety improvement strategies.
73	Durdin, P. Turner, S. Zia, H.	Policy Development And Implementation Road Safety Strategy Crash Data Analysis	The Folly Of Using An Outcome To Predict The Future	If we are to reach the Vision Zero goal where no lives are lost on our roads, then a paradigm shift is required in the way we approach many aspects of road safety. This paper examines the predictive robustness of using historic crash to forecast future crash occurrence and compares it to a proactive risk approach. The findings provide compelling evidence that reactive approaches relying on crash history should be a secondary consideration to proactive risk-based approaches in both the identification of high-risk locations and the assessment of interventions.
76 (also Full Paper)	Hovenden, E. Zurlinden, H. Gaffney, J.	Road Environment (ITS - roads) Intelligent Transport Systems in Road Infrastructure Crash Data Analysis Data Linkage	Safety on Congested Urban Motorways See also: https://doi.org/10.33492/JRS-D-19-00247	The metropolitan Melbourne motorway network carries 40 per cent of urban arterial road travel and casualty crash numbers have been increasing despite a decreasing trend on other urban roads. Infrastructure is rarely mentioned in Police crash reports as being involved in the urban motorway crashes, rather mention is made about traffic conditions and vehicle-to-vehicle interactions. Analysis was undertaken to test the hypothesis that the dynamic of the traffic flow, which causes congestion and requires complex driver responses, is a significant component of the casualty crash problem. A relationship between 'traffic state' and crashes was observed.

77	Timms, M. Corboy, M. Toynton, R.	Road Safety Strategy General Enforcement	Leading Law Enforcement Towards Zero: NSW Police Force Road Policing Strategy 2021	In response to the release of (the NSW Government) Road Safety Plan 2021, New South Wales Police Force (NSWPF) has developed Road Policing Strategy 2021. The plan, devised by NSWPF Traffic and Highway Patrol Command, does not simply rebadge the objectives contained in the Road Safety Plan 2021 with a police logo, but commits NSWPF to an ambitious plan of general road safety deterrence and specific road policing activity. The Road Policing Strategy 2021 is our roadmap to achieving the objectives of Road Safety Plan 2021 and the integration of Towards Zero/Safe Systems into NSWPF business-as-usual.
78	Filardo, L. Graham, R. Fernandes, R. Everingham, S. Douglas, N. Sharma, D.	Communication and Media Education – general and other	New approach to road safety advertising in NSW supporting Towards Zero	Road safety advertising, alongside other measures, has helped reduce the NSW road toll over time. To support implementation of the new Road Safety Plan 2021, which includes a vision of zero road trauma by 2056, a new road safety advertising strategy is being developed. NSW's traditional approach of focusing mostly on road users' behaviour will evolve to the use of greater positive appeals that focus on all parts of the 'Safe System'. This will help provide the community an understanding of all factors that reduce road trauma on NSW roads and position road safety as a shared responsibility.
80	Amoh-Gyimah, R. Haupt, J. Price, A. Lajszczak, H.	Road Environment Road Safety Strategy Safer Mobility Safer Transport & Mobility	Application of Infrastructure Risk Rating (IRR) to Support Speed Limit Reduction in Western Australia	The Infrastructure Risk Rating (IRR) methodology developed in New Zealand assesses road safety risk based on infrastructure, roadside hazards and land use elements. The methodology was applied to 110km/h posted speed limit state roads in Western Australia (WA) to support speed limit review. After identifying medium to high-risk road sections based on IRR scores, stakeholders reviewed the results, considering route hierarchy, surrounding network and implementation issues. As a result, a number of road sections were identified as priority sections that warrant speed limit reduction.
81	Rasch, A.	Driver Psychology Young Drivers Road Safety Programs Driver/Rider Training	From hindrance to help – parental influence in novice-driver education	Funded by the Australian Government and sponsored by Australia's motoring clubs, Keys2drive aims to reduce the high crash risk for newly-licensed drivers by providing free one-hour lessons to novice drivers and their parent/supervisor. Inclusion of parents in Keys2drive lessons is compulsory and underscored by research showing that the depth and breadth of parental involvement in novice-driver education is an important factor in its effectiveness (Masten & Chapman, 2003). In 2019, Keys2drive commissioned new research to measure, among other things, parents' confidence, attitudes, skill and readiness to supervise a novice driver. The research highlighted a need for ongoing upskilling of parents to improve safety outcomes.
82	Elsegood, M. Doecke, S. Ponte, G.	Speed, Speeding & Travel Speeds Restraints Crash Data Collection Crash Data Analysis	Collection and Analysis of EDR Data from Crash Involved Vehicles	Event data recorders (EDRs) are installed in many modern vehicles and, in the event of a crash, record driving data such as travel/impact speed, Delta-V and restraint usage. EDR data was collected from 312 crashed vehicles in South Australia during 2017 and 2018, and 238 of these could be matched to police reports. An analysis on speeding and seatbelt usage showed that 27% of free-speed vehicles were speeding and indicated that seatbelt wearing rates in crashes is close to 97%. EDR data provides a more accurate indication of levels of speeding in crashes than available from police reports alone.
83	Doecke, S. Dutschke, J.K.	Child Restraints Crash Data Collection Crash Data Analysis	Child restraint misuse and injury outcomes observed in at-scene in-depth crash investigations in South Australia	Twenty-three children aged 0-7 who were legally required to be in a child restraint were involved in accidents investigated as part of CASR's at-scene in-depth crash investigations between late 2014 and 2018. Correctness of child restraint use, injury outcomes and crash severity (Delta-V) were determined. Thirteen (57%) of these children were confirmed to be in an age appropriate restraint that had the top tether attached (if required). Three (13%) were in age inappropriate restraints. Six (26%) were in restraints without the top tether attached to the anchor. In a high Delta-V crash, the injuries were much more severe for a child in an untethered restraint compared to a tethered restraint.
84	Liakos, J. Waller, L.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure	Dynamic Speed Management in a Managed Motorway Environment	Transurban operates managed motorways, including Melbourne's CityLink which connects to public motorways in the north, south and west of the city. Managed motorways offer many benefits by optimising the network, enabling safe and reliable journeys for road users. Transurban implemented the Dynamic Speed Management Trial in 2018, increasing the default speed limit from 80 km/h to 100 km/h in off peak periods when deemed safe to do so. Baseline data including crashes, incidents and speed compliance were captured prior to the trial and continually measured during the trial. This extended abstract and presentation will report on the trial findings and learnings.
86 (also Full Paper)	Doecke, S. Thompson, J. Stokes, C.	Speed, Speeding & Travel Speeds Driver Risk Intersections and Roundabouts Crash Data Collection	How do we prevent and mitigate crashes? Results from 116 at-scene in-depth crash investigations See also: https://doi.org/10.33492/JRS-D-19-00254	The Centre for Automotive Safety Research's conducts at-scene in-depth crash investigations in South Australia that allow detailed analysis of the crash in order to determine contributing factors to crashes and the interventions that could prevent or mitigate them. This initial analysis of such a dataset (n=116) showed that the most common contributing factors are human errors, but the interventions to prevent or mitigate the crashes are most commonly infrastructure treatments or vehicle technologies that eliminate the human error and/or reduce the vehicle's speed prior to impact in the event of a human error.
87	Fry, R. Christian, F. Hodge, W. Wakelin, D. Hart, K. Wilkinson, R. Higgins-Whitton, L. Beck, A.	Drink Driving Policy Development And Implementation	Process evaluation of the NSW Mandatory Alcohol Interlock Program	A process evaluation of the NSW Mandatory Alcohol Interlock Program aimed to assess program implementation, improve program delivery and refine policy settings. The evaluation found the rollout was an overall success and sentencing patterns reflected the intent of the legislation. Noncompliance offences were very low (<1%). The participant survey showed 82% of respondents approved of the program, though the take-up rate for the Interlock licence (54%) could be improved. Participants said that the Interlock licence helped them separate drinking from driving and maintain work and family commitments. However, the cost of the device was a common concern.

88	Ponte, G. Wundersitz, L.N.	Distraction & Inattention	Exploring the prevalence of in-vehicle distraction in moving traffic: A pilot study	Video from four locations around Adelaide was examined to code distracted behaviours of drivers moving in traffic. A total of 920 drivers were observed of whom 8.9% were engaged in one of 16 in-vehicle behaviors that were classified as a distraction. The more significant driver distractions included using mobile phones (2.5%), holding an object (1.8%) and eating or drinking (1.5%) while driving. This pilot study demonstrates that there is camera technology suitable for observing distracted driving behaviour among drivers in moving traffic on public roads in South Australia, which could potentially be deployed for a larger, more representative study.
89 (also Full Paper)	Capper, B. Matters, B. Steinmetz, L. Turner, B.	Road Design Intersections and Roundabouts Road Safety Audit and Road Safety Review	Use of the Safe System Assessment Framework as a Safety Key Performance Indicator See also: https://doi.org/10.33492/JRS-D-19-00260	As part of the Northern and South-Eastern Suburban Roads Upgrade packages Major Road Projects Victoria has sought to incorporate road safety metrics into the design review process. The Australian Road Research Board employed the Safe System Assessment Framework to meet this need. Thirteen road project reference designs were assessed to provide baselines scores. Once received, respondents' concept designs will be likewise assessed to provide a comparative metric of road safety performance. This work provided an extension in use of the Safe System Assessment Framework as well as insights into current gaps in road safety design practice.
90	Logan, D.B. Candappa, N. Houghton, H.	Road Safety Barriers	Anatomy of a wire rope safety barrier impact	Carriageway departure crashes make up a significant proportion of fatalities and serious injuries in regional Victoria. Wire rope safety barrier (WRSB) is a proven countermeasure, eliminating 80-90% of serious trauma when fully installed. To demonstrate its life-saving benefits, the TAC staged a 'typical' fatigue-related crash on a public road under controlled conditions, driving a passenger vehicle into a WRSB at 87km/h at a 7-degree angle, while filming and making measurements. The vehicle was effectively contained by the WRSB, disengaging at 46km/h with decelerations well within tolerable levels. The test demonstrated the effectiveness of WRSB and will be used to validate future simulations aimed at improving WRSB design.
91	Dua, A. Bojeen Brifkani, B.Engg. Civil	Road Environment Intersections and Roundabouts (ITS - roads) Intelligent Transport Systems in Road Infrastructure Road Safety Strategy	Effectiveness of the Rural Junction Activated Warning System (RJAWS): Case Study-South Australia	In 2018, the Department of Planning, Transport and Infrastructure completed the trial project of installing rural junction activated warning system (RJAWS) at four rural intersection locations in SA. The RJAWS is an innovative road safety treatment designed to reduce the speed of traffic on the main road by the presence of side road traffic to provide advanced warning to reduce the likelihood and severity of a crash at an intersection. The speed decrease has been chosen in consideration of the Safe Systems approach. The selected locations were identified as high risk locations and these locations would normally require significant and costly work to treat the locations otherwise. Before and after speed study indicates that the system is effective in reducing the speed limit on the intersection approaches although more data analysis is required to confirm that which is currently underway.
92 (also Full Paper)	Hovenden, E. Liu, G.J.	Crash Data Analysis Data Linkage Statistical, Epidemiology and Other Road Safety Research Methods	Use of Spatial Analysis Techniques to Identify Statistically Significant Crash Hots Spots in Metropolitan Melbourne See also: https://doi.org/10.33492/JRS-D-19-00249	Traditional statistical techniques have limitations in analysing crashes as these techniques assume spatial independence and stationarity. Crashes break these assumptions as they tend to cluster at specific locations (spatial dependency) and vary from one location to another (non-stationarity). Several spatial statistical methods were used to examine crash clustering in metropolitan Melbourne, including the Getis-Ord Gi* method which identified statistically significant crash clusters. Using this method, the degree, location and extent of clustering were found to vary for different crash categories, with fatal crashes exhibiting the lowest level of clustering and bicycle crashes exhibiting the highest level of clustering.
93	Sapkota, J. Dua, A.	Road Environment Intersections and Roundabouts (ITS - roads) Intelligent Transport Systems in Road Infrastructure Road Safety Strategy	A case study on raised intersection platform on urban arterial un-signalised intersection, South Australia	With growing safety concerns for cyclists and pedestrians at metropolitan intersections the Department of Planning, Transport and Infrastructure, South Australia, has committed to trial raised intersection platform as a part of a demonstration project. The objective was to reduce the chance of occurrence of vehicles side impacting (right angle and right turn crashes) cyclists or pedestrians at intersections and also to reduce the severity outcomes in the event of crashes occurring. Raised platform force motorists to slow down when approaching and exiting the intersection. The trial was implemented at only location is the first of its kind on an arterial road in South Australia at the un-signalised intersection of The Parade West and Rundle Street in Kent Town. This study involved before and after comparison of data collected such as speed, traffic, and casualty crashes at treated sites after the platform was installed. There was not much time lapse after treatment, therefore casualty crash rates and crash types by road users group were compared to quantify the safety benefit. This study also involved an observation survey at the site and analysing complaints registered in the department after treatment to see if any unusual events are occurring or likely to occur in future. Speed data analysis shows that the trial was successful in decreasing the speed of the traffic approaching intersection. On average, mean speed decreased from 37.2 km/h to 26.6 km/h and the 85th percentile speed decreased from 47.9 km/h to 34.0 km/h. Likewise, no serious injury crashes between vehicle-cyclist were reported since its installation as compared to two crashes during before period. The project was successful to reduce the approaching speed limit on the intersection close to the survivable speed of 30km/h; outcomes of this study could be replicated at intersections where cyclist or pedestrian movements are high and their safety is critical.
94	Lim, H.	Road Environment Road Design	Delivery of Victoria's Audio Tactile Program	Road safety projects in Victoria have traditionally installed Audio Tactile Edge Lines (ATEL) on high and medium volume rural roads with wide sealed shoulders. A new program is now systematically treating high speed rural road across Victoria, utilising several initiatives to more effectively develop and deliver audio tactile. This methodology has led to the application of Audio Tactile Centre Lines (ATCL) and the development of a technical Road Design Note.

95	Xu, S. Baker, J. Raisianzadeh, H. Gupta, S. Byrganov, A.	Speed, Speeding & Travel Speeds Young Drivers (ITS - roads) Intelligent Transport Systems in Road Infrastructure Policy Development And Implementation	NSW Young Drivers Telematics Trial – methodology, results and potential implications for road safety	The NSW Young Drivers Telematics Trial is a randomised control trial which aims to explore whether, and the extent to which, telematics devices reduce risky driving behaviours among young drivers. Participants are randomly allocated into control and treatment groups, with the latter receiving feedback about their driving behaviour via a LED dashboard display and a mobile phone app. Preliminary results show that the treatment group have lower rates of harsh braking, turning and acceleration compared with the control group. The treatment group also have a lower average speed and are spending a lower proportion of their driving time exceeding the posted speed limit. These preliminary results suggest that the use of telematics to provide feedback to drivers can have a positive effect on driving behaviours.
96	Haworth, H. Schramm, A.	Other Mobility Transport - Scooters, Segways, Quad bikes and SSVs, Horses, etc. Policy Development And Implementation	E-Scooters: Are they a road safety issue?	Electric scooters (e-scooters) have suddenly arrived on roads and footpaths in many cities across the world. There has been huge media coverage and jurisdictions have scrambled to respond to the regulatory challenges they pose. Our observational study in central Brisbane found more than 90% compliance with the requirement to ride on the footpath, although helmet use was low for shared, but not private, e-scooters. These observations suggest that e-scooters are technically not a significant road safety issue according to current road crash definitions and regulations for riding in Queensland and confirm concerns about the injury risks associated with their use.
97	Howard, M. Wilson, J.	Child Restraints Safer Mobility Indigenous Road Safety Community Programs	Putting child restraints at the heart of a safety culture in remote Aboriginal communities: a (modified) human-centred design approach	Child safety restraints undoubtedly are protective of babies and children travelling in cars. For a broad range of reasons their use in remote Aboriginal communities in South Australia is not ubiquitous. On the Right Track Remote has been working with 'The Story Catchers' to capture stories on film from community members and other service providers to understand the complexity of the issue and help to increase the effectiveness of our current child restraints program. The methodological approach has provided us with invaluable learning, insights and inspiration.
98	McMillan, S. Mayes, M.	Road Design Bicyclists Pedestrians School Safety	Safer School Precincts - The Power of Partnerships in Creating Change	It's not always safe or easy for kids to walk, cycle, and scoot to school in Australian urban and regional environments. Parents make decisions about primary school age children's travel modes based significantly on their perception of their child's safety (personal and traffic related). The South Australian Government's Way2Go program's partnership model works with 261 schools and 43 local councils to develop context specific, community led School Travel Plans with identified actions to create and sustain safe school precincts. The presenters will outline the process involved and share evaluation tools, related research, key learnings and examples.
99	Mackenzie, J. Dutschke, J. Van den Berg, A. Elsegood, M. Mongiardini, M. Meuleners, L.	Road Environment Signage & Signalisation Crash Avoidance and Crash Severity Reduction	Assessment of rural road line markings for suitability with Lane Departure Warning	An assessment of line markings in rural WA was performed using vehicles equipped with lane departure warning (LDW) systems. Crossing events were performed by drifting slowly towards the line of interest. A video system was used to record whether a warning was triggered in response. Overall, 189 crossing events were measured with 154 (81%) triggering an accurate warning and 35 (19%) failures. Warning failures were attributed to a range of factors, such as low travel speed or faded line markings. However, in general, LDW systems were deemed capable of providing appropriate warnings in rural road environments where there are suitable line markings.
101	Bartosak, C. Lohmeyer, C.	Speed, Speeding & Travel Speeds Community Programs	Painting a different picture of managing speed: the effectiveness of street murals	The Roopena Street, Ingle Farm South Australia road murals were developed in partnership with community, Salisbury Council and the Department of Planning, Transport and Infrastructure as a 'Living Neighbourhoods' project, in response to speeding issues identified on the local street. Road murals are intended to modify driver behaviour by creating visual cues that alert the driver they are entering a different precinct. A longitudinal study has considered skid resistance, lessons learned, findings and recommendations. This alternative approach to managing speed was found to reduce both the speeds travelled and the number of vehicles exceeding the speed limit on Roopena Street.
102	Beck, B. Perkins, M. Cameron, P. Gabbe, B.	Bicyclists Statistical, Epidemiology and Other Road Safety Research Methods	Single-bicycle crashes driving increases in serious injury rates in cyclists	Increases in rates of single-bicycle fatalities have been reported in Australia and the Netherlands. However, little is known about whether crash counterparts in cyclist crashes are changing over time. This study aimed to investigate temporal trends in serious injury rates in cyclists, with a focus on crash counterparts. Data were extracted from the Victorian State Trauma Registry (VSTR) over the period of 1 July 2006 to 30 June 2018. Increases were observed in the incidence of single-bicycle crashes and collisions with other pedal cyclists. An increased emphasis on these crash types is required to reduce cycling injury rates.
103	Beck, B. Perkins, M. Dietze, P. Nambiar, D. Cameron, P. Pilgrim, J.	Drink Driving Drug Driving	The prevalence of alcohol and other drugs in fatal road crashes in Victoria, Australia	Alcohol and other drugs are known risk factors for road traffic crashes. We performed a populationbased review of road trauma deaths in Victoria between 01 July 2006 and 30 June 2016 using data from the Victorian State Trauma Registry and the Victorian Institute of Forensic Medicine. While road traffic fatalities declined in motor vehicle drivers, motorcyclists and pedestrians, we observed increases in the prevalence of opioids, amphetamines and ketamine in motorcyclists. These data provide important insights that can be used to inform testing regimes and targeted interventions to reduce alcohol and other drug use in all road users.
104	Cosgrove, L.	Child Restraints Road Safety Programs Early Childhood Road Safety	Using maths and science curriculum to increase understanding of how and why correct, age-appropriate child car seat use improves safety	Kids and Traffic, part of Transport for NSW's (TfNSW) Road Safety Education Program, seeks to prevent child road trauma. Kids and Traffic collaborates with educators to develop integrated road safety curriculum, including maths and science, to improve child and adult understanding of how and why child car seats protect children. Findings from the Buckle up Safely Program (Keay et al., 2012) and observational evidence suggest that this approach can improve safety outcomes for children through increasing correct use of age-appropriate restraints. Evaluation now underway will inform professional development and resources to be made available to all NSW early learning centres.

105	Mongiardini, M. Raftery, S.J. Ponte, G. Woolley, J.E.	Bicyclists Legislation and Law Crash Data Analysis	Evaluation of the ACT Government's Safer Cycling Reforms Minimum Passing Distance and Allowance to Ride Across Pedestrian Crossings	Two major components of the ACT Government's safer cycling reforms trial were evaluated: (i) minimum passing distance (MPD) rule and (ii) allowance for cyclists to ride across pedestrian crossings. The evaluation involved analysis of crash and enforcement data during the pre-trial and trial periods as well as pre-trial and post-trial community surveys, correspondence from community members and comments from a cyclist organisation. TheMPD rule has likely improved cyclist safety in the ACT, and overall public awareness and perception of potential cycling safety benefits increased. However, crashes between motor vehicles and cyclists riding across pedestrian crossings also increased.
106	Radalj, T. Sultana, S.	Speed, Speeding & Travel Speeds Safer Transport & Mobility Enforcement Programs Statistical, Epidemiology and Other Road Safety Research Methods	Two Decades of Impacts of Road Safety Strategies on Driver Travel Speed Behaviours on WA Road Network	Thirteen annual speed surveys were conducted on the Western Australian road network over the period 2000 to 2018 to measure impacts of road safety strategies, in particular speed enforcement strategies, on driver speed behaviours on speed limit roads ranging from 50 km/h to 110 km/h. Effectiveness of speed road safety programmes was estimated in terms of changes in speed data indices (speed compliance rates, excessive speeding, 85th percentile and mean speed). When compared to the 2000 survey, the number of speeding drivers recorded in 2018 was reduced up to 73.3% in the Perth metropolitan area, and similarly but to lesser extent in the rural areas. Over the same period WA fatality crash rates have reduced by 47% from 1.07 in 2000 to 0.54 fatalities/100MVKT in 2018.
109	Bamrungwong, C. Kronprasert, K. Wattana, K.	Road Safety Audit and Road Safety Review IRAP, AusRAP, etc. (ITS - roads) Intelligent Transport Systems in Road Infrastructure Road Safety in Developing Countries	Thailand Rural Road Safety Audit System Toolkit	The Rural Road Safety Audit System (RSAS) Toolkit has recently been developed by Department of Rural Roads of Thailand. RSAS is an on-line decision-making tool designed for road safety practitioners to systematically conduct rural road safety improvement projects in Thailand. This paper presents the overview of the RSAS Toolkit. It helps identify hazardous locations on rural road networks using crash data and iRAP Star Rating model, determine safety deficiencies on road sections, and recommending possible short-term and long-term treatments. The RSAS Toolkit shall be a useful tool in preparing road safety improvement program funding applications for rural road projects.
110	Frost, F. Donaldson, G.	Community Programs Road Safety Across Cultures Road Safety Programs	"Would you like fines with that?" Changing attitudes to use of carseats in a low income community.	In late 2018 Blacktown Council was contacted by the local highway patrol sergeant concerned about the large number of infringements being issued for unrestrained children in Mount Druitt. We set about providing education in the community to improve compliance but more importantly to protect the young children in the area.
112	Nguyen, L. Blanks, M. Pham, L. Truong, T. Khun, C. Sidik, M.	Distraction & Inattention Young Drivers Motorcyclists Driver/Rider Training	Reducing distracted driving behavior among university students: the effectiveness of an empowerment-based intervention in Cambodia and Vietnam	Distracted driving is a common risky behavior associated with young motorcycle drivers in Cambodia and Vietnam. This abstract aims to explore the impact of the Safety Delivered program, using an empowerment-based intervention for university students to reduce distracted driving behavior. AIP Foundation launched Safety Delivered, with support from The UPS Foundation, in 4 universities in Phnom Penh (Cambodia), 4 universities in Hanoi and 6 universities in Ho Chi Minh City (Vietnam). The program used multi-faceted trainings, peer-to-peer education, and awareness raising activities. These interventions were successful, leading to substantial improvements in student knowledge, attitudes and behavior at target sites.
113	Lewis, I. Kaye, S.A. Delhomme, P. Forward, F.	Driver Psychology Autonomous Vehicles	Examining drivers' a priori acceptance of Level 4 automated cars: An exploration of drivers in Australia, France, and Sweden	There have been rapid advances in cooperative and automated vehicle (CAV) technologies in recent years. This study, underpinned by the Theory of Planned Behaviour and the Unified Theory of Acceptance and Use of Technology, examined whether there were differences in the intentions to adopt Level 4 automated cars reported by drivers from Australia, France, and Sweden. N = 1563 drivers completed an online survey. The results revealed drivers from France reported significantly higher intentions than drivers from Australia and Sweden. In understanding the factors which influence intentions, insights are provided for future efforts aimed at encouraging adoption of such technologies.
115	Uddin, M.H.M.A. Sarker, M.S. Sarker, S. Biswas, K. Khan, T.A.	Road Furniture (Poles, Signs, Etc) Signage & Signalisation Road Safety Audit and Road Safety Review Road Safety in Developing Countries	Safety Performance Analysis of Road Signage Across Highway: Experience from Existing Road Safety Audit in Bangladesh	Roads with flawed design causing loss of innumerable lives. iRAP assessed Bangladesh's most of the roads as 2-stars or less out of 5-stars indicating significant infrastructural deficiency. Here, road crashes claim 68 lives daily and USD316 million annually. To assess the infrastructural hazard, Roads and Highways Department, Bangladesh, conducted road safety audit on 500km crash-prone highway. It reveals that only 10.4% signages are available than required whereas 21.4 % existing sign are either nonfunctioning or wrongly designed. The evaluation summarized that investment of USD1 million could eliminate this hazard and make roadways safer. This article highlighted those findings and recommendations.
119	Holmes, M.W.	Heavy Vehicles - Trucks, Buses, Hazardous Materials Workplace and Work Related Road Safety Fleet Safety Land Use & Urban Planning	A Review of International Best Practices to Improve Heavy Vehicle Safety in Urban Environments	Road freight is increasing across Australia's major cities due to rapid economic and population growth in urban centres. The increase in urban freight results in greater interactions between heavy vehicles and other road users sharing existing road infrastructure and can introduce road safety risks due to exposure and physical size incompatibilities. Many developed countries have invested in leading approaches to address the risks associated with heavy vehicle freight in urban environments. This presentation highlights the best practices identified and reviewed as part of a 2018 Churchill Fellowship and provides recommendations for governments, infrastructure planners, constructors and developers to consider in mitigating potential road safety impacts with the urban freight task.
120	King, M.J. Alexander, M.	Road Safety in Developing Countries	Capacity building in road safety: What do practitioners think?	The Decade of Action for Road Safety emphasizes the need to build road safety capacity in low and middle income countries. The term "capacity building" was borrowed from other areas of development activity, and in road safety is restricted mostly to training. This presentation reports qualitative research undertaken with the aim of exploring the experiences and opinions of road safety practitioners involved in capacity building activities in low and middle income countries. The findings indicate that there is a need to conceptualize road safety capacity building more clearly, and as a longer term process rather than a short term program.

124	Ram, S. Jose, A.	Intersections and Roundabouts Crash Avoidance and Crash Severity Reduction Motorcyclists	Optimal Size of Roundabout for Safety Considerations	Recently, Indian roundabouts caused hundreds of fatal accidents due to their poor geometrical designs and unconventional driving behaviour. This study addresses safety concerns in roundabouts by analyzing different roundabout in India with varying sizes and traffic conditions. Study also identifies 240 roundabouts in India and 13 roundabouts of varied traffic conditions and vehicular composition are selected.We have investigated all conflict points of variable severities and locations on a roundabout. Research put forward solutions to reduce vehicular conflicts through optimization of sizes. This approach benefitted in reducing 32 conflicts points to 8 on roundabouts in such a way that all fatal conflicts are eliminated.
125 (also Full Paper)	Turner, S. Durdin, P. Mani, S.	Intersections and Roundabouts Road Safety Audit and Road Safety Review	Making Evidence-based Crash Analysis as Routine as Sidra analysis See also: https://doi.org/10.33492/JRS-D-19-00125	Achieving safe system or vision zero outcomes at high-risk urban intersections, especially priority cross-roads and high-volume traffic signals is a major challenge for most cities. Even after decades of crash analysis and improvement works many of these intersections still perform poorly. While best practice for optimising the efficiency of intersections requires the use of modelling tools, like Sidra, this is rarely the case with safety analysis. This is despite the large number of evidence-based safety analysis models and tools that are now available to understand intersection crash risk. This paper outlines the SESAP (Site-specific Evidence-based Safety Analysis Process) that has been developed to enable road safety professionals to estimate and predict the safety of intersections and potential upgrades in New Zealand and Australia.
126	Rusli, R.	Driver Risk Young Drivers	A study on Risk Taking Behaviour among Motorcyclist in East Coast Region, Malaysia	Malaysia has recorded the second largest fatality in road traffic crash in Southeast Asia with 24 road traffic deaths per 100,000 populations in 2015. Motorcyclists are among the highest road user involved in the fatal traffic crashes and mostly are associated with risk taking behaviour. Most of road safety study in Malaysia conducted in west areas or areas with high populated people such as Klang Valley or Shah Alam. This is the first study conducted in the areas with less populated in east coast region. Online survey via Google form has been distributed to the potential respondents. A total of 205 respondents contributed in this survey. This study used descriptive analysis and regression to identify motorcyclist's behaviour towards traffic safety. Results from this study show that 54% of the respondents have personally experienced involving in motorcycle crash. Most of the crash experienced motorcyclist more carefully when riding a motorcycle. 58% of respondent do not agree that experienced motorcycle rider will not be involved in road crashes. More road safety awareness campaign should be conducted especially for motorcyclist in rural areas.
127	Stephenson, A.	Fatigue Education – general and other	Shift working driver fatigue programme – a pilot programme to raise awareness and motivate change among employees and employers	The NZ Transport Agency (NZTA) is developing a driver fatigue programme to educate and gather the information needed to help prevent shift worker fatigue-related car crashes. Employers will get a baseline level of self-reported fatigue from employees before starting and finishing a shift, and how fatigued they are before driving home. Employees will get served education tips before work and when driving home. There is also a suite of products, resources and tools available to help reduce instances of driver fatigue and begin a culture of awareness and action around fatigued driving in workplaces.
128	Bartels, J. Chapman, S. Davern, T.	Young Drivers Novice Driver/Rider Licensing	myLearners – Supporting Victorian Learner and Supervising drivers through a staged approach	VicRoads and the Transport Accident Commission (TAC) developed myLearners, an electronic logbook mobile application and an educational website to support learner and supervising drivers through the learning to drive journey. myLearners can capture data on learner driver trips, send targeted road safety messages and track engagement in the road safety messages and feedback by the learner and supervising driver. This extended abstract will provide an overview of the myLearners product.
129	Ryan, E.	Young Drivers Motorcyclists Community Programs Driver/Rider Training	Full Gear – Community Youth Road Safety Program	The Full Gear Project was co-designed by young people, a local community house and the Glenorchy City Council and aimed to address unsafe/illegal motorcycle riding and to promote positive road safety messaging in the community. This paper explores how social issues and safety issues can be jointly addressed, the role of social workers and other support organisations in addressing road safety with young people and the impacts on the local and broader community.
132	Vaeau, G. Howell, S.	Community Programs Young Drivers	Developing the Drive Community toolkit: Working with community-based groups to support driver licensing education programmes	The Drive Community toolkit, developed by ACC and NZTA working with community groups, extends young driver education resources and supports community-based driver licensing education programmes. Community groups are well-positioned to support harder-to-reach at-risk young drivers through their holistic support services. The award-winning toolkit contains best-practice interactive resources, designed for classroom sessions. These support young adults through the graduated driver licensing system (GDLS) to become safe and skilled drivers. Demand for the toolkits has been high and initial feedback has been extremely positive.
134	Senserrick, T. Oviedo-Trespalacios, O. McDonald, C..	Communication and Media Driver Psychology Novice Driver/Rider Licensing Road Safety Programs	Time to Re-Think Our Approach to Road Safety Education?	In other health-related fields, education regarding risky behaviours has progressed from abstinenceonly ("don't do it") messaging to harm reduction approaches. The latter does not preclude the "abstinence is safest" message, but acknowledges that risks can be inevitable and, therefore, also includes education on ways to reduce potential harms should the risky behaviour occur. Wide adoption of this approach regarding alcohol and other drug use, for example, is associated with improved safety behaviour and reduced harm. We argue road safety education is generally limited to abstinence-only approaches and question whether it is time also to take a harm reduction approach.

137	Isles, S. Graham, P. van der Merwe, Z. Pidd, A. Dicker, B. Hedditch, J. Nicolson, M. Oliver, V. Xu, A. Kennedy, I. Civil, I.	Ambulance and Emergency Services Data Linkage Emergency Hospital Trauma Statistical, Epidemiology and Other Road Safety Research Methods	Death and severe injuries on NZ roads: Different things to different people	Many sources record road-related deaths and injuries but use different definitions. Achieving safer roads requires an accurate description of road trauma. To create a comprehensive picture of roadrelated trauma, a collaboration of five agencies in New Zealand brought together data from seven databases and matched individuals. The resulting analysis allowed a true representation of road trauma beginning with all injuries, the number presenting to hospital, hospital admissions, serious life-threatening injuries, and deaths. The study addressed important gaps in the understanding of road trauma. It demonstrated that interagency collaboration can address deficiencies in individual databases and allow a common definition for road traffic injuries.
138	Eugene, A. Mortimer, M. Thomson, S. Horan, B.	Older Drivers & Road Users Road User Training – General (Bicyclists, Workplace, OHS, Etc.)	Hector VR®: Harnessing Co-Design Principles to Build A Mixed Reality Driving Simulator for Older Drivers	Driving is key to independence for many older people. However, ageing-related declines in processing, attention and cognition can impact driving competence. This project is the first of its kind in Australia to use a “mixed reality” solution to develop a driving simulator specifically with, and for, older drivers. As a decision assistance tool, the Hector VR® driving simulator provides older drivers with objective information about their driving competence including reaction time and compliance with road rules. Evaluation results confirm the utility of a co-design approach in developing a fit-for-purpose driving simulator with a high degree of user acceptance.
141	Zia, H. Harris, D. Smith, D.	Communication and Media Road Safety Programs Speed, Speeding & Travel Speeds	Speed Management? Let’s Talk About it!	Inappropriate or excessive speed is a major cause of road trauma. Effective speed management is fundamental and critical to solving this issue. Most of the current guidance is focused on the analytical aspects of speed management and setting speed limits. However, critical to the success of any speed management project is effective engagement and consultation with stakeholders and the community. Currently there is little guidance on this important part of the process and as such, it is often overlooked by practitioners. This paper identifies good practice guidance for engagement and consultation to effectively implement speed management interventions.
142	Yam, Y.	Advocacy Communication and Media Drug Driving Drug Testing	What’s needed to improve the Drug Driving issue in Victoria?	In response to the growing drug driving problem in Victoria and increased government funding to tackle the issue, RACV interviewed experts to investigate the regulatory and non-regulatory management of drug driving in Victoria and identified key areas of improvement. There was strong emphasis for further research to be undertaken to improve the cost-effectiveness and relevance of drug driving laws and roadside drug testing (RDT). Interviewees stressed the power of education and therapeutic approaches that combat drug driving as part of a broader public health issue. Overall, effective implementation of these strategies will involve collaboration between government and nongovernmental institutions.
143	Yam, Y	Policy Development And Implementation Safer Mobility	Exploring policy and support strategies to improve experiences of the VicRoads medical review process	To encourage and empower drivers to manage their fitness to drive and undergo a fitness to drive medical review if necessary, RACV examined the perceptions and experiences of drivers and the people who have supported someone through review (‘supporters’) to identify potential support strategies. The research identified gaps in public knowledge about fitness to drive, and dissected the perceptions, triggers, barriers, and emotions related to the medical review from the perspective of the drivers and supporters. Key improvements were also identified, the implementation of which will require collaboration between government and non-governmental entities.
144	Truong, L. Currie, G.	Crash Data Analysis Land Use & Urban Planning Road Safety Strategy Safer Mobility	Exploring the road safety impacts of public transport: a case study of Melbourne	This paper explores the impacts of travel to work by public transport on road safety at a macroscopic level using a case study of Melbourne. Random effect negative binomial regression is employed to model crashes at the statistical area level 2 (SA2). Results indicate that using public transport (i.e. train, tram, and bus) for travelling to work tends to reduce severe as well as total crashes, highlighting the great potential of public transport as a road safety solution. Safety issues related to cycling, walking, and motorcycling to work are also discussed.
145	Maloney, B.L.	Community Programs Education – general and other Road Safety Programs	Merging in the Years Ahead – providing interactive road safety education to senior drivers	With older South Australian drivers continuing to be overrepresented in our state’s road toll, RAA provides ongoing road safety education to older road users. RAA’s new program, Years Ahead – Road Rules Quiz, uses interactive technology to generate valuable data, which highlights the knowledge gaps faced by older road users. The program provides participants with up-to-date information and allows RAA to understand the challenges and issues faced by these drivers so that we can target these particular issues in future advocacy and education.
147 (also Full Paper)	Thompson, J. Baldock, M. Lindsay, T.	Crash Data Analysis Data Linkage Motorcyclists Scooters	Motorcycle Crashes Resulting in Hospital Admissions in South Australia: Crash Characteristics and Injury Patterns See also: https://doi.org/10.33492/JRS-D-19-00245	This study examined records from the Royal Adelaide Hospital for 763 motorcyclists (admitted January 2008-November 2010 and April 2014-December 2016). Records were linked with policereported crash data and blood test results. Compared with 1617 car drivers admitted over the same periods, motorcyclists were younger, more commonly male, more likely to hold a learner permit, and less likely to be over the legal alcohol limit. Their crashes were more likely to be single vehicle and more common on weekends and in 50 and 80 km/h speed limits. They also had a higher injury severity. Countermeasures to improve motorcycling safety are discussed.
149	Beer, K. Hillier, P. Karndacharuk, A.	Policy Development And Implementation	Integrating Safe System principles into Road Safety Auditing	On 21 February 2019, Austroads released an update to the Guide to Road Safety (AGRS) Part 6, which is now called Managing Road Safety Audits. The current guide remains for now as Part 6A, but where there is any contradiction, the new Part 6 takes precedence. Key new items in the guide relate to the duties when engaging auditors, the duties when undertaking road safety audits, and the duties of road transport authorities.

151	Thompson, J. Mudford, J. Condon, L. Rowe, B.	Community Programs Driver/Rider Training Road Safety Programs Young Drivers	An economic evaluation of Victoria's L2P - Learner driver mentor program	The L2P – Learner driver mentor program (L2P) is a Transport Accident Commission (TAC) funded initiative which is coordinated by VicRoads. L2P provides supervised driving experience to young learner drivers aged 16-21 who do not have access to a supervising driver or vehicle. In 2018, Vicroads commissioned an evaluation to assess the program's perofmrnace and contribution to young driver safety in Victoria. L2P was found to generate significant road safety benefits along with social and economic value by increasing economic participation and reducing social isolation.
152	Stevenson, M. Wijnands, J. Mortimer, D. Harris, A.	Driver Risk Insurance Statistical, Epidemiology and Other Road Safety Research Methods Young Drivers	The effects of driver feedback and financial incentives on driving behaviours: A randomised control trial	A new strategy that may contribute to reducing the burden associated with road traffic injury is the use of driver feedback and financial incentives to change driver behaviours. The current study assesses the on-road efficacy of an optimised combination of feedback and incentives in changing risky driving behaviours. A total of 232 drivers were recruited to participate in the study. Following a baseline period, participants were randomly assigned to i) no intervention, ii) weekly personalised driver feedback, and iii) weekly personalised driver feedback plus a financial incentive. Data collection is complete and we will complete the analysis in April 2019.
154	Devlin, A Beck, B. Simpson, P.M. Ekegren, C.L. Giummarra, M.J. Edwards, E.R. Cameron, P.A. Liew, S. Oppy, A. Richardson, M. Page, R. Gabbe, B.J.	Bicyclists Motorcyclists Pedestrians Post Crash Rehabilitation	The Road to Recovery for Vulnerable Road Users Hospitalised for Orthopaedic Injury	Vulnerable road users are susceptible to sustaining series injury that can lead to life-long consequences. This study aimed to compare three vulnerable road user groups for health-related quality of life, return to work status and level of function at 6- and 12-months post-injury. The Victorian Orthopaedic Trauma Outcomes Registry comprised 6,186 patients who sustained orthopaedic trauma as a pedestrian, cyclist or motorcycle rider in Victoria from 2009 to 2016. Distinct differences in demographics and recovery outcomes between the groups were found. This research has implications for targeting treatment towards individuals at risk of a poor recovery after orthopaedic transport injury.
155	Messias, D. Soo, J.	Crash Avoidance and Crash Severity Reduction NCAP And Consumer Test Ratings	Accelerating the supply of safer vehicles through Government fleet	Vehicle safety technology has seen a dramatic development in the past decade with the focus being shifted from passive safety features aimed at protecting the occupant in a crash to active safety features intended at avoiding collisions altogether. To realise the full road safety benefits of these features, their uptake must be accelerated and one of the methods to achieve it may be through Government fleet policy. This study investigates strategies for the development of a vehicle purchasing policy for Government fleet ensures the purchase of the safest vehicles whilst balancing their needs of model availability and cost.
156	Perego, P. Fiocchi, C. Biassoni, F.	Driver Psychology Novice Driver/Rider Licensing Young Drivers	Practical Driving Test Anxiety: an analysis of the phenomenon and a resolution proposal	People taking the practical driving test, often cope with a big amount of anxiety, which could have negative effects on their performance during the task. The present work shows the results of a training conducted at a driving school involving candidates to the practical driving test, in order to reduce their anxiety level. The training is composed by cognitive and emotion regulation tasks and activities. The preliminary data analysis suggests that, on a short term, the training was effective in reducing the anxiety. Further research is required for looking into the long term effectiveness.
157	Logan, D.B. Corben, B. Lawrence, B. Sobhani, A.	Bicyclists	Development of fatality and injury risk relationships for cyclist-vehicle impacts	There is very little literature addressing cyclist fatality and serious injury (FSI) risk in impacts with motor vehicles. This study built on established curves relating pedestrian FSI risk to vehicle impact speed and incorporated the effects of cyclist speed and impact angle. A technique was developed that considered a vehicle-cyclist crash as two impacts: (a) the first impact between the cyclist and the vehicle and; (b) the second impact between the cyclist and road/roadside infrastructure. Combining the FSI risk of each yielded an estimate of cyclist FSI risk. This pilot method will need to be validated using real-world data.
158	Stephan, K. Lawrence, B. Newstead, S.	Road Environment	Effectiveness of 40 km/h Speed Limits in Reducing Crashes on Melbourne Roads with Strip Shopping and Factors Influencing Effectiveness	The effectiveness of reducing the speed limit to 40 km/h on Melbourne arterial roads with strip shopping was evaluated in a quasi-experiment. The treatment was associated with a 14% reduction in casualty crashes, 17% reduction in fatal and serious injury crashes, translating to a benefit-cost ratio of 13. Characteristics associated with a larger reduction in casualty crashes were two-lane roads, sheltered parking on both sides, fewer off-street parking facilities, presence of a railway station but without parks or sports fields. FSI crash reductions were larger on roads with fewer offstreet parking facilities without a painted chevron median.
159	Baldock, M. Stokes, C. Thompson, J.	Crossings (Pedestrian, School, Rail, Rural/Animal) Hazard Perception Road Furniture (Poles, Signs, Etc)	Evaluating retro-reflective screens to aid conspicuity of tabletop carriages at passive level crossings	The aim of this project is to design and undertake an experimental evaluation of the potential effectiveness of a prototype retro-reflective strip or screen installed at level crossings for the purpose of improving the detection by motorists of tabletop carriages and other trains at the crossings. A prototype screen was produced and footage recorded of trains passing through a crossing at night. A laboratory-based experiment using the footage will be run to assess whether the screen improves detection of, and reaction time to, the presence of trains. The presentation will describe the experiment and the results.
160	Taylor, F. Davis, C.I. Nyko, C.B.	Policy Development And Implementation Road Safety Strategy Statistical, Epidemiology and Other Road Safety Research Methods	Stop, Ask, Listen and Collaborate: Working Towards Zero with Local Government	Local Governments (LGs) are in a unique position to provide road safety authorities with insight into local factors that contribute to road trauma in their communities. Victorian LGs are responsible for a significant portion of Victoria's road network. Approximately 30 per cent1 of all fatalities in Victoria occur on LG roads. The Transport Accident Commission (TAC), interested in exploring this knowledge as well as the resourcing capacities of each LG, stopped and listened to all 79 municipalities in Victoria. They told us how we could assist in their journey towards zero.

162	Wundersitz, L. Palamara, P. Brameld, K. Raftery, S. Thompson, J. Govorko, M. Watts, M.	Indigenous Road Safety Road Safety Programs Road Safety Strategy	Regional and remote road safety: A national view	Road crash fatality rates continue to be unacceptably higher in regional/remote areas than major cities. This study investigates the causes of road crashes in regional/remote areas and provides strategic guidance to identify the most effective approaches to eliminate harm on the road network in these areas. Consistent with the Safe System approach, strategic planning across all components of the system is necessary to allocate resources and eliminate harm in regional/remote areas over a realistic long-term time frame. The paper concludes with a discussion of evidence-based countermeasures and new initiatives urgently needed to eliminate harm on regional/remote roads.
163	Huxtable, S.	Autonomous Vehicles Legislation and Law Policy Development And Implementation	Victoria's Automated Driving System (ADS) permit scheme	On-road trials of automated vehicles are critical to their safe development and deployment. They also serve as an opportunity to build government's knowledge about the technology, as well as public awareness and perception. Victoria's Automated Driving System (ADS) permit scheme is a performance-based framework within which vehicle manufacturers, technology developers and mobility providers can lawfully operate an automated driving system for testing and development purposes, with or without a human 'driver'. This paper discusses the concept behind the scheme, and aims to share the learnings to date.
164	Allen, T. Stephan, K. Newstead, S. Symmons, M. Lenné, M. McClure, R. Hillard, P. Day, L.	Motorcyclists Scooters	Rider, motorcycle and trip-related factors associated with motorcycle injury crash risk in Victoria, Australia	This population based case-control study aimed to investigate risk factors associated with serious injury motorcycle crashes in Victoria, Australia. Cases were adult riders admitted to hospital following a recent motorcycle crash on a public road. Controls were adult riders observed passing a recent case crash site. All participating riders completed a structured questionnaire. Data were analysed using multiple conditional logistic regression. Analysis identified rider, motorcycle and triprelated factors that were: a) significantly associated with crash risk, and b) prevalent in at least 15% of cases. These findings have direct application for evidence-based strategies to improve motorcycle safety.
165	Whyte, T. Kent, N. Keay, L. Coxon, K. Brown, J.	Biomechanics Crash Testing Restraints	Comfort accessories for elderly drivers: Influence on occupant injury risk	The aim of this study was to analyse the effect of various comfort accessories, observed to be used by 26% of elderly drivers, on occupant injury risk. A collection of frontal sled tests using a 5th percentile Hybrid III dummy showed increased sternal deflection when the dummy was seated on cushioning, indicating potential for increased thoracic injury. When a lumbar support roller and cushion were used the dummy submarined under the lap belt which would pose an increased risk of severe abdominal injury.
166	McIntyre, A. Sinclair, J. Page-Smith, J. Ziekemijjer, P. Ellis, N.	Bicyclists Communication and Media	Overview and Outcomes of Victoria's Passing Distance Cycling Safety Public Education Campaign	Research shows close passing is associated with the level of safety and discomfort felt by cyclists. A TAC public education campaign aimed to address safe passing distance and encourage more respect for cyclists. The TAC's campaign was seen and well understood by the market. Surveys collected data on mutual respect and the endorsement of recommended passing distances. Passbox conducted a naturalistic study of passing distance in Melbourne pre- and post-campaign. Some small but significant changes in the desired direction were observed. Results also showed that infrastructure has an important role to play and the benefits of bicycle lanes.
167	Mooren, L. Friswell, R. Williamson, A. Grzebieta, R. Olivier, J.	Fleet Safety Heavy Vehicles - Trucks, Buses, Hazardous Materials Workplace and Work Related Road Safety	Validating Self-Report Transport Manager Safety Surveys	Safety management research has focused largely on identifiable policies, practices and technologies and has relied heavily on self-report surveys of managers. This paper suggests that, in some cases, there is a strong argument for validating manager self-report surveys. It further argues that management culture can moderate the effectiveness of policies, practices and technologies. Evidence was found for the efficacy of 17 safety management characteristics in a qualitative study (n=15) designed to validate an earlier manager survey study of safety management in heavy vehicle transport operations (Mooren et al., 2014). The results suggest a better validation rate for companies with lower crash claim rates.
168	Oviedo-Trespalacios, O. Nandavar, S. Watson, B. Lewis, I. Haque, M.M. White, K. McLaren, T. Newland, C. O'Donnell, K.	Distraction & Inattention Policy Development And Implementation Road Safety Strategy	Benchmarking distracted driving against other key risky driving behaviours	Speeding, drink driving, drug driving, distracted driving, and fatigued driving are the most significant behavioural contributors to road trauma worldwide, yet little is known about the differences in crash risks and prevalence between each of these behaviours. This study invited international road safety experts to be part of a semi-quantitative risk assessment process considering the perceived crash risk associated with these behaviours, population factors, group exposure, and individual exposure. From this, insights into the relative importance of these behaviours were obtained.
169	Scott-Parker, B. Huang, B.	Driver Psychology Driver/Rider Training Hazard Perception Older Drivers & Road Users	SAFER-Senior: A situation awareness and escape route identification skills intervention improving the road safety of senior drivers	With the ageing of the global population, the overrepresentation of older drivers in road crash statistics has never been more important. A pilot of SAFER-Senior, a revision of SAFER which is accelerates the acquisition of situation awareness skills in young drivers – also overrepresesntated in road crash statistics across the globe – is underway on the Sunshine Coast. An analysis of data collected pre- and post-SAFER-Senior reveals that SAFER-Senior builds situation awareness skills in older drivers.
170	Watson, B. Lewis, I. White, K.M. Ho, B. Nandavar, S. Oviedo-Trespalacios, O. Gauld, C. McLaren, T. Newland, C. O'Donnell, K.	Road User Behaviour and Human Factors	Should we be talking about addiction when it comes to young drivers and smartphones?	A qualitative investigation involving 30 young drivers was undertaken to explore how they perceive their own and their peers' smartphone use, both in general and while driving. A particular aim of the study was to explore whether young people considered it appropriate to describe problematic smartphone use as an 'addiction'. The findings suggest that that illegal smartphone use while driving is perceived to be very widespread. However, while the participants acknowledge that the behavior is highly habitual, they don't tend to see it as 'addictive' in nature. The findings have important implications for the design of education messages and programs.

171	Read, G.J.M. Salmon, P.M. O'Brien, A. Stanton, N.A.	Autonomous Vehicles Safer Transport & Mobility	Identifying the risks associated with automated vehicles across the system lifecycle	Advanced automated vehicles (AVs) are expected to enter the Australian road transport system imminently. This study aimed to conduct an initial proof of concept study to identify risks across the entire AV system lifecycle. The Networked-Hazard Analysis and Risk Management System method (NET-HARMS), a recently developed approach for systemic risk identification, was applied. The results map out the lifecycle for AVs, and identify a set of task and emergent risks, and concomitant risk control measures. The findings can assist to support road transport stakeholders to understand the systemic risks associated with the introduction of advanced AVs.
172	Govorko, M.H. Palamara, P.	Crash Avoidance and Crash Severity Reduction	Western Australian Drivers' Use Of And Attitudes Toward Advanced Driver Assistance Technologies	Drivers' use of and attitudes toward Advanced Driver Assist (ADA) technologies were investigated through a telephone survey involving 301 Western Australian drivers. Overall, drivers appeared to have high rates of use and favourable attitudes toward current ADA technologies. A high proportion of drivers agreed technologies such as Blind Spot Monitoring, Lane Keeping Assist and Autonomous Emergency Braking reduced their chance of crashing and helped them to be a safer driver. However, there were indications drivers had less than favourable attitudes toward some elements of ADA technologies, such as Lane Keeping Assist and Lane Departure Warning producing unnecessary or distracting alerts.
173	Page-Smith, J. Young, D. Young, J. Castillo, J.	Autonomous Vehicles	"Car, will you drive my Baby?" - Community attitudes towards autonomous vehicles and associated technologies	While Automated Vehicle (AV) research and development can be tracked back to the 1920s, it is only in recent time that significant effort and milestones in technology have led to a belief that automated driving is possible. Driverless cars and new technologies have the potential to positively affect a significant proportion of road trauma (Austroads, 2017). However, adoption of this technology is highly dependent on obtaining the trust and confidence of the general public (Kaur & Rampersand, 2018). This study investigates the changes in community acceptance of AVs and associated technologies since 2014.
175	Wilmot, A. Gorell, R. Mcleod, S.	Financing Road Safety Road Safety Strategy	Barriers to road safety investment for Rural Local Governments	State and federal funded road safety programs enable local governments to address road safety deficiencies on local roads. The framing of these programs is crucial to their successful take-up and implementation, as the criteria for project selection, nomination process and co-funding arrangements can unintentionally create institutional barriers that discourage rural Local Governments from submitting projects for consideration. Investigation of the above has concluded that these unintended barriers can be addressed through performance, as opposed to crash-history based criteria, supported by targets and predictive models, and addressing the issue of proportionally higher costs faced by smaller local governments.
176	Hatfield, J. Poulos, R.G.	Bicyclists	Riding with children for transport and recreation: Carrier use and safety issues	Supporting children to bicycle may protect them against various inactivity-related diseases. Perceived safety may be a barrier to riding with children, particularly for transport. To extend the sparse research investigating adults' experience of relevant safety issues adult riders completed online questionnaires about riding with children for transport (n=66) and recreation (n=18). Questions focused on experience of safety issues associated with different types of child carrier and cycling infrastructure. Results suggest that initiatives to reduce interactions with traffic as well as traffic speed may help to move adults from riding with children for recreation only to riding for transport also.
177	Keating, M.	Drug Testing	Australia's second generational approach to roadside drug testing	Australia's current model of roadside drug testing, based on principles of deterrence, is internationally recognised as the largest and most intensive drug driving enforcement program in the world. This paper considers the future direction of roadside drug testing in Australia by drawing upon key findings and recommendations from a report released in October 2018 by the National Drug Driving Working Group – "Australia's second generational approach to roadside drug testing". The report explores a range of critical issues which impact on Australia's continued efforts to establish a best practice model for roadside drug testing, including the limitations of current drug testing technology, application and relevance of deterrence theory and testing of medications.
178	Olivier, J. Esmaeilikia, M. Johnson, M. Beck, B. Grzebieta, R.	Bicyclists Statistical, Epidemiology and Other Road Safety Research Methods	Does the Australian Bureau of Statistics Method of Travel to Work data accurately estimate commuter cycling in Australia? Also see: https://doi.org/10.33492/JRS-D-19-00178	The Australian Census of Population and Housing includes a responder's Method of Travel to Work for Persons (MTWP) on Census Day. With some exceptions, responders can select multiple modes of transport. In Australia and overseas, this data is used to estimate mode share and the proportion of Australians who utilize various active transport modes. This is especially true for cycling as there are scant data sources for Australian cycling exposure. In this study, we will discuss the often not advertised limitations of this data and provide examples of when it has been misused. When some of these issues are addressed, the MTWP data indicates an inconsistent trend in bicycle travel both by overall count and mode share.
179	Williams, T.	Policy Development And Implementation Road Safety Programs Advocacy	Fostering community participation in road safety policy development and strategic planning (Community participation in road safety policy development and strategy planning) See also: https://doi.org/10.33492/JACRS-D-19-00179	Public participation in Western Australian (WA) government policy development and strategy setting is not governed by a particular best practice model. The WA Service Priority Review Working Together One Public Sector Delivering for WA, released 2017, identified the need to build a public sector focussed on community needs and to develop a whole of government citizen engagement strategy for WA, including co-designing. The Road Safety Commission (Commission) employs a diverse range of public participation and engagement initiatives. An initial step in preparing for development and introduction of a whole of government strategy review of the nature of public participation initiatives of the Commission. The review method was an analysis of five initiatives that provide reasonable representation of the Commission's public participation and engagement activities. For the purposes of this review, the International Association for Public Participation spectrum of public participation has been used to classify the activities. This paper presents a summation of the review to date, communicating the current status and potential future direction of the Commission. Further work is required by the Commission.

180	St. Louis, R.M. Koppel, S. Molnar, L.J. 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	Older driver resilience levels and self-reported driving-related abilities, perceptions, and practices over five years	This study investigated resilience scores for drivers aged 75 years and older at two points in time, approximately five years apart (Time 1: Male: 67.2%; Mean age=81.6 years, SD=3.3, Range=76.0-90.0; Time 2: Male: 67.1%, Mean age=85.3 years, SD=3.0, Range=81.0-94.0). Participants completed a range of self-reported driving-related questionnaires and a resilience scale. Data for a subset of 125 Ozcandrive participants completing the resilience scale at both Time 1 and Time 2 were analysed. Results show a significant increase in resilience across the two time points, and increasing strength of associations between resilience and self-reported driving-related abilities, perceptions, and practices.
181	Patterson, S.	Communication and Media General Enforcement	The development of an enforcement campaign within the Towards Zero framework	The Transport Accident Commission (TAC) in partnership with Victoria Police required a new enforcement campaign that fit within the new Towards Zero framework. The TAC worked with a creative advertising agency to develop the creative concepts, tested them amongst the community and utilised Victoria Police's valuable enforcement and crash data to inform the media buying strategy and placement. The process resulted in the successful development of a new campaign and positive community and stakeholder outcomes.
182	Senserrick, T. Siskind, V. Watson, A.	Novice Driver/Rider Licensing Policy Development And Implementation Young Drivers	Are Declines or Delays in Youth Driver Licensing Evident in New South Wales or Queensland?	Declining driver licensing rates or delays in licensure among youth have been reported in several countries in recent years, including in Europe and North America, as well as in Australia. It has been argued this could be due to tougher graduated licensing systems. The current research aims to explore whether such declines or delays are evident New South Wales and Queensland. The focus is on licensing trends pre and post July 2007 for those aged younger than 25 years versus older, given both states introduced significant licensing reforms at this time, with some exemptions applying from age 25.
184	Stokes, C. Moon, W. Woolley, J. Strandroth, J. Johansson, N.	Education – general and other	Safe System for Universities: linking graduate knowledge with industry best-practice	Safe System represents long-established best-practice in road safety internationally, in Australia and in New Zealand. However, there has been limited success in implementing Safe System policy into practice. While Safe System theory is taught at some Australian universities, there are currently no consistent means of formal education before professionals enter the workforce, leading to a discrepancy between graduate engineer knowledge and industry best-practice. The Safe System for Universities (SS4U) project provides a means for consistent education of Safe System theory at a tertiary level. SS4U is designed for self-learning and a curriculum and material to teach Safe System within existing courses.
187	Wilmot, A. McLeod, S. McDonald, S. Wiseman, B. Wescombe, A.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure Intersections and Roundabouts Policy Development And Implementation Road Design	Introducing Rural Intersection Advanced Warning Signs in Western Australia: A collaborative forward planning approach (alternative title - A collaborative approach to introduce innovative technology for Road Agencies)	Emergent road safety treatments can pose a number of implementation challenges for road agencies. While there are strong incentives to accelerate the use of new treatments, institutional barriers can also constrain their introduction, and teething problems can temper the perceived success of pilot projects. These challenges have the potential to delay our achievement of zero road death and serious injury. We profile recent research and policy development to support the introduction of Rural Intersection Activated Warning Signs (RIAWS) in Western Australia. We contrast the significant benefits of this approach against problems which arose during the introduction of other innovative safety treatments.
189	Carden, C.	Financing Road Safety IRAP, AusRAP, etc. Policy Development And Implementation Road Safety Programs	Streamlining the development of effective road safety programmes	The Northland Programming Tool was developed for the Northland Transport Alliance and was named as a finalist for the 2019 New Zealand 3M Traffic Safety Innovation Award. The tool assists practitioners with identifying the appropriate intervention to install on a selected corridor or intersection. It allows these projects to be added to a programme and then assists with the prioritisation of projects within a programme. Prioritisation is done based on the available budget and a user defined metric, such as the highest death and serious injuries savings per kilometer of road network. This paper also explores the opportunities for further developing the tool.
190	Schuster, R. Ziekemijjer, P. Reynolds, A.	Crash Data Analysis Crash Data Collection Data Linkage	The power of linked data in understanding differences between serious injury measures	A linked dataset comprising TAC Claims, Road Crash Information System (RCIS) and Victoria Police Traffic Incident System (TIS) from 2012-2017 was established to analyse the differences in reported serious injuries. The comparative analysis reveals the extent of injury level miscoding within the current TIS, and scoping differences between the two databases. Analysis continues to uncover further insight into the differences between the reported series'.
191	Oviedo-Trespalacios, O. Truelove, V. King, M.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure Distraction & Inattention	The impact of 'Do not disturb while driving' and 'Android Auto' on mobile phone use while driving: A mixed-methods approach	Mobile phone distracted driving is a huge concern as this behaviour is constantly evolving and is a major contributor to road trauma rates. Banning hand-held phone use while driving does not always work and can result in the more dangerous behaviour of concealed phone use while driving. Therefore, utilising technology reduce risk is an important area to explore. This study used a mixed methods design to explore drivers' perceptions, as well as the effectiveness and usability, of applications designed to prevent mobile phone distracted driving.
192	Brameld, K.	Distraction & Inattention General Enforcement Hazard Perception Intersections and Roundabouts	Driver behavior and intersection crashes	This study explored driver related factors associated with casualty crashes at intersections in Western Australia from 2013-2017. Most casualty crashes occurred at intersections in 50-80 km/h speed limit zones and involved the following crash types: right angle, right turn thru and rear end. Review of the literature suggests that these are likely to be associated with behaviours such as inattention, misjudging gaps in traffic, driving too fast for the conditions, disregarding traffic controls and following too closely. Safe roads, safe speeds and safe vehicles offer substantial promise in preventing intersection crashes in the future.

195	Johnson, M. Hayden, B. Copeland, S. Dunn, P. Dalton, S.	Bicyclists Driver/Rider Training Motorcyclists Pedestrians	Truck drivers on bicycles: insights from the first year of vulnerable road user training for heavy vehicle drivers	Sharing Roads Safely is a driver training course focused improving safe interactions between heavy vehicle drivers and vulnerable roads. Based on the best practice program from the United Kingdom (CLOCS), Sharing Roads Safely was adapted for the Australian context by the Amy Gillett Foundation in collaboration with Rail Projects Victoria and in consultation with stakeholders from across the construction and logistics sector. Piloted in September 2018, the program is now being conducted regularly (industry rostered days off) and includes three modules (online, facilitated workshop, walking and cycling (on-road)). This paper details the content of the course and feedback from drivers and insights from the first year of course delivery.
198	Hirsch, L. Mackie, M. Wilson, N. Cornille, Z. Hawley, G.	Bicyclists Pedestrians Road Design Safer Transport & Mobility	Te Ara Mua Future Streets – Influences on road user behaviour	Te Ara Mua – Future Streets is a controlled before-after study of a neighbourhood street retrofit in Auckland, New Zealand. This paper focuses on one aspect of the study – to understand if walking and cycling was made easier and safer. A video coding framework was developed to understand road user behaviour and interactions and was applied to three sites where streets were changed. Across the three sites, there was a shift towards vulnerable user behaviour that is indicative of safer and easier walking and cycling. In addition, lessons for the design of some infrastructure features were identified.
199	Ferris, J.	Education – general and other Pedestrians Road Safety Programs School Safety	"My ideas are important too!": Student perceptions of a critical pedagogical transport safety education experience in rural Australia	How is a transport safety education program designed to involve school students in producing their own knowledge and empowering students to think critically, perceived by school students themselves? Eleven students aged thirteen and fourteen from rural Australia participated in three transport safety education lessons using a critical pedagogical approach to learning. Through focus groups the students shared their thoughts and feelings about their experiences, and ten clear themes on their values were identified. These themes may help policy makers and program designers understand school students' motivations for learning, and may improve educational outcomes if incorporated into education program design.
200	Ferris, J.	Early Childhood Road Safety Education – general and other Road Safety Programs School Safety	Adding trains and trams to Safety Town: A government and not-for-profit road/rail education partnership leading the way in NSW	One third of pedestrians hospitalised due to serious injuries at level crossings each year in Australia are young people (Henley & Harrison, 2017), and heavy and light rail infrastructure investments are increasing across NSW. The TrackSAFE Foundation (TrackSAFE) identified opportunities to integrate rail safety education content into the existing evidence-informed road safety education resource 'Safety Town', funded by Transport for NSW (TfNSW) and widely used by schools across NSW. Through a comprehensive program review process, new content was added to help primary students learn about pedestrian and passenger safety near trains, trams, platforms and tracks.
201	Johnson, M. Napper, R. Johnston, V.	Bicyclists Intersections and Roundabouts Legislation and Law Road Design	Behaviour, Law and Design: an interdisciplinary approach to improving intuitive road design, the road rules and cyclist safety	There is a high level of confusion and misunderstanding on the roads about the negotiation between drivers and cyclists when a cyclist is continuing straight and driver is turning left. This study builds on existing knowledge to go beyond problem identification to investigate potential solutions. The innovative, interdisciplinary team combines behavioural research with law and design to investigate and evaluate potential improvements in the road rules and road design. The study includes on-road trial of new left turn intersection design in Melbourne in Q2, 2019 with a pre- and post-study (roadside observations) and a review of the road rules to identify opportunities for amendment or clarification.
202	Sirol, M. Alexander, J. Buckham, J. Sutton, P. Eveleigh, M. Le, J.	Intersections and Roundabouts IRAP, AusRAP, etc. Motorcyclists	A Safe Systems Response: Protecting Motorcyclists along the Oxley Highway	The Oxley Highway is popular among motorcyclists from all over Australia as it has many tight and demanding corners which require a lot of concentration. However, over a 44 kilometre section between Wauchope and Walcha, there have been 60 crashes since 2012. Of those, 58 have been on curves and 43 have been motorcyclists. There have been 25 serious injury crashes and 6 fatal crashes. All 6 fatal crashes have been a motorcyclist. In response to the high crash rate involving motorcyclists, the Centre for Road Safety (CRS) and Roads and Maritime Services (RMS) worked collaboratively to engage local motorcycle groups and key stakeholders to introduce a Safe Systems package to improve safety along this popular riding route.
205	Elhenawy, M.M.Z. Young, K. Rakotonirainy, A. Grzebieta, R. Williamson, A.	Crash Reconstruction – including computer simulation Distraction & Inattention Statistical, Epidemiology and Other Road Safety Research Methods	Using Deep Learning to Detect Driver Distraction in the Australian Naturalistic Driving Study (ANDS) Video Data - Preliminary Results	This paper reports preliminary results of investigating the use of machine learning techniques to label distraction related events from video data collected from the Australian Naturalistic Driving Study (ANDS). This offline automatic labeling is designed to replace manual coding and accelerate the data reduction process with the view to save effort and money. We adopted the well-known pre-trained deep learning network Alex to label ANDS video data. The pre-trained network was used as a starting point after modifying the fully connected and classification layers. Then the modified model was retrained using ANDS data. The re-trained network achieved promising results despite low video quality.
206	Biswas, R.K. Olivier, J. Senserrick, S. Williamson, A. Friswell, R.	Driver Psychology Driver Risk Hazard Perception Speed, Speeding & Travel Speeds	A systematic review on close-following or short headways: Preliminary findings	Rear-end crashes account for the highest number of crashes among all crash types. An important component in understanding rear-end crashes is close-following tendency of drivers. However, headway is not consistently defined or measured in the research literature. In order to consolidate common headway definitions, a systematic review was conducted to summarize the definitions of headways and methods of measurement. Over half of the reviewed articles did not clearly define headway, which includes contextualizing reference points of headway measure (e.g., bumper/axle/rear) and explaining the accuracy of setups used to measure headway.
207	Schroeter, R. Bond, A. Mosley, K. Pascale, M.	(ITS - roads) Intelligent Transport Systems in Road Infrastructure (ITS - vehicles) Intelligent Transport Systems in Vehicles	A Human Machine Interface for the Ipswich Connected Vehicle Pilot	The Queensland Department of Transport and Main Roads (TMR) with support from Queensland University of Technology (QUT) and iMOVE Cooperative Research Centre is undertaking a pilot of Cooperative Intelligent Transport System (C-ITS) technologies (the Ipswich Connected Vehicle Pilot). The pilot comprises a field operational test involving 500 public participants with C-ITS technologies retrofitted to their vehicles. A human-machine interface (HMI) will provide the driver with advisory information and warnings relating to eight C-ITS safety use-cases. This extended abstract describes the design of the HMI based on pilot needs and relevant human factors guidelines and standards.

208	Tucker, J. Jeffreys, I.	Pedestrians Policy Development And Implementation Speed, Speeding & Travel Speeds Workplace and Work Related Road Safety	Flashing Lights for Assistance Vehicles – Is Red Best?	It is widely believed that vehicle-mounted lights are effective in making vehicles more visible/conspicuous to other road users. For roadside workers, conspicuity is their first, and often only, line of defense. Following numerous near misses and impact incidents involving vehicles operating on high-speed (>80km/h speed limit) roads, RACQ trialed red flashing warning lights with the existing yellow flashing warning lights, comparing traffic speed and passing behavior.
209	Stokes, C. Woolley, J. Mongiardini, M.	Policy Development And Implementation Road Design Road Safety Strategy Statistical, Epidemiology and Other Road Safety Research Methods	Prioritising harm elimination: The effect of benefit-cost metrics and planning timeframes on perceived benefits	Benefit-cost analysis is extensively used to justify and prioritise road infrastructure investment but its reliance, when applied to road safety initiatives, can be counter-productive. Due to their substantial costs, primary Safe System-aligned treatments that virtually eliminate harm often come with low benefit-cost ratios (BCRs) and it can take many decades for their benefits to mature. The aim of this study is to compare the benefits of high-BCR supporting treatments and low-BCR primary treatments over both short- and long-term planning timeframes. The results show that primary treatments provide greater long-term benefits but require adequate investment for these benefits to be realised.
210	Prabhakharan, P. Chung, J.	Distraction & Inattention Driver Psychology Motorcyclists	Understanding the Role of Inattentional Blindness in Motorcyclists' LBFTS Crashes	There is a growing body of evidence which suggests that the psychological mechanism which leads to a 'Look-But-Fail-To-See' (LBFTS) crash, where a driver looks but fails to perceive and act appropriately, could be through Inattentional Blindness (IB). IB occurs when attention is directed to particular objects or tasks, leading to failures to perceive an unexpected object, even if it appears in the middle of the visual scene (Mack & Rock, 1998). Extending on previous work by Prabhakharan & Chapman (2016), the present study aimed to further examine how 'attentional sets', might play a role in LBFTS crashes with motorcyclists.
211	Prabhakharan, P. Cunningham, M.L. Bennett, J.M. Regan, M.A.	Driver/Rider Training Education – general and other Novice Driver/Rider Licensing Road User Training – General (Bicyclists, Workplace, OHS, Etc.)	Education and Training Requirements for Drivers of Automated Vehicles in Australia and New Zealand	This paper documents the outcomes of Stage 1 of an Austroads-commissioned research study designed to examine what roles, if any, registration and licensing agencies and other stakeholders in Australia and New Zealand should be undertaking to ensure that licence applicants and licensed drivers are competent in the safe operation of advanced driver assistance systems and emerging automated driving features. The key findings from Stage 1, which involved a review of the literature, web search and consultation with members of the project international Expert Advisory Group, are reported in this paper.
213	Stockill, S. Cocker, M. Foley, L. Henderson, C. Hulme, M. Bobbermen, D. Small, M.	Fleet Safety Legislation and Law Policy Development And Implementation Workplace and Work Related Road Safety	Deployment of WHS Guidance on Vehicles as a Workplace	A national work health and safety (WHS) guide on Vehicles as a Workplace was published work health and safety regulators and Austroads in March 2019. A national forum was run to help launch the guide and a number of other supporting activities have been agreed. This paper will report on this activity, early lessons learned by WHS regulators in rolling out the guide, and a simple evaluation amongst industry participants as they take the guide forward.
214	Smith, T. Anderson, W.	Bicyclists Education – general and other Pedestrians Speed, Speeding & Travel Speeds	Targeted speed limit reductions for vulnerable road users – case learnings	In 2018, the Department of Transport and Main Roads undertook two demonstration projects to reduce speed limits in areas of high pedestrian and cyclist activity. The demonstration sites included one state-controlled strip road and one local government-controlled CBD area with above-average rates of casualty crashes. By developing a compelling case for speed limit reductions including crash data, alternative solutions, stakeholder support and road user mix data, lower speed limits for the two demonstration sites were introduced, supported by targeted local communications.
216	Broe, C. Anderson, W. Kolesnik, P. Hales, A.	Enforcement Technologies Intersections and Roundabouts Speed Cameras Speed, Speeding & Travel Speeds	Hold the Red: innovative technology reducing the risk of crashes at signalized intersections	Crashes at signalised intersections caused by motorists disobeying red light signals carry elevated risks of serious injury or fatalities. In an Australian first, the Department of Transport and Main Roads and the Queensland Police Service are conducting a trial of innovative crashavoidance radar-based technology at several intersections across Queensland which monitors vehicle speeds approaching an intersection, predicts when a vehicle will run a red light and then extends the opposing red lights to prevent vehicles and pedestrians from entering the intersection, lowering the chance of a crash while still issuing infringement notices to the offender.
218	Murray, C.	(ITS - vehicles) Intelligent Transport Systems in Vehicles Communication and Media	Connect the Community - Development and Evaluation of a Public C-ITS Awareness Campaign	The Queensland Department of Transport and Main Roads (TMR) will deliver the Ipswich Connected Vehicle Pilot, Australia's largest trial of Cooperative Intelligent Transport Systems (C-ITS) technologies from late 2019. A key objective of this Pilot is to increase the public's awareness and understanding of C-ITS, so as to increase consumer confidence in the technology and increase uptake. To meet this objective, and to raise awareness of the existence of the Pilot, TMR will deliver a public C-ITS awareness campaign. This paper discusses the methodology and approach of this campaign, and implications for public education and Pilot participant recruitment.
219	Downing, N. Evans, D. Mulholland, D.	Early Childhood Road Safety Education – general and other	Gamification, coding and crossing the road: Innovation in school road safety education in Queensland	The Queensland Department of Transport and Main Roads (TMR) aims to drive culture change in road safety, including through whole-of-life education. Schools are an essential channel. In Queensland, road safety is an optional part of the curriculum. In 2015, TMR reviewed its resource offering and determined a new approach was needed. The new online program Journi was designed to address customer needs through at least three innovative approaches: gamification to promote engagement; links to new curriculum requirements for digital technologies; and provision of practical tools for teachers. TMR is monitoring Journi and planning an evaluation. Results will inform further development.
220	Downing, N. Maxwell, S.	Distraction & Inattention Policy Development And Implementation	Public sector innovation: an ecosystem-based approach to addressing driver distraction	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. The Department of Transport and Main Roads (TMR) in Queensland has applied an ecosystem-based approach to this 'wicked' policy problem by codesigning solutions with stakeholders who may contribute to drivers' decision-making to engage in this high-risk behavior.

221	Fitzgerald, M. Curtis, K. Cameron, P. Howard, T. McKie, E. Ford, J.	Data Linkage Emergency Hospital Trauma Statistical, Epidemiology and Other Road Safety Research Methods	The Australia New Zealand Trauma Registry – Transport-related trauma (20 word limit)	The Australian Automobile Association estimated the cost of road trauma at $30 billion a year. Operating since 2011, the Australian New Zealand Trauma Registry collects trauma data from major trauma centres across Australia, and more recently New Zealand, in order to reflect and act upon emerging trends and demands on the trauma system, and to improve road safety across Australia. The ATR has data from nearly 30,000 road-transport related severely injured patients, that can contribute to improvements to road safety. The ATR seeks to increase its collaboration with road safety and transport peak bodies to use this data more effectively.
222	Moir, L. Harrison, S.	Policy Development And Implementation Road Design Road Environment	Implementing the Queensland Road Safety Policy	In 2018, senior leadership within Queensland's Department of Transport and Main Roads (TMR) signed off the first “Road Safety Policy”. The policy aims to embed Safe System principles in TMRs business and includes two key methods being, 1, to incorporate default treatments in all new projects and 2, to mandate the use of a newly developed Safe System Project Management Control Checklist and utilise the Austroads’ Safe System Assessment Framework throughout all stages of the projects lifecycle from early concept planning to finalisation. The implementation of the Policy included stakeholder engagement prior to final sign-off, workshops with affected areas and the development of fact sheets and frequently asked questions.
224	McShane, P.	Crash Data Analysis Enforcement Programs General Enforcement Speed Cameras	A Corridor Analysis Approach to Selecting Combined Red-light Speed Camera Sites in Queensland	During 2018, an enhanced methodology was developed for selecting suitable sites for the placement of combined red-light speed cameras within Queensland. Preliminary evaluations of recent installations suggest that the combined red-light speed cameras can influence crashes at the immediate site and at other signalised intersections along the adjoining road corridor, providing support for previously reported “halo effects”. Using this reasoning, the Department of Transport and Main Roads (TMR) revised its site selection methodology to prioritise placement by ranking road corridors in one-kilometre segments on the prevalence of red-light violation type crashes and speed related crashes.
225	Smyth, T. Osmond, S. Downing, N. Sheehan, M. Tozer, M. Watson, B. Wilson, H. Zhao, X.	Drink Driving Driver Psychology Driver Risk Education – general and other	Online Brief Intervention for Queensland’s first-time drink driving offenders	Drink driving is a persistent contributor to fatalities and serious injuries on Queensland’s roads, and additional intervention strategies are needed to promote the separation of drinking and driving. Based on public consultation and evidence for the effectiveness of Brief Intervention (BI) for reducing alcohol consumption, Queensland’s Department of Transport and Main Roads (TMR) is developing a compulsory online BI for first-time drink driving offenders in Queensland. The introduction of an online BI will complement existing drink driving countermeasures that support positive behaviour change and reduce reoffending.
228	Meesmann, U. Torfs, K.	Distraction & Inattention Drink Driving Drug Driving Speed, Speeding & Travel Speeds	The ESRA2 survey: Comparing Australian road safety performance with European countries	ESRA (E-Survey of Road Users’ Attitudes) is a joint initiative of research organisations and road safety institutes from 46 countries globally. The overall aim is to provide a solid contribution to a joint monitoring system on road safety attitudes and behaviours for policy measures. The next edition (ESRA3) of this survey will be launched in 2021. This presentation will highlight the Australian results of the current survey in comparison to the results of 20 countries in Europe and other selected countries (benchmark).
229	Jurewicz, C.	Intersections and Roundabouts Crash Data Analysis	Risk assessment of rural intersections based on predictive modelling	Rural intersections present unique road safety issue: they are numerous and typically have low crash counts. Hence, crash history can be a poor predictor of future safety performance. Given that 10% of all Victorian severe crash injuries occur at rural intersections, their effective prioritisation for improvement is a priority. This paper explores prioritisation of rural intersections based on severe injury estimates using three alternative approaches. The findings show that predictive models based on traffic flow, road hierarchy, intersection type, and maximum speed limit optimise both prioritisation logic and ease of applicability. These findings may be useful in development of future safety infrastructure investment programs.
232	Hardiman, M. Hardiman, J. Flight, C.	Crash Data Analysis Crash Data Collection Crash Investigation – including investigation methods & technology Crash Reconstruction – including computer simulation	Proposed Amendments to the Australian Design Rules Pertaining to Mandation of Event Data Recorders in Australian Sold Vehicles	In 2016, 1295 lives were lost and 32,300 injuries suffered on Australian roads, an annual cost of $33 billion. (Litchfield, 2017) Collisions are analysed by experts to determine causation including driver behaviour, speed, vehicle safety and road design. Criminal prosecutions and coronial investigations rely on collision expert findings. Collision investigation includes analysis of Event Data Recorders (EDR). EDR’s have capability of recording pre-crash data including speed, braking and acceleration, Currently, no Australian legislation exists mandating that vehicles be fitted with EDR or that stored data be accessible. Such legislation would enhance collision causation analysis, increasing road safety and reducing road trauma.
238	Evans, T. Stuckey, R. Macdonald, W.	Driver Psychology Driver Risk Hazard Perception Young Drivers	Situation awareness and hazard perception deficiencies of young novice drivers, particularly at night	Hazard perception performance of novice versus experienced drivers (n=63) was investigated during a PhD research program. Results are reported from thematic analysis of transcripts of participants’ commentaries on daytime and night-time road-traffic scenarios in suburban Adelaide. They commentated while being driven around a set route in normal traffic and whenever they detected hazards in each of 14 video clips. They also rated risk and difficulty throughout each clip. Novices (L- and P-platers) demonstrated poorer situation awareness, including lower awareness of hazards associated with poor visibility, particularly in night-time scenarios. Implications for development of improved driver training programs are identified.
240	O’Donovan, S. van de Heuvel, C. Baldock, M. Byard, R.W.	Crash Data Analysis Data Linkage Motorcyclists	Obesity and age as factors in lethal leg amputation following motorcycle crashes	The autopsy files at Forensic Science South Australia (FSSA) were searched from January 2008 to December 2018 for all cases of motorcycle fatalities with a lower limb amputation. Six cases were identified; five male riders and one female pillion passenger, with age ranging from 48 to 67 years (average 59 years), significantly older than the control group (40.6 years; p<0.01). All decedents were overweight with body mass indices (BMI) of 28.7-43.5, average 34.9, significantly greater than the control group (28.8; p<0.05). This study has shown that older motorcycle riders with higher BMIs are at greatest risk of lower limb/pelvis amputations.

248	Nassau, J. Waller, E.	Autonomous Vehicles Temporary Road Works	Connected vehicle solutions for safer roadworks	One of the major anticipated benefits from Connected and Automated Vehicles (CAVs) is improved road safety. Limited access motorways ought to provide a simpler environment for adoption of these vehicles. Despite operating at high speed, there should be fewer complications from factors such as traffic lights, pedestrians, cyclists and oncoming traffic. It will be important to ensure that these vehicles will not only be able to safely drive in typical motorway conditions, but will also able to handle atypical situations such as incidents and roadworks. To ensure the safety of the 10,000 people currently working on Transurban projects to build new roads and more lanes across the country, as well as their continued safety in a future road environment with CAVs, Transurban is conducting a series of trials and developments focused on work zone safety, together with key partners.
252	Chalmers, E.	Road Environment Motorcyclists Bicyclists Community Programs	Wildlife crashes - an epidemic?	This paper summarizes a Workshop held by the ACT Chapter of the Australasian College of Road Safety in July 2019 on the rising level of injuries involving wildlife in the ACT and Region. The workshop brought together a wide range of stakeholders to better understand the growing risk from these crashes; to identify the likely interventions to best reduce the risks; and to connect the people involved so that future work will be better integrated. The workshop was an eye-opener for participants. The issue is growing in complexity and impact; effective interventions are not obvious or easy; and there are many stakeholders involved.

Understanding the Safe System context behind pedestrian road trauma in New Zealand

Lily Hirsch[a], Hamish Mackie[a], Iain McAuley[b],

[a]Mackie Research, [b]NZ Transport Agency

Abstract

In 2016 in New Zealand, pedestrians accounted for 7.6% of road fatalities and 6.6% of serious injuries (Ministry of Transport, 2017). The aim of this research was to understand the Safe System factors associated with pedestrian deaths and serious injuries. A sample of 100 pedestrian fatality and 200 serious injury crash reports from 2013-2017 were analysed to identify the involvement of the Safe System factors in each crash case. The research identified common crash typologies and highlighted the need for improvements in speed management, environmental design, safer vehicles, safety campaigns, and infrastructure design. In addition, the research identified latent high-order system factors that obstruct the mechanisms to effectively address these Safe System issues and which ultimately perpetuate the occurrence of pedestrian deaths and serious injuries.

Background

The majority of New Zealanders will be a pedestrian at least once a day. Although walking for transport causes the least harm to other people, it is not always easy or safe. In 2016 in New Zealand, pedestrians accounted for 7.6% (n=25) of the road fatalities and 6.6% (n=257) of serious injuries. Current analysis methods identify various risk factors, but they do not extend to determining how the factors come together to result in significant harm. The aim of this research was to understand the range and pattern of Safe System factors in crashes, how these factors connect to actual harm situations, and to understand the 'system context' associated with pedestrian road trauma.

Method

The research protocol followed an analysis of 100 pedestrian fatalities and 200 serious injuries (99 fatal and 199 serious injury crash cases) in the form of NZ Police Traffic Crash Reports sampled from 2013-2017. The analysis protocol – modified from previous research (Mackie, Gulliver et al., 2017; Stigson, Krafft et al., 2008) – was designed to ascertain the involvement of the four Safe System pillars (Roads and Roadsides, Speed, Vehicle, User) in each crash case. The 'User' pillar was split to more equally represent drivers and pedestrians. Individual pillars could be 'triggered' as contributing to the crash in response to certain factors being present. Subsequent to the analysis, a workshop with system experts was held to discuss the conclusions and through an adapted version of Rasmussen's (1997) *hierarchical model of socio-technical systems*, to identify the broader high-order system issues intrinsic in the crash typologies.

Results

The findings demonstrated that multiple Safe System factors are often implicated in pedestrian deaths and serious injuries - more so in fatal crashes (Figure 1). For example, this research found a link between posted speed limit (Speed Pillar), and the lack of pedestrian priority crossings near bus stops (Road Environment Pillar). This shows that in general we need to better understand how system factors interact to result in deaths and serious injuries.

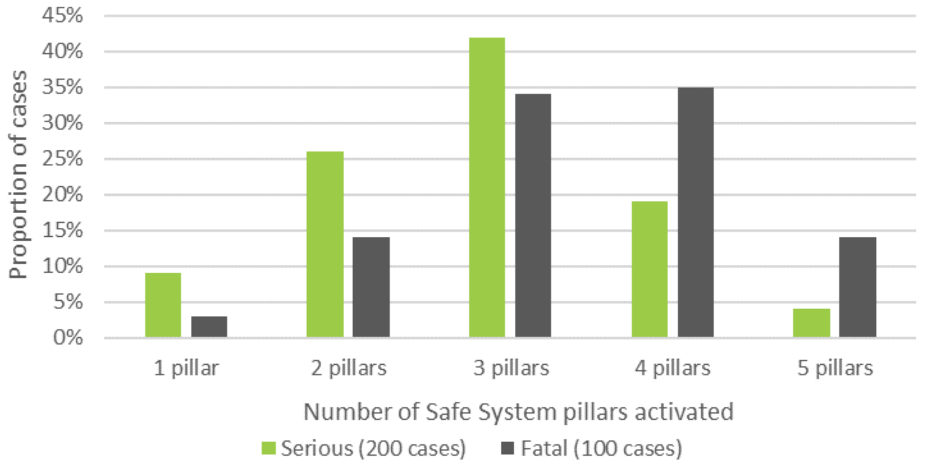


Figure 1. Proportion of fatal and serious cases involving multiple Safe System pillars

The combination of the crash analysis and system expert workshop enabled the high-level mapping of crash typologies (e.g. mid-block crossing with no facilities n=76 cases). The mapping exercise identified how intrinsic high-level system failures can be directly traced to fatal or serious injury outcomes for everyday users of the road system. A simplified flow-chart of this mapping for the mid-block crossing typology is provided in Figure 2.

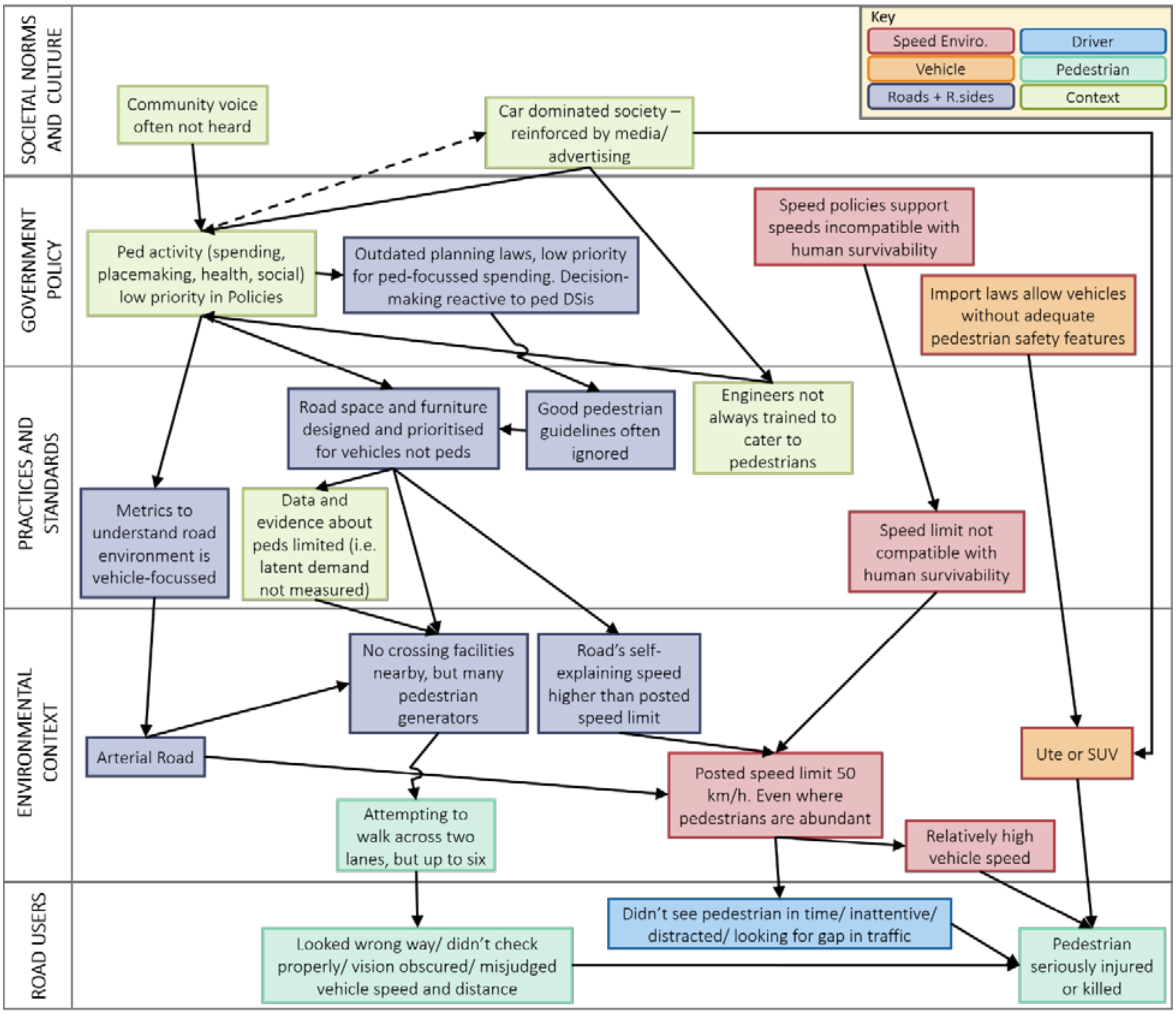


Figure 2. Mapping system failures for 'mid-block crossing with no facilities'

Conclusions

Our knowledge of the factors that are likely to result in high severity pedestrian crashes is robust. However, translating this evidence into Safe System practices is often fraught. The research highlights how pedestrians are valued less – in economic and efficiency terms – than vehicles and how this attitude is ingrained across all levels of New Zealand's transport system. These in-built biases affect the latent system conditions that increase the likelihood of serious pedestrian crashes. Ultimately, the values and policies of the high-level transport system require a paradigm shift away from a focus on individual behaviour and towards an ingrained and holistic Safe System ethos. These intrinsic system issues could be addressed through higher-level system reforms that prioritises pedestrian safety. These include giving pedestrian safety and access higher priority in road safety planning, design and investment, managing vehicle speeds down to survivable levels, reducing the aggressivity of the vehicle fleet, promoting pedestrian safety through advertising campaigns, and generally taking a more whole-of-system approach to pedestrian safety. A proactive and systemic approach is required before meaningful street changes and a tangible reduction in the burden of pedestrian casualties in New Zealand can be reached.

References

Mackie, H. W., P. Gulliver, R. A. Scott, L. Hirsch, S. Ameratunga and J. de Pont (2017). Serious injury crashes: How do they differ from fatal crashes? What is the nature of injuries resulting from them?, Mackie Research, The University of Auckland, and TERNZ prepared for the AA Research Council.

Ministry of Transport (2017). Pedestrians: Crash facts. Wellington, New Zealand, Ministry of Transport.

Rasmussen, J. (1997). Risk Management in a Dynamic Society: A Modelling Problem. Safety Science, 27(2/3):183-213

Stigson, H., M. Krafft and C. Tingvall (2008). "Use of fatal real-life crashes to analyze a safe road transport system model, including the road user, the vehicle, and the road." Traffic Injury Prevention 9(5): 463-471.

Management of queuing and waiting for truck drivers by road transport customers

Rena Friswell[a], Ann Williamson[a]

[a]Transport and Road Safety (TARS) Research, UNSW Sydney

Abstract

Time spent queuing and waiting for loading and unloading at customers' premises can contribute to fatigue risk for long distance truck drivers yet the nature, constraints and effects of practices used to manage queuing and waiting by customers in Australian states that have adopted national fatigue management laws are undocumented. Drivers and company representatives were interviewed to elucidate queuing and waiting management practices. The results suggest drivers can experience poor management of queuing and waiting regularly and customer companies have viewed their role as preventing breaches of the law rather than managing fatigue risk.

Background

Queuing and waiting for loading/unloading have been identified in past research as being both common and contributing to long distance heavy vehicle driver work hours and self-reported fatigue (Chen et al., 2015; Williamson & Friswell, 2013).

Chain of Responsibility (CoR) provisions in Australian legislation governing long distance heavy vehicle driver fatigue have, until recently, obliged transport customers to ensure their loading/unloading processes do not cause drivers to breach regulated work hours or drive while fatigued (State of Queensland, 2012). Recent changes to the legislation now require customers to assess and manage driver fatigue risk arising from loading/unloading activities.

Anecdotal and media reports (Skinner, 2014a, 2014b) suggest transport customers have not necessarily managed their CoR obligations well for driver fatigue management. The aim of the current project was to better understand how transport customers manage queuing and waiting for loading/unloading and whether the methods are effective from the perspective of drivers.

Method

In the first phase of the project, 41 long distance heavy vehicle drivers were recruited via advertising placed at retail truck stops around NSW, in industry print media and on Facebook to identify customer depots where they had experienced good and poor management of queuing and waiting. 27 of these drivers completed a more detailed survey (either online (48%) or by telephone interview (52%)) to describe a recent good and a recent poor experience. A range of open-ended and closed questions addressed the nature of drivers' experiences ("What happened?"), the timing of events (e.g., "What time did you arrive?") and the circumstances (e.g.,"What facilities were provided for you to use while you waited?").

All depots identified by drivers (excluding transport companies' depots) were invited to take part in the second phase of the project. Representatives from 13 of the customer depots were interviewed about their practices and challenges when managing queuing and waiting for loading/unloading at their premises, as well as the company's understanding of their CoR obligations for drivers. The interviews gathered qualitative information.

Results

Drivers identified problems contributing to long queuing and waiting times and limited rest opportunities, with implications for fatigue risk. These included issues with communication, staying with the truck, fairness, site rules and procedures, schedule adherence, depot hours, over-utilisation of the depot, access to facilities, dock design, management of loading staff and division of labour.

Company results showed variation in management practices (including truck processing, queue type, communications, scheduling approach, monitoring, etc) and corroborated many driver concerns. Particular management challenges were posed by infrastructure limitations, unpredictable events including breakdowns and late drivers, seasonal fluctuations, truck scheduling, and internal company processes. Financial and operational considerations shaped many of these issues. Companies typically perceived their primary CoR duty regarding driver fatigue was preventing drivers leaving the depot in breach of fatigue law rather than managing hours and rest opportunities on site.

Conclusions

The studies suggest drivers can spend considerable time queuing and waiting at customers premises without real opportunities for rest. The results should inform fatigue risk management guidance for customers of road transport.

References

Chen, G. X., Sieber, W. K., Lincoln, J. E., Birdsey, J., Hitchcock, E. M., Nakata, A., . . . Sweeney, M. H. (2015). NIOSH national survey of long-haul truck drivers: Injury and safety. *Accident Analysis & Prevention, 85*, 66-72. doi:10.1016/j.aap.2015.09.001

Skinner, S. (2014a, 29.10.2014). Visy responds on chain of responsibility fatigue issue. *Australasian Transport News*.

Skinner, S. (2014b, 28.10.2014). Weak link at customer end of chain of responsibility. *Australasian Transport News*.

National heavy vehicle law (Queensland), (2012).

Williamson, A., & Friswell, R. (2013). The effect of external non-driving factors, payment type and waiting and queuing on fatigue in long distance trucking. *Accident Analysis & Prevention, 58*, 26-34. doi:10.1016/j.aap.2013.04.017

Work-related injury and illness among older truck drivers in Australia: A population based, retrospective cohort study

Sharon Newnam[a], Ting Xia[b], Sjaan Koppel[a] Alex Collie[b]

[a] Monash University Accident Research Centre, [b] University of Michigan Transport Research Institute[2]
[b] Monash University, Insurance Work and Health Group, Faculty of Medicine Nursing and Health Sciences, 553 St Kilda Road, Melbourne VIC 3004 Australia.

Abstract

This study explores the landscape of work-related injury and disease in the Australian transportation industry. This population based, retrospective cohort study was based on claim data collected from the National Dataset for Compensation-based Statistics (NDS) in Australia. Three key findings were identified: the relative risk of workers' compensation claims increased with age; older truck drivers were not found to have significantly higher rates of musculoskeletal (MSK) or fracture injuries, and; older truck drivers had a significantly larger proportion of neurological injury compared to younger age groups. The findings of this research support the need for context sensitive, multi-domain, interventions targeted at older drivers.

Background

The professional truck driver population is aging in Australia (ATA, 2017). It has been projected the rate of truck driver recruitment in the Australian road freight industry will need to increase by 150% to account for the increase in demand for road freight services and to replace retiring and / or ageing truck drivers (Department of Transport, Victoria, 2010). These figures suggest that policy and practice should focus on strategies to retain older truck drivers in the industry for as long as (safely) possible.

This study explores the landscape of work-related injury and disease in the Australian transportation industry. The research categorises the data by distribution of injury types, mechanisms of injury and body part sustained following the injury and calculated the relative risk for older truck drivers (i.e., 60+ years) compared to their younger counterparts. The objective of this study was to identify the unique challenges facing older truck drivers, so to inform recommendations to improve the health and wellbeing of this valued workforce.

Method

This population based, retrospective cohort study was based on claim data collected from the NDS (Safe Work Australia, 2004) across four time periods (2004–2006, 2007–2009, 2010–2012, and 2013–2015). The NDS is compiled from workers' compensation claims data from all nine of the state, territory and Commonwealth workers' compensation systems. The database contains information on the injured worker, their employer, job characteristics, injury or disease details, and claims outcomes.

Negative binomial regression was used to determine relative risks (RRs) and 95% confidence intervals (95% CI) for the comparison of claim rates across age groups. The 35-44 years age group was set as reference group. Regression models adjusted for time period and jurisdiction to investigate the differences in the RR of a particular type of injury across age groups.

Results and Conclusions

The relative risk of workers' compensation claims increased with age. The highest rates were observed in the older truck driver group (79.53 per 1,000 workers per year), with a 26% increased risk compared to the 35-44 years old group (adjusted RR: 1.26, 95% CI: 1.10 to 1.44).

Older truck drivers were not found to have significantly higher rates of MSK or fracture injuries. The overall rate was 41.79 per 1,000 workers. The rate was 18% lower for the oldest and the youngest age groups compared to the 35-44 age group (adjusted RR: 0.82, 95% CI: 0.72-0.95; adjusted RR: 0.68, 95% CI: 0.60-0.77). Furthermore, older truck drivers had a slightly higher rate of fracture injury than drivers in the 35-44 year old age group (adjusted RR: 1.03, 95% CI: 0.89-1.20), but this was not statistically significant. A possible explanation of these findings is self-regulation, whereby older drivers compensate for deficiencies in certain areas by adapting their behaviour to minimise their crash risk (Koppel & Charlton, 2013).

Older truck drivers had a significantly larger proportion of neurological injury (i.e., sound and pressure) compared to younger age groups and that the percentage of these claims increased with age. In fact, the rate reached 19.11 among older truck drivers, which was nearly 15 times higher compared to the 35-44 year old age group (adjusted RR: 15.2, 95% CI: 12.31-18.80). Although it is well known that truck drivers are susceptible to traffic noise (e.g., engine and road noise) for long durations, the magnitude of this problem was surprising.

Several recommendations emerged from this research including (i) the need for self-screening tools within regular workplace health and safety programs to assist in identifying and managing any decline in functional and/or cognitive performance over time (ii) selecting vehicles with superior noise controlling measures (iii) journey planning practices and (iv) the review and revision of noise related risk controls within health and safety laws and regulations.

This paper has recently been published in the journal, Safety Science. Please contact the lead author for a copy of this publication.

References

Australian Trucking Association (2016). Professional truck driver – shortage. http://www.truck.net.au/resource-library/volvo-report-professional-truck-driver-shortage

Department of Transport Victoria, (2010), A workforce strategy for road freight drivers.

SafeWork Australia. (2004). National Data Set for Compensation-based Statistics. Canberra.

Koppel, S. N. & Charlton, J. L. (2013). Behavioural adaptation and older drivers. Behavioural Adaptation and Road Safety: Theory, Evidence and Action. CRC Press.

Creating Efficiencies In Roadside Driver Drug Testing

Peter Thompson

South Australia Police

Abstract

Driver drug testing is expensive and how the task is undertaken creates demand on police and the public. South Australia Police (SAPOL) has implemented efficiencies to reduce demand and cost in the drug testing process whilst increasing detections. This paper will present the success of changes implemented in South Australia to improve efficiencies in the roadside drug testing program. The outcomes of these changes have been economic improvements in both capital and operating costs, a reduced demand on police and the public, an increase in detections and a more simplified process to the previous model.

Introduction:

SAPOL has been undertaking the process of testing drivers for illicit drugs since July 2006. The drugs detected in the program are:

- Methylamphetamine (MA)
- Methylenedioxymethamphetamine (MDMA)
- Delta 9 tetrahydrocannabinol (THC)

The program established in South Australia is currently one of the world's largest screening at a rate of 45 tests per 1,000 licensed drivers.
The program implemented was based on a 2 stage screening process involving:

- An initial screen using a Drugwipe II Twin
- An oral fluid collection and analysis using a Cozart DDS instrument.

Positive results from the screening process were then forwarded to a laboratory for confirmation. This process is the same as introduced by other jurisdictions around Australia and the way the majority of Australian jurisdictions have operated their programs to date. This program has been successful in South Australia with 1 in every 10 drivers screened for an illicit drug returning a positive result during 2016/2017 fiscal period.
In 2016 SAPOL had to consider the drug testing process moving forward due to the second stage screening apparatus, the Cozart DDS, being removed from production and no longer supported.

Discussion:

Research was undertaken to look at how the program was operating in South Australia, the performance of instruments that were being used around Australia for the second screening stage of oral fluid analysis (OFA) and what changes could be made to the South Australian program to create efficiencies.
The examination of the program recognised that SAPOL was already determining a screening result at the first and second stage. Modelling was undertaken to consider outcomes if the second screening was removed. It was identified through this process that if the second stage screening test (OFA) was eliminated it would:

- Remove the requirement to purchase an instrument.
- Lead to a cost reduction of consumables to collect an oral fluid sample.
- Create human resource efficiencies on the servicing and management of instruments.
- Provide a more simplified process for Police and the Public.
- Likely increase the number of positive detections in the laboratory.

Modelling showed that eliminating the second stage screening instrument would remove the false negative rate experienced at the second stage. It was hypothesised that this would lead to more positive detections being confirmed in the laboratory.

Outcomes

As a result of the research and modelling into the driver drug testing program in South Australia a decision was made by SAPOL to change the program in late 2016.
Before the change could be implemented changes were required to South Australian Legislation to remove the requirement of an instrument at the second stage. The change in legislation was passed by both houses of Parliament and assented on 12 December 2017.
With the passing of legislation SAPOL redesigned the driver drug testing program. The redesigned program now involved:

- An initial screen using a Drugwipe II Twin
- An oral fluid collection using a Pathtech Oral Fluid Collection Kit.

Positive results from the screening process would then be forwarded to a laboratory for confirmation.
The new program also meant that police officers no longer had to convey drivers to police stations or testing sites to obtain the oral fluid and undertake a second test. The oral fluid collection could be undertaken at the roadside saving time for police and members of the public.

On the 22 February 2018 the new drug driving process was implemented. The new process was also mirrored in the South Australian Harbours and Navigation Act and the Rail Safety National Law (South Australia) Act at the same time.

Results:

Whilst no formal or independent review of the changes has been made, SAPOL has monitored and reviewed the changes implemented. The implementation of the new program saw immediate results.
Cost reductions were made in the following areas:

- 100% capital savings on the purchase or oral fluid analysis instruments
- 100% recurrent costs on servicing instruments
- 28% reduction on the cost of oral fluid collection consumables

There was a demand reduction on the human resource in managing oral fluid analysis instruments. South Australia had 50 instruments which were required to be serviced, distributed state-wide and managed on a daily basis which no longer had to occur.

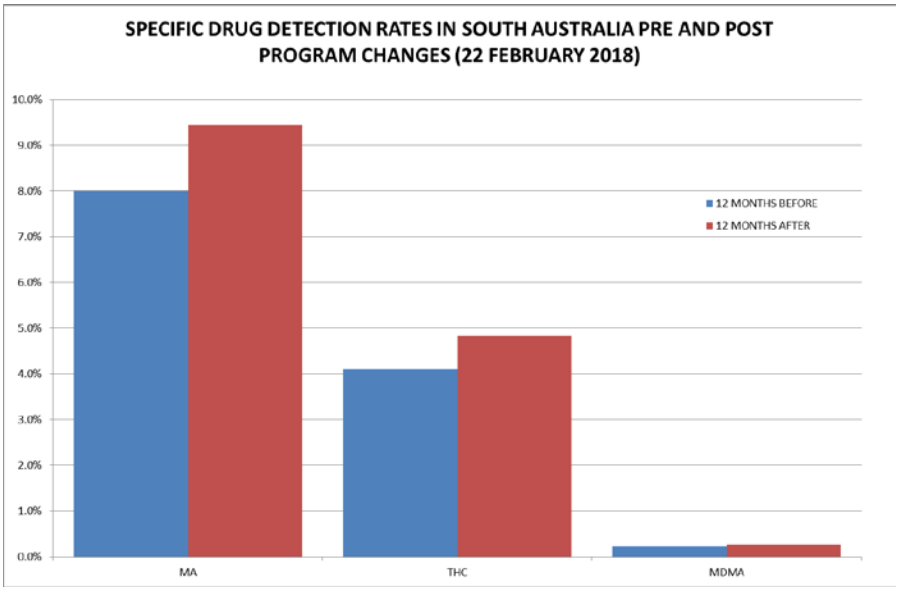
A review of the performance of the new program identified a 19.6% increase in the detection rate of drivers returning a positive test as identified in the following table:

Program Comparison	12 months Before	12 months After
Screening Tests	50668	50846
Laboratory Positive	5043	6055
Detection Rate	10.0%	11.9%

Table One – Comparisons before and after Implementation (22 February 2018)

Table One identifies an additional 178 drug screening test undertaken compared to the previous 12 months, but this resulted in an additional 1,012 driver samples returning a positive test in comparison. The detection rate under the new program was 11.9% of 1 in every 8.4 drivers screened returning a positive result.

A breakdown of the specific drugs saw an increase in the detection rate across all drugs.



Examining the variance increase of all drugs saw a consistent percentage increase under the new program as identified in Table Two below.

Drug	Varaince Increase
MA	18.1%
THC	17.8%
MDMA	20.3%

Table Two – Specific Drug Detection Variance following Program Implementation

Although there are many factors that impact on detection rates the consistent variance across all drugs is likely attributed to the change in the driver drug testing program.

Conclusion:

The changes implemented for the driver drug testing program in South Australia has shown to have improved efficiencies from all aspects. More drivers are being detected, program costs have been reduced and the process for a positive driver is quicker.
The process is now less complicated and more stream-lined which can enable the program to be expanded beyond specialised police officers in the future.

The effect of sanctions on Victorian speeding drivers

Kelly Imberger[a], Angela Watson[b] and Sherrie-Anne Kaye[b]

[a]VicRoads, [b]Queensland University of Technology - Centre for Accident Research & Road Safety – Queensland

Abstract

Speeding is a major contributor to deaths and serious injuries. To assist in speed countermeasure development, an examination of speeding offenders' characteristics, re-offence and casualty crashes during and after periods of licence sanctions was undertaken. These analyses aimed to determine the effects of the following sanctions: licence bans; the increase in speeding ban periods and demerit points for higher level speeding offences; additional demerit point bans for high-range offenders in addition to a 12-month speeding ban; and the good behaviour bond available as an alternative to licence suspension after reaching the demerit point threshold.

Background

Speeding is a major contributor to deaths and serious injuries in Victoria. To assist in speed countermeasure development an examination of speeding offenders' licensing and offence history to understand their characteristics, re-offence rates and casualty crash rates during and after periods of licence sanctions was undertaken. The project analysed the effects of:

1. licence bans for speeding offences
2. the increase in speeding ban periods and demerit points on 15 December 2002 for higher level speeding offences
3. additional demerit point bans for high-range offenders in addition to a 12-month speeding ban
4. the good behaviour bond (GBB) available as an alternative to licence suspension after reaching the demerit point threshold.

Method

Drivers convicted of a speeding offence committed between 1 January 1996 and 31 December 2014 were considered eligible persons for all analyses. The analyses involved calculating rates of speed offending and crashing per 1,000 licence person-years. Rates were calculated for each licensing period as per Figure 1. To test the statistical differences in rates across the different time periods, rate ratios were calculated, separately for casualty crash rates and speeding offence rates.

Figure 1 illustrates the licensing cycle after a speeding ban and is applicable to some of the analyses undertaken.

Results

A selection of results for two of the four analyses are reported here, all analyses will be reported in the full paper.

Effect of licence bans

Speeding offenders had statistically significantly ($p < .01$) lower rates of speeding offences and casualty crashes during the:

- ban compared with the:
    - pre-licence ban[1] (71% lower offences and 71% lower crashes)
    - licensed (ban finished) (48% lower offences and 16% lower crashes)

[1] The period between the offence and the start of the licence ban.

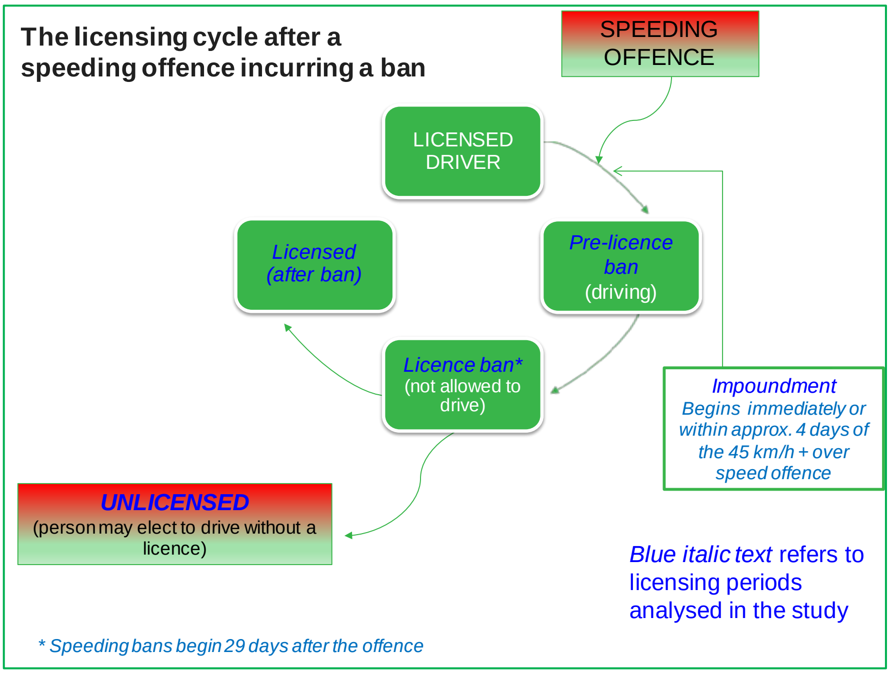


Figure 1. The licensing cycle indicating the licence periods for drivers who have their licences banned (suspended) for a speeding offence

- licensed (ban finished) period than the pre-licence ban by 45% and 66% respectively.

Effect of good behaviour bond (GBB)

The following findings were obtained for GBBs[2]:

- There were statistically significantly ($p < .01$) lower speeding offence rates (6%) and casualty crash rates (31%) following the successful completion of the GBB than in the period before it was served.
- One quarter (24.7%) of offenders who breached their GBB went on to re-offend during their breach suspension.

Conclusions

The study findings indicate that licence bans from speeding offences reduce speeding re-offending and casualty crashes. The increase in speeding ban periods in December 2002 had a positive impact on speeding offences and casualty crashes and the increase in demerit points at this time was associated with a decrease in crashes.

A demerit point suspension imposed after a 12-month speeding ban was not effective in reducing subsequent speeding offending or casualty crashes compared with those who received a speeding ban (6 or 12 months) only.

There were positive outcomes for the GBB, with lower re-offence rates for those who elected to undertake this option when reaching the demerit point limit.

[2] There were 444,400 (12.9%) offenders, from a pool of 3,450,338 speed offenders, who reached the demerit point limit during the period 1 January 1996 to 31 December 2014. There were 329,531 (9.6%) speeding offenders who opted for a Good Behaviour Bond (GBB) of all speeders in the study period. Nearly 75% of offenders who reached the demerit point limit took the GBB.

Development of a driver distraction safety rating system for new vehicles

Kelly Imberger[a], Christopher Poulter[a], Michael Regan[b], Mitchell L. Cunningham[c] & Michael Paine[d]

[a]VicRoads, [b]University of New South Wales, [c]Australian Road Research Board and The University of Sydney, [d]Vehicle Design and Research Pty Limited

Abstract

Drivers engage in a wide range of non-driving related tasks while driving that have potential to distract them and compromise their safety. These include interactions with infotainment systems built into the vehicle by vehicle manufacturers. Tasks can include communication, entertainment, navigation and internet browsing. Performing these tasks can degrade driving performance and increase crash risk. Not all infotainment technologies in new vehicles are equal in terms of their potential to distract. This paper documents the findings of a study commissioned by VicRoads to develop a test protocol for rating the distraction potential of new vehicles entering the Australian market. A Road Map is presented with options for introducing it as a consumer or NCAP distraction rating.

Background

Driver distraction is often defined as "...the diversion of attention away from activities critical for safe driving toward a competing activity, which may result in insufficient or no attention to activities critical for safe driving" (Regan, Hallett, & Gordon, 2011, p. 1776), and is a significant contributor to road trauma. Competing activities, according to this definition, can be driving or non-driving related. Drivers in Australia engage in a wide range of non-driving activities (Young et al., 2019). These include interactions with infotainment systems provided by vehicle manufacturers. A recent US study found that interacting with the visual display unit (VDU) in a vehicle carries a nearly five-fold increase in crash risk (Dingus et al. 2016).

Not all technologies in new vehicles brought into Australia are equal in terms of their potential to distract. The same technologies are often designed and implemented in very different ways by different manufacturers. Consequently, some vehicle cockpits are more demanding of drivers' attention than others and are more likely than others to distract them. This paper reports the outcomes of a study commissioned by VicRoads designed to a develop a test protocol for rating the distraction potential of new vehicles entering the Australian market, along with a Road Map for its introduction as a consumer or New Car Assessment Program (NCAP rating).

The project and its methods

This project, undertaken by the Australian Road Research Board (ARRB) in collaboration with VicRoads, had two components:

1. Feasibility research examining how the current New Car Assessment Program (NCAP) safety rating processes operate and a review of HMI guidelines and criteria, potential test methods and other human factors literature applicable to development of a distraction safety rating system.
2. Development of a Road Map that outlined how a distraction safety rating system might be incorporated into NCAP ratings, how it could operate as a standalone process and what other potential implementation pathways could be followed.

The project was guided by Scientific and Ratings Advisory Committees; comprised of local and international distraction experts and vehicle safety rating organisations, respectively. The project was undertaken in collaboration with distraction experts from the University of Utah who were engaged in similar work (Regan, Cunningham, & Paine, 2018).

Project findings

Based on the research literature reviewed, and consultation with members of both Committees, three out of a total of nine scientific methods identified were found to be most suitable for evaluating the distraction potential of in-vehicle HMI (the first step in developing a distraction rating for the in-vehicle HMI):

1. the Detection Response Task (DRT)
2. the Visual Occlusion Test (VOT), and
3. an HMI distraction checklist.

The DRT is an internationally recognised and validated measure of cognitive demand. The VOT is, similarly, an internationally recognised and validated measure of visual demand. Both measures are used by many vehicle manufacturers. The checklist, developed by the project team, derives from well-established vehicle HMI design guidelines and standards. The checklist can tap into visual and cognitive distraction and bi-manual interference (e.g. hand(s) off the steering wheel), with design guidelines and principles that derive predominantly from established human factors theory and principles (NHTSA, 2013). Together, these three methods were judged to be capable of being combined to measure and rate the potential for distraction deriving from driver interactions with in-vehicle infotainment systems (Regan, Cunningham, & Paine, 2018). A voluntary scheme for encouraging vehicle manufacturers to produce less distracting vehicle HMIs is considered the most feasible approach to developing a rating system in the short-term, with a longer-term vision of incorporating the test method into consumer rating systems such as NCAP (Regan, Cunningham, & Paine, 2018).

Conclusions

An HMI distraction rating system that is credible to industry and consumers is feasible, but requires further validation and possibly demonstration of its potential to reduce crashes - similar to evidence requirements directing the policies of Australasian/European NCAP.

References

Dingus, T., Guo, F., Lee, S., Antin, J., Perez, M., Buchanan-King, M., & Hankey, J. (2016). Driver crash risk factors and prevalence evaluation using naturalistic driving data. *Proceedings of the National Academy of Sciences*, *113*(10), 2636-41.

National Highway Traffic Safety Administration (NHTSA), (2013). *Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices*. National Highway Traffic Safety Administration, Department of Transportation: Washington, DC, USA. Retrieved June 8, 2019, from https://www.federalregister.gov/documents/2013/04/26/2013-09883/visual-manual-nhtsa-driver-distraction-guidelines-for-in-vehicle-electronic-devices

Paine, M. & Regan, M.A. (2018). *Road Map for an HMI Distraction Safety Rating (Component 2; Deliverable 5)*. Sydney: Australian Road Research Board (report available from VicRoads).

Parnell, K.J., Stanton, N.A., & Plant, K.L. (2018). What technologies do people engage with while driving and why?. *Accident Analysis & Prevention*, *111*, 222-37.

Regan, MA., Cunningham, ML., & Paine, M. (2018). *Towards Zero Distraction Project: Final Report - Overview of Project Findings and Next Steps (Deliverable 6)*. Sydney: Australian Road Research Board (report available from VicRoads).

Regan, M. A., Hallett, C & Gordon, C.P., (2011). Driver distraction and driver inattention: definition, relationship and taxonomy, *Accident Analysis & Prevention*, *43*(5), 1771-81.

Young, K., Osborne, R., Koppel, S., Charlton, J., Grzebieta, R., Williamson, A., Haworth, N., Woolley, J. & Senserrick, T. (2019). What are Australian drivers doing behind the wheel? An overview of secondary task data from the Australian Naturalistic Driving Study. *Journal of the Australasian College of Road Safety*, *30*(1), 27-33.

Field testing anti-speeding messages

A. Ian Glendon[a], Ioni Lewis[b]

[a]School of Applied Psychology, Centre for Work, Organisation and Wellbeing, & Cities Research Institute, Griffith University, Gold Coast, Queensland, Q4222
[b]School of Psychology & Counselling, Centre for Accident Research and Road Safety – Queensland, & Institute of Health and Biomedical Innovation, Queensland University of Technology, Kelvin Grove, Q4059

Abstract

On a 60mph section of road that included a 40kph school zone, speed detection devices were installed prior to, immediately after, and further away from variable message signage (VMS) displaying anti-speeding messages. Speed data (>250,000 vehicle movements) were collected continuously prior to VMS installation (week1), during message display (week2), and post-display (week3). Speed reductions associated with VMS deployment from week1 to week2 were partially sustained at week3.

Background

Using VMS for road safety requires effective messages to influence driver behaviour (Wu & Liang, 2017), and only display messages allowing drivers to change their immediate behavior (e.g., speed choice). Drivers may change their speed selection to a modest extent on encountering VMS messages (Schramm et al., 2012; Song et al., 2016; Soole et al., 2010), and changes may be sustained over time (Winnett & Wheeler, 2002). This study sought to determine whether drivers' speeds through a straight level section of road including a school zone could be influenced by anti-speeding messages.

Method

Week1: data gathering prior to VMS installation provided baseline measures. Week2: three messages displayed. Week3: after VMS removal, data would identify residual effects. The selected site had a speed-related fatal or serious (requiring hospitalization) crash within the previous 6 years. The 60kph speed limit throughout included a school zone with a 40kph school hours speed limit.

The messages (see Table 1), developed according to principles described by Lewis et al. (2016), used a protection motivation theory theoretical framework (Cathcart & Glendon, 2016; Glendon et al., 2018; Glendon & Walker, 2013). Figure 1 shows a sample displayed message.

Results

Results reported here relate only to data from the speed detection device recording vehicle movements into the school zone. So that only vehicles whose drivers were free to select their speed were included in the analyses, vehicles at <4s distance from a lead vehicle were excluded (19%).

All vehicles detected exceeding speed limit: week1 16.41% (mean 46.94kph), week2 13.82% (45.75kph) – week1:week2 effect[1] 0.151, week3 14.58% (46.10kph) – week1:week3 effect[1] 0.106.

Mean speed changes in *week2 compared with week1*: night-time -1.65% (effect[2] 0.003), daytime excluding school hours -1.98% (0.004), school hours -4.01% (0.013). Mean speed changes in *week3 compared with week1*: night-time -1.84% (effect[2] 0.003), daytime excluding school hours -1.32% (0.002), school hours -2.43% (0.005).

[1] Cohen's *d* (both effects p<.001).
[2] Partial η^2 (all effects p<.001).

Percentages of drivers entering the school zone at >40kph over the 10 week1 school hours periods: 45.03-68.56% (mean range 40.03-43.88kph); week2: 30.56-52.12% (range 38.57-41.00kph); week3: 35.73-59.24% (range 38.28-42.44kph).

Conclusion

Modest mean speed reductions from week2 compared with week1 were detected for all time periods. School hours' vehicle movements showed the largest mean speed decrease and the largest reduction in percentages of drivers exceeding the 40kph school zone speed limit. Week2:week1 reductions were partially sustained in week3 for all time periods.

Main lessons: 1) strategically deploy speed detection devices and analyse resultant speed data before deploying VMS; 2) avoid displaying VMS messages at times when few drivers are speeding. Recommend displaying targeted messages at this location during school hours only and vary messages (perhaps daily) for maximum effect. Study replications are required for longer time periods in varied road environments.

Table 1. Anti-speeding messages and their protection motivation theory (PMT) derivations

Screen 1 display	Screen 2 display	PMT appraisal category	PMT element represented	Field study presentation
SPEEDING?	PENALTIES APPLY!!	Threat appraisal	Counter-rewards	Days 1, 2 & 3 (~72 hours)
KEEP OUR STREETS SAFE	STAY WITHIN THE LIMIT	Coping appraisal	Self-efficacy	Days 4 & 5 (~ 48 hours)
REDUCE YOUR SPEED	KEEP YOUR FAMILY SAFE	Threat appraisal	Perceived severity	Days 6 & 7 (~ 48 hours)

Figure 1. VMS prior to school zone showing one of the messages

References

Cathcart, R. L., & Glendon, A. I. (2016). Judged effectiveness of threat and coping appraisal anti-speeding messages. *Accident Analysis & Prevention, 96*, 237–248. doi:10.1016/j.aap.2016.08.005

Glendon, A. I., Lewis, I., Levin, K., & Ho, B. (2018). Selecting anti-speeding messages for roadside application. *Accident Analysis & Prevention, 119*, 37–49. doi:10.1016/j.aap.2018.06.016

Glendon, A. I., & Walker, B. (2013). Can anti-speeding messages based on protection motivation theory influence reported speeding intentions? *Accident Analysis & Prevention, 57*, 67–79. doi:10.1016/j.aap.2013.04.004

Lewis, I., Watson, B., & White, K. M. (2016). The Step approach to Message Design and Testing (SatMDT): A conceptual framework to guide the development and evaluation of persuasive health messages. *Accident Analysis & Prevention*, *97*, 309–314. doi:10.1016/j.aap.2015.07.019

Schramm, A. J., Rakotonirainy, A., Smith, S. S., Lewis, I. M., Soole, D. W., Watson, B. C., & Troutbeck, R. J. (2012). *Effects of speeding and headway related variable message signs on driver behaviour and attitudes*. Brisbane, QLD: Department of Transport and Main Roads.

Song, M., Wang, J. H., Cheung, S., & Keceli, M. (2016). Assessing and mitigating the impacts of dynamic message signs on highway traffic. *International Journal for Traffic and Transport Engineering*, *1*(6), 1–12. doi:10.7708/ijtte.2016.6(1).01

Soole, D. W., Smith, S., Lewis, I., & Rakotonirainy, A. (2010). *Vehicle-activated signs (VAS) as a method of speed management: A literature review and recommendations* (Prepared for Main Roads Queensland). Brisbane, QLD: Centre for Accident Research and Road Safety – Queensland (CARRS-Q).

Winnett, M. A., & Wheeler, A. H. (2002). *Vehicle-activated signs – A large scale evaluation: Prepared for Road Safety Division, Department for Transport* (TRL Report TRL548). Crowthorne, UK: TRL Limited.

Wu, Z., & Liang, Y. (2017). Variable message sign location selection basing on drivers' perception. *Transportation Research Procedia*, *25*, 1745–1754. doi:10.1016/j.trpro.2017.05.133

Building policing legitimacy and strengthening community relationships: On the road towards zero with IM_PACT

Senior Sergeant Bruce Peel[1], Sergeant Darren Green[1], Dr Sarah Bennett[2]

Queensland Police Service[1], University of Queensland[2]

Abstract

The IM-PACT initiative between the Queensland Police Service and University of Queensland offers a resource efficient problem-solving model founded on three principles: (I) Identification of the problem; (M)essage development; and message delivery (PACT). PACT prompts police to explain the (P) Purpose of an engagement, (A) Acknowledge good habits, convey a (C) Crime message and (T) Thank people for their involvement. With minimal impact on resources, PACT-related Random Breath Testing (RBT) affords opportunity to share responsibility for road safety and crime prevention by both police and the community. This presentation provides the audience with an RBT experience incorporating the PACT message.

Background

During 2015-16, the Ipswich Police District in Queensland experienced a concerning spike in road fatalities (Queensland Police Service, 2016). Whilst traffic enforcement and Random Breath Testing (RBT) helped reduce this trauma, the continued challenges to concurrently meet other community safety objectives placed a consistently high demand on police resources. The PACT message-delivery model works on the premise that the lawful mechanism to intercept drivers for RBT presents prime opportunities for police to constructively engage with citizens with potentially multiple benefits. The three million annual RBT interactions by the QPS (Queensland Police Service, 2016) present substantial prospects. A transformed comprehension was promoted to realise the greater benefits of RBT amongst police by using the procedurally-just message-delivery process of PACT (Mazerolle, Bennett, Antrobus, Eggins, & Martin, 2015). The simple PACT acronym guides police in their interactions with the public during RBT, prompting purposeful communication regarding road safety and crime prevention.

Implementation of the IM-PACT model

In partnership with the University of Queensland (UQ), a 6-month trial of the IM-PACT model, concluding in April 2018, involved 94 operations across the Ipswich District. Using randomised conditions, 9302 RBTs were conducted in 45-minute blocks, consisting of controlled (traditional) deliveries and experimental (PACT) deliveries. The typical PACT delivery commenced with a professional introduction and explanation of the purpose of the interception (that police are conducting RBT to help keep the roads safe). This engagement was followed by an acknowledgement of a good habit such as the wearing of seatbelts. Following the breath testing, the chosen crime message was delivered. This trial's crime message targeted the prevalence of stealing from motor vehicles and provided succinct crime prevention advice. The engagement concluded with simply thanking the driver for their involvement in the RBT. Whilst PACT encounters were on average 39 seconds longer than traditional RBT encounters, drivers' surveys found positive public perceptions and outcomes (Peel, Green, & Bennett, 2019).

Research potential of the IM-PACT model

In December 2018, the IM-PACT team submitted a funding proposal to the Australian Research Council to deliver the rigorous evaluation needed to make an evidence-based decision regarding the efficacy of IM-PACT. Through analysis, the outcomes of IM-PACT trials and data interpretation are expected to provide evidence that can significantly improve the smart deployment of RBT to achieve multiple benefits regarding community safety.

Conclusion

Supporting the vision of zero deaths and serious injuries on Queensland roads (Queensland Government, 2015), the QPS makes substantial investment each year through RBT. Through its effectiveness and minimal impact on resources, the IM-PACT problem-solving model appears to be a sustainable business concept to enhance RBT encounters. The procedurally-just encounters associated with the IM-PACT model assist in building police legitimacy and strengthening community relationships to assist police in resourcefully achieving broader social benefits regarding crime and road safety (Bennett, Peel, & Green, 2019). It is envisaged that the QPS and law enforcement agencies globally will benefit from embedding the IM-PACT problem-solving model and PACT message delivery process into everyday policing practices such as RBT.

References

Bennett, S., Peel, B., & Green, D. (2019). *Saving lives, reducing crime and building legitimacy with IMPACT.* Forthcoming.

Mazerolle, L., Bennett, S., Antrobus, E., Eggins, E., & Martin, P. (2015). Enhancing police legitimacy: Results from the Queensland Community Engagement Trial (QCET). *Public Safety Leadership Research Focus, 3*(4), 1-8.

Peel, B., Green, D., & Bennett, S. (2019). *Saving lives, reducing crime and building legitimacy with IMPACT.* QPS Research Showcase. QPS, Brisbane.

Queensland Government. (2015). *Safer Roads, Safer Queensland - Queensland's Road Safety Strategy 2015-2021*. Online: Queensland Government Retrieved from file:///C:/Users/peppe/Downloads/roadsafetystrategy201521.pdf.

Queensland Police Service. (2016). *Annual Statistical Review 2015-16*. Online: Queensland Police Service, Retrieved from https://www.police.qld.gov.au/corporatedocs/reportsPublications/statisticalReview/Documents/2015-16/AnnualStatisticalReview_2015-16.pdf.

The challenges of coordinating a multi- agency safe systems approach in Local Government Road Safety

Tracey Norberg[a], Sgt Chris Upton[b], Stefan Gerakios[a] Dylan Louder[a]
[a]Goulburn Mulwaree Council (GMC), [b]NSW Police

Abstract

Local Governments (LG) face challenges in managing road safety. The biggest is the coordination of numerous stakeholders from multi-agencies, each with their own perspectives and organizational constraints. In GMC the responsibility falls with the Road Safety Officer (RSO). Inhibiting factors for road safety at LG level include: lack of immediate funding stream, strict adherence to engineering guidelines, lack of resources, unrealistic expectation of stakeholders, the "blame" factor and invested interests. This paper will show how the key to a successful safe systems outcome is the RSO's ability to negotiate an evidence-based solution agreed by all stakeholders.

Background

NSW Local Governments can partner with Roads and Maritime Services (RMS) and Centre for Road Safety (CRS) in the Local Government Road Safety Program (LGRSP). This program was developed to enable Councils to promote state-wide road safety initiatives at a local level and to develop localized road safety programs. GMC has participated in the LGRSP for 17 years which enables them to employee a full-time RSO. GMC manages a road network of 1250km, which covers 250km urban road and 1000km rural roads. Daily, Council receives notification of road safety issues. Beyond the LGRSP responsibilities, GMC requires the RSO to investigate, review and prioritize Council's response. Issues are often reported as solution-based requests. Coordinating a multi-agency response is often required where the contributions from local stakeholders are managed by the RSO. It is the RSO's task to identify the road safety concern and apply evidence-based best practice solutions championing safe systems.

Case Study: Local School Crossing

Concerns for pedestrian safety were brought to Councils attention about a school crossing on busy arterial road (6729ADT). Frequent driver non-compliance at the school crossing resulted in reported near misses. Council received these reports from multiple stakeholders who each suggested a different solution.

Proposed Stakeholder Cause:

1. Parents felt speeding and Council's perceived lack of actions were the contributing factors ("blame" factor)
2. School staff felt poor visibility of the crossing
3. RMS suggested incorrect placement of 40km/h flashing lights
4. Engineers identified road infrastructure deficiencies
5. Police believed it was the whole community's human behavior

Proposed Stakeholder Solution:
1. Parents requested the installation of speed humps
2. School Staff suggested enhanced visibility of the crossing
3. RMS recommended extension of the school zone featuring relocation of the 40k flashing lights
4. Engineers recommended extension of the kerb blisters
5. Police conducted enforcement issuing of a high number of infringements this strategy could not be deployed consistently due to resourcing. Police requested the RSO conduct an education campaign with the extended community

RSO Coordinating Safe-System Solutions
After collecting evidence, observing the crossing and coordinating the stakeholder contributions the RSO managed the implementation of the following safe system solutions:
Road and roadsides
1. Crossing's visibility enhanced with yellow pedestrian fencing, line markings and new flags.
2. Council lodged funding with RMS for infrastructure treatments
Speed
1. Data collection confirmed 85th speed percentile 40km/h or under
2. Flashing 40k school signs relocated to provide motorist with additional warning
People
1. Localized educational campaign developed and implemented by RSO reaching target audience via social media and radio advertising. Campaign included information on road rules for school crossing and expected road user behavior

Where to from here
- Ongoing monitoring of the crossing.
- GMC awaiting funding for infrastructure extensions.
- Reported near misses have reduced but still occur.
- Local Stakeholder knowledge of safe systems enhanced
- RSO coordinates ongoing contact.

This is just one of the multiple problems the RSO encounters daily over and beyond Council's planned Road Safety Delivery Program.

References

NSW Government, Transport for NSW, Local Government Road Safety Guidelines, 2014-2017 (http://www.rms.nsw.gov.au/buisness-

Mobility Versus Safety: The Issues Related to Traditional Road Design/Traffic Analysis Approach Illustrated in Two Abu-Dhabi-Based Case Studies

Francisco D.B. Albuquerque[a], Dina M. Awadalla[a], and Ahmed H. Elzaher[a]

[a]Civil & Environmental Engineering Department, College of Engineering, United Arab Emirates University, Al Ain, UAE

Abstract

Car transportation is highly inefficient and strikingly unsafe. Hence, policy and design priorities should focus on other, more sustainable transport alternatives. This paper explains how standard road design guidelines may lead to evermore-inefficient road transport. Secondly, the paper shares two recent, road-transport-impacting decisions made in the Emirate of Abu Dhabi. Based on on-going roadside and intersection safety studies, it is concluded that these recent decisions may be negatively affecting road safety. Finally, the paper discusses why such decisions may be classic examples of how mobility improvement may come at the expense of road safety deterioration.

Background

Emphasis may often be on trying to accommodate an ever-growing vehicle demand, resulting in a driver-accommodation-oriented mindset that often leads to an ever-growing number of traffic-related deaths, as well as an increased waste of resources in the form of idled road capacity during off-peak hours.

Objectives

The objectives of this paper are: i) to expose how standard road design guidelines may lead to an evermore-inefficient road transport system, and ii) to make use of real-world case studies to illustrate how mobility improvements may come at the expense of road safety deterioration.

Method

The methodology adopted by this paper can be broken down into two parts. Firstly, issues related to traditional road design/traffic analysis are exposed. Secondly, two cases, based on recent policy- and design-related decisions made in the city of Al Ain, in the Emirate of Abu Dhabi, are presented [Dajani 2018; Rousseau 2018]. Data from on-going roadside- and intersection-safety research studies are used to evaluate the implications of these decisions.

Standard Road Design Guidelines

Standard road design and traffic analysis guidelines often call for a design/analysis to be based on peak-hour traffic conditions. As shown in Figure 1, traffic volume exceeds capacity over a very short time window, resulting in a level of service (LOS) F. This “failing” LOS level often leads to capacity increases, resulting in an expansion of the light-blue area (i.e., idled capacity). This sort of road design approach is often pursued even when road safety may be at risk.

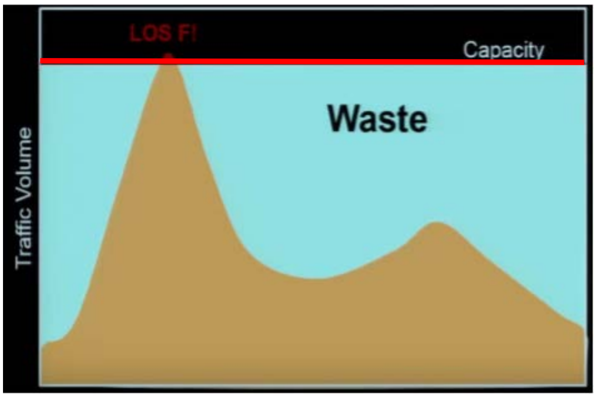


Figure 1. Daily Traffic Volume Distribution

Case Studies

Case I - Intersection Design Type Change

Table 1.a shows that 9 and 1 percent of all crashes having occurred at signalized intersections and roundabouts, respectively, resulted in injuries.

		Intersection Type			
		Signalized Intersections		**Roundabouts**	
		#	%	#	%
Crash Severity	PDO	21,779	91.00	48,928	99.28
	Minor	1,350	5.64	127	0.26
	Moderate	629	2.63	183	0.37
	Severe	123	0.51	17	0.03
	Fatal	53	0.22	26	0.05
		23,934	100.00	49,281	100.00

Table 1.a.

Variables Investigated	Roadside Design In Line With Benchmark		Posted Speed Limit (kph)	
Categories	Yes	No	≤ 80	≥ 100
%	19.83	80.17	40.52	59.48

Table 1.b.

Table 1. Preliminary Intersection Safety and In-Depth Roadside Design Analyses

Case II – Posted Speed Limit Raise

Table 1.b shows that, based on the 116 roadside sites studied, 93 were not in line with the benchmark [AASHTO 2011, AD DOT 2012], and 69 percent were located on high-posted-speed-limit roads.

Results

The results relating to the two cases presented are as follows:

Intersection Design Type Change

The replacement of roundabouts with signalized intersections in the city of Al Ain may negatively impact safety.

Posted Speed Limit Increase

The majority of the roadside areas investigated in the city of Al Ain are not in compliance with the benchmark. Hence, posted speed limit raises should not have been implemented without a significant roadside design upgrade.

Conclusions

The authors recommends road designers and decision-makers to ask the following questions before giving the go-ahead to projects which may primarily be concerned with increased car-mobility levels, especially during peak hours.

1) In the case of new projects: are the economic benefits associated with decreased delay being traded-off against an increase in the risk of injury or death?
2) In the case of retrofitting projects, more specifically in the form of a roundabout replacement, can the economic benefits associated with decreased peak delay offset an increase in the risk of injury or death plus the design/construction/maintenance cost associated with traffic signal operation?
3) Is net daily delay associated with the adoption of a signalized intersection decreased or increased? Here, net daily delay is defined as the delay reduced during the peak hour plus the delay increased during off-peak hours due to red-light-waiting times.

References

Albuquerque, F.D.B. Improving walkability, livability, and safety through urban street retrofit design. Proceedings of the Annual International Conference on Architecture and Civil Engineering, 2018.

Hakkert, A.S., Brainmaster, L. The uses of exposure and risk in road safety studies. SWOV Institute for Road Safety Research, The Netherlands. R-2002-12. Leidschendam, 2002.

Dajani, H. Speed limits to be increased on Abu Dhabi roads to boost safety. The National. November 29, 2018. Available at:https://www.thenational.ae/uae/transport/speed-limits-to-be-increased-on-abu-dhabi-roads-to-boost-safety-1.797068. Accessed February 11, 2019.

Rousseau, O. Abu Dhabi's Musanada launches $119m Al Ain roadworks. ConstructionWeekOnline. October 31, 2018. Available at: https://www.constructionweekonline.com/article-50615-abu-dhabis-musanada-launches-119m-al-ain-roadworks. Accessed February 11, 2019.

American Association of State of Highway and Transportation Officials (AASHTO). Roadside Design Guide. 4th ed. Washington D.C.: American Association of State of Highway and Transportation Officials (AASHTO); 2011.

Abu Dhabi Department of Transport (AD DOT). Roadside Design Guide. 2nd ed. Abu Dhabi Department of Transport; 2012.

Risky Driving: The Role of Cognition in Youth

Andrea Dimeco[a], Joanne Bennett[a,b], Jennifer Batchelor[a]
[a]Macquarie University, [b]Australian Catholic University

Abstract

Youth (aged 15 to 24 years), engage in risky driving more than any other age group. Previous research has established a link between cognition and fitness to drive for older drivers. The present study aims to explore these findings in a youth driver sample. 100 undergraduate students completed a cognitive test battery and drives on a simulator. Results revealed global cognitive functioning, executive function and visuospatial skills were related to risky driving behaviors. However due to being below the recommended 80% cut-off scores could not be developed. Future studies should examine cognitive factors in combination with personality and social factors to identify risky young drivers.

Introduction, Method, Results, Discussion

Risky driving is one of the leading causes of youth mortality worldwide (World Health Organization, 2014). Research into older drivers has established a link between risky driving and cognition, culminating in the Information Processing Model developed by Uc and Rizzo (2008). The model highlights how different forms of cognitive dysfunction can result in poor driving outcomes. As a result, cognitive function can predict an individual's fitness to drive for older drivers Recently, Zicat, Bennett, Chekaluk, and Batchelor (2018) extended the model to a sample of younger drivers, highlighting its validity across the lifespan. However, there is yet to be a study utilising measures of cognitive ability to predict an individual's propensity to take risks in a younger driver sample. Such research may help in profiling potentially risky drivers which can aid in reducing the number of potentially risky youth on the roads. As such, the present study aims to address this gap by developing cognitive measures as indicators of an individual's propensity to engage in risky driving.

There were 100 participants in this study (72% female) with an average age of 20 years and average number of years spent driving of 4 years. Participants completed a battery of cognitive tests, previously shown to be related to driving performance (Bennett, Chekaluk & Batchelor, 2016) and drove a simulator which measured speeding, out of lane and collisions. Significant relationships between cognitive tests scores and driving performance measures were identified and logistic regressions and Area Under the Curve analyses were examined to assess variance and develop cut-off scores.

The results of the present study indicate that several cognitive tests were significantly related to driving performance. Table 1 outlines the four separate binary logistic regressions carried out in order to determine whether risky driving could be predicted from cognitive performance. Following this, four separate Area Under the Curve analyses were performed in order to assess model fit. Although each model was significant, no model was able to meet the 80% criterion required to develop cut off scores (Bedard, Weaver, Dārzin, & Porter, 2008).

The present study was able to replicate previous findings by validating the Information Processing Model by Uc and Rizzo (2008) in a sample of younger drivers. In line with the model, this study found significant relationships between measures of visuospatial ability and speeding, executive function and lane positioning and mental status with total number of collisions. However, the present study was not able to successfully achieve its aim of developing cut-off scores. This may be due to a number of methodological limitations and time constraints such as some cognitive measures used being better suited for older samples of drivers (Reger et al., 2004). Nevertheless, future research should aim to assessing a more broader sample that is more indicative of the young driver population and take into account other potentially important variables such as personalty and social factors. A more comprehensive study may aid in preventing risky youth on the road through a combined cognitive, personality and social profile.

Table 1. Logistic Regressions for related Cognitive Predictors and Driving Performance

Variable	β	*SE* β	Wald χ^2	*p*	Cox & Snell R^2	95% CI for e^{β}		
						e^{β}	Lower	Upper
Collisions								
MMSE	-.379	.183	4.29	.038	.048	.68	.48	.98
SDLP								
SST	-.294	.107	7.61	.006	.082	.75	.60	.92
Speeding								
VOSP	-.382	.132	8.44	.004	.090	.68	.53	.88
CFT-Copy	-.154	.080	3.72	.054	.035	.86	.73	1

Note. MMSE= Mini-Mental State Examination; SDLP= Standard Deviation of Lane Position; SST= Stop Signal Task; VOSP= Visual Object and Spatial Perception Battery; CFT-Copy= Rey Complex Figure Test-Copy; *SE*= Standard Error; e^{β}= Odds Ratio; CI= Confidence Interval.

References

Bedard, M., Weaver, B., Dārzin, P., & Porter, M. M. (2008). Predicting Driving Performance in Older Adults: We are not there yet! *Traffic Injury Prevention, 9*(4), 336-341. http://dx.doi.org/10.1080/15389580802117184

Bennett, J. M., Chekaluk, E., & Batchelor, J. (2016). Cognitive Tests and Determining Fitness to Drive in Dementia: A Systematic Review. *Journal of the American Geriatrics Society, 64*(9), 1904-1917. http://dx.doi.org/10.1111/jgs.14180

Reger, M. A., Welsh, R. K., Watson, G., Cholerton, B., Baker, L. D., & Craft, S. (2004). The Relationship Between Neuropsychological Functioning and Driving Ability in Dementia: A meta-analysis. *Neuropsychology, 18*(1), 85. http://dx.doi.org/10.5555/0894-4105.18.1.85.supp

Uc, E. Y., & Rizzo, M. (2008). Driving and Neurodegenerative Diseases. *Current Neurology and Neuroscience Reports, 8*(5), 377. http://dx.doi.org/10.1007/s11910-008-0059-1

WHO. (2014). Adolescents: Health Risks and Solutions. *The World Health Organisation.* Retrieved from http://www.who.int/news-room/fact-sheets/detail/adolescents-health-risks-and-solutions

Zicat, E., Bennett, J. M., Chekaluk, E., & Batchelor, J. (2018). Cognitive Function and Young Drivers: The Relationship between Driving, Attitudes, Personality and Cognition. *Transportation Research Part F: Traffic Psychology and Behaviour, 55*, 341-352. http://dx.doi.org/10.1016/j.trf.2018.03.013

Prevalence of Illegal Mobile Phone Use on Australian Roads

Alexander Jannink[a], Chris Kells[a], Andrew Matthews[a]

[a]Acusensus Pty Ltd

Abstract

This paper presents data and information on the prevalence of mobile phone use by drivers across road networks in Australia with the intent to inform enforcement strategies. The data for this study has been obtained by the deployment of fixed and mobile illegal mobile phone use detection cameras. The cameras surveil drivers at particular points on the road network. We find a consistent and high baseline rate of offending that matches closely results of naturalistic driving studies. We present the proportions of drivers using phones by hand, by vehicle type, by passenger count and by time of day.

Background, Method, Results and Conclusions

The illegal use of mobile phones while driving has grown to epidemic proportions on Australian roads and represents a major challenge for reducing road trauma. Despite all states and territories enacting laws banning handheld phone use while driving, it has proven difficult for the police to enforce these laws.

Acusensus has developed an innovative camera-based solution that provides authorities with a new tool to detect and deter illegal mobile phone use. A sensor system detects and records the presence and speed of all vehicles and a specialised camera system captures high-resolution evidence of phone use. The system can operate 24/7 in all weather conditions, while the cameras can be mounted on existing road infrastructure or operated from vehicles or mobile trailers. Key innovations in the solution involve the removal of glare from the images and the use of Machine Learning (“AI”) to automatically identify drivers using a phone illegally.

Method

Acusensus has deployed the camera solution at various roadways in Australia, from freeways to metropolitan arterials to regional roads. The solution can accurately detect the proportion of drivers who utilise a phone (illegally) while in motion, at any time of the day. Further analysis was conducted on those drivers identified to examine at what times of day drivers offended, in what way they used the phone (e.g. with one hand or with two), whether prevalence was higher in heavy or light vehicles, and whether drivers offended with passengers in the vehicle or not.

Results

Across deployments at 14 different locations, capturing 30 million 12MP images, Acusensus has observed:

- A camera solution could be devised to provide clear prosecutable evidence of a driver illegally using a phone for 95% of illegal usage by consistently removing glare from windscreens and showing the phone use in 12MP resolution.
- The rate of drivers using phones while at speed (60km/h to 100km/h) was fairly consistent across different locations, with an average of 1.9% of drivers illegally using a phone while transiting past any of the camera locations, with a minimum of 1.4% and maximum of 2.8%.

- The rate of drivers using phones was negatively correlated with the posted speed limit for a given location (i.e. drivers offended more frequently in the lower speed limit locations).
- Drivers were most likely to use their left hand to manipulate the phone (75%).
- Some drivers used a phone illegally with both hands (5%).
- Drivers used phones illegally at any time of the day or night, with only slight variances in offending rates – slightly lower in morning peak periods of 6am-9am and slightly higher in the evening period of 7pm-9pm.
- Highest volumes of phone offences per hour were found to occur between 4pm and 5pm.
- 15% of drivers using a mobile phone had a passenger in the vehicle.
- 15% of drivers using a mobile phone were operating a heavy vehicle.

Conclusions

The data indicates that the prevalence of illegal phone use is extensive and consistent. Further, the camera system can be relied on to provide prosecutable evidence of drivers using phones illegally.

The data shows that a very high number of drivers will be identified and ‘caught’ by the system, at volumes far exceeding those typically captured by speed enforcement cameras.

Drivers using a phone have a significantly higher risk of crashing, and this information can be used to inform authorities as to how address this dangerous behaviour from an enforcement policy perspective.

Road crossing behaviour among primary and secondary school students in Tanzania

Paolo Perego[a], Federica Biassoni[a], Maria Rita Ciceri[a], Felix Wilhem Siebert[b], Rebecca Wiczorek[b]
[a]Traffic Psychology Unit of Research, Università Cattolica del Sacro Cuore di Milano, Italy
[b] Department of Psychology and Ergonomics, Technische Universität Berlin, Germany

Abstract

Tanzanian police reported that in 2016 over 3,381 people were killed on the roads, another 9,549 were injured in road accidents and 30% of all crashes involved pedestrians. This abstract shows the results of a study conducted in primary and secondary schools in the Arusha Region. The students were asked to identify the areas of interest within several road scenarios representing road crossings. The preliminary data analysis suggests that 90% of 205 subjects, aged 8 to 18, identified only left and right areas of the various images without controlling other areas from which other possible dangers could have arisen.

Background, Method, Results and Conclusions

The United Republic of Tanzania is located on the east coast of Africa and has a population of almost 55 million (National Bureau of Statistics, 2016). The Tanzanian police reported that in 2016 over 3,381 people were killed on the roads, and another 9,549 were injured in road accidents (Tanzania Traffic Police Force, 2016). The WHO (2018) estimates that the real figure is more than five times as much, with an estimated mortality rate of 29.2 per 100,000 inhabitants. As in many high-income countries, a significant part of the Tanzanian road toll is the victims of road accidents, which account for 30% of all road accidents (WHO, 2018), about twice the proportion in developed countries. Since the population of Tanzania is relatively young, with around 44% under the age of 15 (National Bureau of Statistics, 2016), school-age children are therefore exposed to a high level of risk as pedestrians. Possible reasons should be investigated, for example the lack of effective road safety education in schools or common fatalistic beliefs (Perego et al, 2018). A reading of the road education syllabus used in Tanzania showed little explanation and even a lack of road crossing guidance. This abstract shows the results of a study conducted in three different primary and secondary schools in the Arusha Region in January 2019 to investigate the students' representation of areas of interest within nine selected road scenarios, showing road crossings. The results will then be compared with those of other studies conducted in Europe, where road safety education has road crossing rules as one of its main concerns (Biassoni et al, 2018). The images were chosen from over 100 photographs taken on both urban and rural roads in Tanzania. 205 students responded to the questionnaire, which was divided into two parts: the first with questions about age, gender, how the subject arrives and returns to school, with whom and if the subject has ever had an accident as a pedestrian. In the second part, nine street scenarios were shown to the subjects in random order. The subjects were asked to imagine being in the position of the person who took the photo, waiting to cross the street, and to point to the areas in the picture where he would look at first, second and third. The picture was divided into nine quadrants, as in Figure 1. A first analysis of the data suggests that 90% of the subjects aged between 8 and 18 years (average age = 12.33 SD = 2.61, 103 males and 102 females) indicated only the A2 and C2 quadrants of the various images without controlling other areas from which other possible dangers could have arisen. One of the reasons for these results could be related to the lack of proper road safety education. The complete analysis of data, which will be carried out in March 2019, could be a starting point to improve this part of the national program in primary and secondary schools.

Figure 1. One of the 9 selected road scenario imagines

References

Biassoni F., Bina M., Confalonieri F., Ciceri M.R. (2018). Visual exploration of pedestrian crossings by adults and children: Comparison of strategies. Transportation Research Part F Traffic Psychology and Behaviour, 56, May 2018.

National Bureau of Statistics, United Republic of Tanzania (2014). Population Distribution by Administrative Areas, 2012 Population and Housing Census, National Bureau of Statistics, United Republic of Tanzania.

Perego P., Biassoni F., King M.J., Ciceri M.R. (2018). Perception of road hazards in a Tanzanian Secondary School before and after a traffic psychology intervention. Journal of Transport & Health, 10, June 2018.

Tanzanian Traffic Police Force, (2016). Statistics available directly from Traffic Police Headquarters, Sokoine Drive, Dar es Salaam, Tanzania.

WHO (2018). World Health Organization. Global status report on road safety 2018. Download from: https://www.who.int/violence_injury_prevention/road_safety_status/2018/en/

Linking hospital admissions and Police motorcycle crash reports in New Zealand: Can we improve our Midland Region evidence base?

Alastair Smith[a], John Garvitch[b], Kaye Clark[b], Janet Amey[a], Grant Christey[a,c],

[a]Midland Trauma Research Centre, Waikato District Health Board, New Zealand, NZ Transport Agency, Hamilton, New Zealand, [c] Waikato Clinical School, University of Auckland, New Zealand

Abstract

Motorcyclists are vulnerable road users and are over represented in trauma statistics. This study linked Police crash data (held by the NZ Transport Agency) and hospital trauma admissions (held by the Midland Trauma System). We investigated possible under-reporting by Police, as well as analysing the demography of those casualties requiring hospital admission but not recorded by Police. Linkage rates and reporting biases are of interest from a policy perspective as information on motorcyclists admitted to hospital, but not recorded by Police, do not contribute to the policy evidence base.

Background, Method, Results and Conclusions

Consultation is currently underway on an updated New Zealand Road Safety Strategy. The safety of motorcyclists as vulnerable road users is rightly high on the agenda. Motorcycle deaths and injuries reported by Police have increased since the early 2000s (Ministry of Transport, 2017). Motorcycle casualties are also an area of concern to the Midland Trauma System (MTS) as the regional hospital based trauma service. Motorcyclists represent about 32 percent of all on-road transport related hospital trauma admissions.

Methods

A retrospective review of anonymised, prospectively-collected trauma registry data from 1 January 2012 to 31 December 2016 was conducted. Patients admitted to a Midland hospital within seven days of an on-road motorcycle or moped-related event occurring within the region were included. Variables examined included: patient demographic characteristics, injury event information, in-hospital management, severity of injuries, length of stay and rurality of injury and patient residence. Police records and MTS registry data were linked using probabilistic methods.

Results

A total of 1,331 on-road crash casualties were recorded by Police while 689 on-road crash casualties were admitted to hospital (Figure 1). Linkage revealed under-reporting by Police of crash casualties resulting in hospitalisation. Approximately 56 percent (386) of hospital admission records were linked with Police records with an additional 303 (46 percent) patient admission records which could not be linked to any Police records. Higher linkage rates were significantly associated with crash severity as recorded by Police, patient injury severity recorded in the trauma registry, age and an urban crash location. Motorcyclists aged less than 45 years were significantly more likely to self-present. The odds of linkage for patients who self-presented to hospital were also significantly lower than those who did not self-present.

Conclusions

The 303 'missing' motorcyclists are important, not only because their injuries were significant enough to require hospital admission, but because undercounting can impact investment in road safety. Comparison with the group recorded by Police showed that the populations differ in terms of their demography, but not in terms of when they crashed or where. However, the reasons why these crashes were not known to Police are harder to ascertain. There could be a relationship between the conditions of a crash (question of guilt, extent of material damage, severity of the injuries, wished avoidance of Police etc.) as well as the attitude of any attending member of the public towards informing Police (Lujic, Finch, Boufous, Hayen & Dunsmuir, 2008; National Safety Council, 2017).

While the increase in casualties aged over 45 years reported by Police appears to be reflected in hospital trauma admission volumes, the merging of these datasets highlight several sources of bias underlying reporting of motorcycle crashes to Police. An understanding of these biases and including knowledge gained from linked Police-hospital datasets could assist with developing an evidence base that has considered complementary cross-sector crash information. Therefore, consideration should be given to more regular data linkage, to improve the evidence base on which key policy and funding decisions rely.

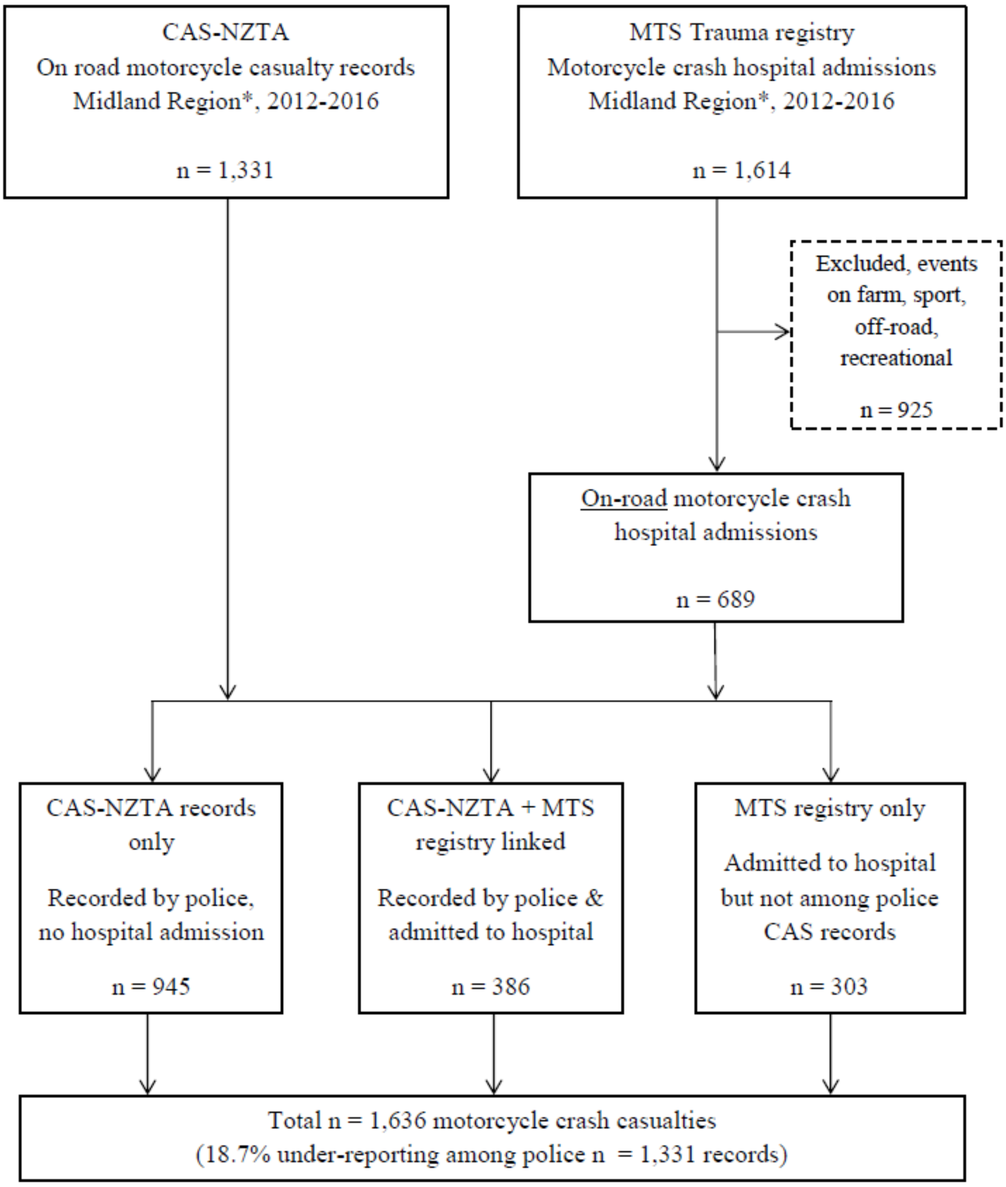


Figure 1. Flow diagram of data selection and linkage between Police and trauma registry dataset (*excluding Tairawhiti DHB) and occurring during 2012-2016.

References

Lujic S, Finch C, Boufous S, Hayen A, Dunsmuir W. (2008). How comparable are road traffic crash cases in hospital admissions data and police records? An examination of data linkage rates. Aust NZ Public Health, 32(1):28-33.

Nwomeh BC, Lowell W, Kable R, Haley K, Ameh EA. (2006). History and development of trauma registry: lessons from developed to developing countries. World Journal of Emergency Surgery, 1,32.

Midland Trauma System. (2017) Annual Report 2015-2016. Hamilton, New Zealand: Waikato District Health Board.

Ministry of Transport. (2017). Motorcyclists. www.mot.govt.nz

National Safety Council. (2017). Undercounted is underinvested: How incomplete crash reports impact efforts to save lives. www.nsc.org

Implementing Safe System Treatments in NSW School Zones

Will Warner[a], Andy Graham[a]

[a]NSW Centre for Road Safety, Transport for NSW

Abstract

Children's road safety is one focus of working towards zero, and school zones are provided in NSW wherever a school has a direct road access point.

NSW has implemented a suite of school zone safety treatments via a series of targeted programs, since school zones were implemented for all NSW schools in 2003. As a result, school zones are now one of the safest areas of the NSW road network. Fewer crashes now occur in NSW school zones, and research indicates that drivers take particular care.

Safe System treatments in NSW school zones

40km/h Speed Limit

A 40km/h speed limit applies from 8:00-9:30am and 2:30-4:00pm in school zones on school days. There are more than 3,000 schools across NSW, and 50 school zone speed cameras complement police enforcement.

Road Environment Treatments

Consistent, high-visibility treatments are in place in all school zones. There are now more than 6,000 school zone flashing lights in place, as well as dragon's teeth road markings and 40km/h signage.

The NSW Government has also recently completed a safety infrastructure program which funded local councils to install infrastructure like raised crossings, kerb blisters, pedestrian refuges and safety fencing. 140 safety infrastructure projects were completed between 2016 – 2018.

Behavioural Treatments

A variety of driving and parking offences attract a higher fine and additional demerit point when committed in a school zone. Such penalties apply for offences including speeding, double parking and illegal U-turns, and seven additional stopping and parking offences were recently added to this penalty framework.

State-wide radio and press reinforce awareness of school zone dates, times and demerit points throughout the year. There are also crossing supervisors at approximately 800 pedestrian and children's crossings.

Vehicle Treatments

The Centre for Road Safety has also developed the Speed Advisor smartphone application, which alerts drivers when they are entering an operational school zone.

The app is available free of charge for Apple and Google smart phone users, and has been downloaded to almost 180,000 devices in total.

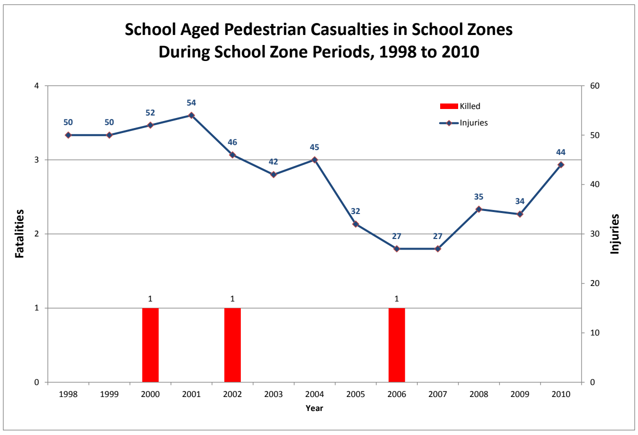
NSW Safe System in School Zones

Safe Roads - Traffic calming treatments - Enhanced visibility: o Flashing lights o Dragon’s teeth o Signage o Pedestrian crossings o Fencing - Pedestrian bridges - Protected bus stops - Kiss and drop zones - Consistent look and feel	**Safe People** - Increased penalties o Speeding o Double parking o U-turns - School Crossing Supervisors - School education programs - Safety campaigns - Safety resources (e.g. bike helmets) - Policies for managing dedicated access points - Staggered school start times - Police & council enforcement
Safe Speeds - 40km/h *(8-9:30am & 2:30-4pm)* - Police enforcement - 50 x school zone speed cameras	**Safe Vehicles** - Speed advisor smartphone app o ‘*Entering active school zone*’ announcements

These Treatments have been Effective

A prior review of child pedestrian casualties pre and post implementation of school zones, found that child pedestrian casualties (killed and injured) decreased from more than 50 per annum prior to 2001 to around 30 per annum between 2005 and 2009.

Recent data indicate that there are now approximately 20 child pedestrian casualties in active school zones each year.



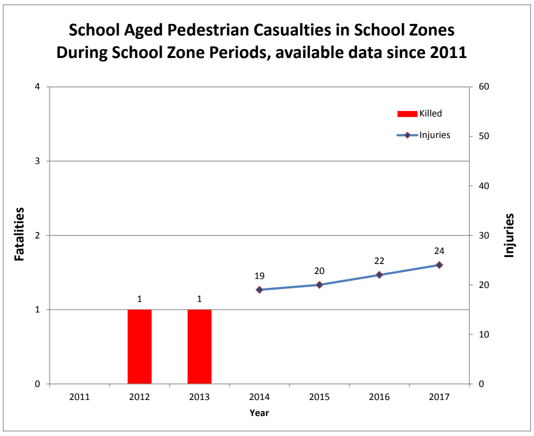


Figure 1: Child pedestrian casualties in school zone locations.

<u>Note</u>: Data from 1998-2010 is from a prior study, derived by overlaying crash data and speed zones for a sample of NSW school zones. More recently, NSW injury data has been coded within school zones from 2014.

The Centre for Road Safety also completed research in 2017 which identified that in general, few drivers consider the unpredictability of others. However, in school zones, drivers do consider the unpredictability of children, and focus on other road users.

The research also identified that drivers generally perceive that there is some flexibility around the road rules, particularly around the need for absolute compliance with speed limits. However, in school zones drivers take compliance more seriously.

Reference: Ipsos (2017) Deep Diving NSW Drivers’ Road Safety Attitudes and Behaviours

Kings Highway Road Safety Partnership – "Reduce Speed on the Kings Highway" – Road Safety Campaign

Kate McDougall[a], Joanne Wilson-Ridley[b], Dominic Goodyer[c,] Corey Heldon[d], Glenda Castles[e], Belinda Owen[f,]

[a]Eurobodalla Shire Council, [b]Queanbeyan-Palerang Regional Council, [c]NSW Police Monaro Highway Patrol, [d]Australian Federal Police, [e]Transport for New South Wales, [f]ACT Government, JACS

Abstract

Saving and preserving lives along the Kings Highway is the major focus of the Kings Highway Road Safety Partnership (KHRSP). The KHRSP is an interstate multi-agency, multi-jurstictional partnership coordinating road safety programs with members from NSW and ACT policing, ACT Government, Transport for NSW and NSW Local Governments. Acting on the Roads and Maritime Services 2012 Kings Highway Road Safety Review, the Partnership capitalised on a $35m road safety engineering program by designing a coordinated behavioural and enforcement program, implemented from 2016-2018 and it saw a reduction in the rate of road trauma on the Kings Highway.

Background

The Kings Highway while only 140km in length navigates through two state territories, one Australian Federal Police (AFP) enforcement jurisdication, two NSW Police jurisdictions and three Local Government Areas (LGA). KHRSP was established in 2008 to provide a safe system approach to reduce road trauma on the Kings Highway. A major strength of the partnership is the successful coordination of multi-agencies and different jurisdictions, utilising State and local educational and enforcement initiatives.

Method

In 2016 KHRSP reviewed their program strategies and identified the need for a new re-invigorated approach, recommending enhanced communication with communities residing along the Kings Highway. Crash statistics indicated 29% of controllers involved in crashes on the Kings Highway resided in the LGA's along the Kings. Controllers from ACT were also targeted with 28% of all casualty crashes involving ACT residents.

New approach aimed to:

- Create a new educational campaign specific to drivers of the Kings Highway during peak holiday times of summer and Easter.
- Deliver educational messages about the risks of speeding, aiming for repeated exposure before and along the Kings Highway journey.
- Promote Police enforcement activities during peak holiday times. The Police's goal was for every driver during peak periods to encounter at least one highly-visible Police vehicle on the Kings Highway.
- The campaign added strategies to support and measure this police goal.

Resulting Campaign

- An ACT advertising company was engaged, developing the following Towards Zero catch phrase **'Reduce Speed on the Kings Highway…Your family is counting on it'** tailored to summer and Easter road users and secondary message to promote police enforcement.

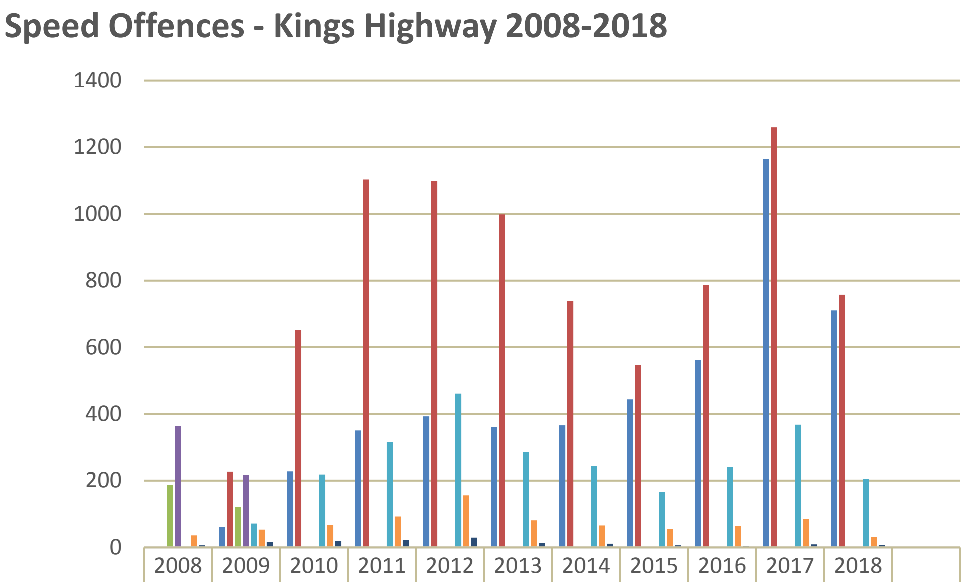
Figure 1. Reduce Your Speed Easter: Poster with police message.

- NSW and ACT Governments funded this campaign using various platforms to distribute the road safety message. Including:
    - Petrol pumps and in venue advertising at petrol stations in ACT, Queanbeyan, Batemans Bay,
    - Social media by AFP and press releases/ACT media
    - Roadside banners

- o Shopping Centre advertising and summer/Easter holiday timed posters displayed at key rest stops and cafes on route

Towards Zero Results

Table 1. NSW Speed Offences – Kings Highway 2008-2018



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Exceed Speed <=10km/h	0	61	228	351	393	361	366	444	562	1165	711
Exceed Speed >10km/h	0	227	651	1103	1099	999	740	548	788	1260	758
Exceed Speed <=15km/h	188	122	0	0	0	0	0	0	0	0	0
Exceed Speed >15 km/h and <=30km/h	364	217	0	0	0	0	0	0	0	0	0
Exceed Speed >20km/h	0	72	218	316	461	287	243	167	241	368	205
Exceed Speed >30km/h and <=45km/h	36	53	68	93	156	81	66	55	64	85	31
Exceed >45km/h	6	16	19	22	29	14	11	6	4	9	7

- NSW Police task year round Operation Monarch alongside Statewide operations on the Kings Highway. Operation Monarch activity increased in both 2016 and 2017 to support '**Reduce Speed on the Kings Highway…Your family is counting on it'** campaign as evident in speed offences issued in Table 1.
- Prior to the implementation of the campaign the number of speed related crashes peaked at 51 in 2012, reducing to 22 in 2017. Severity of crashes reduced from 8 serious injuries in 2016 to 3 in 2017 and 1 in 2018.
- The campaign featured Police on-location at highly recognisable destinations along the Kings. Driver expectation versus actual exposure to Police enforcement on the Kings was measured by driver surveys at the Braidwood Driver Reviver over long weekend holidays. In 2018 89% of respondents indicated likely, very likely or almost certain to see police along the Kings Highway, 76% reporting they had seen police already on their journey.

The KHRSP is working Towards Zero.

References

Kings Highway Road Safety Review (2013) NSW Government, Transport for NSW

Transport for NSW Crash Data 2008-2018

NSW Police Speed Fine data 2016-2018

MotoCAP: One year on

David Beck, Dan Leavy

Centre for Road Safety, Transport for NSW

Abstract

The Motorcycle Clothing Assessment Program (MotoCAP) was launched in September 2018 to improve motorcyclists' safety by providing riders the ability to choose gear based on its relative protection, which should result in increased availability of more protective gear on the market. One year on from the launch, this paper considers the performance of clothing currently on the market, and how consumers and industry have responded to the program.

Background

The Motorcycle Clothing Assessment Program (MotoCAP) was launched in September 2018. It is an Australian/New Zealand program that provides motorcycle riders with an independent rating that indicates how motorcycle protective clothing is likely to perform in a hot weather and in a crash. This enables riders to compare the relative protection of products when choosing gear.

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.

The program is administered by Transport for NSW on behalf of a consortium of fourteen private and government organisations across Australia and New Zealand with an interest in road safety. Testing and rating of products is conducted on behalf of MotoCAP by the Deakin University Institute for Frontier Materials.

One year on from the launch of MotoCAP, the paper will explore whether the performance of gear currently on the market has justified the need for MotoCAP, and how successful the program has been.

Findings from MotoCAP

A review of gear rated following the launch of MotoCAP has highlighted the need for such a program to better inform consumers and encourage industry to provide high performing garments. Findings of note include:

- A dearth of suitable clothing for females, with little dedicated gear on the market, and much of the gear tested performing poorly.
- Poor performance in both protection and thermal management of textile riding jackets, with none tested scoring higher than two stars in either category.
- The safety performance of a number of leather jackets and denim pants bears little correlation with their retail price.

Consumer response

For MotoCAP to achieve its aims, consumers need to use the ratings when choosing to purchase gear. Consumer response, received through social media and emails via the website contact page, has been overwhelmingly positive to MotoCAP, welcoming it as much needed and eye-opening.

Furthermore, consumers appear to be spending more time on the ratings for higher performing gear, with the pages for the highest rated jackets and pants receiving the most page views.

Industry response

One of the goals of MotoCAP is to influence industry and encourage them to invest more resources into improving the performance of their products. The MotoCAP consortium is starting to see evidence of this.

MotoCAP has been approached by a number of motorcycle gear start-ups looking to build a brand known for well-performing products. They are now working with Deakin University Institute for Frontier Materials to improve the performance of their products.

MotoCAP has also been contacted by more established members of the industry sector looking to commission ratings of products they expect would perform well.

Findings

The launch of MotoCAP has been well received by the public, and has stimulated industry to investigate how to improve the performance of their garments. The ratings to date have shed light on the wide range in the performance of gear on the market, allowing consumers to choose better performing gear at reasonable prices. To date, MotoCAP has proven a useful tool to encourage better protection of motorcyclists.

Examining Queensland Drivers' a Priori Acceptance of Conditional and Full Automated Vehicles

Sherrie-Anne Kaye [a], Ioni Lewis [a], Lisa Buckley [b], Andry Rakotonirainy [a]

[a] Queensland University of Technology (QUT), Centre for Accident Research & Road Safety – Queensland (CARRS-Q), [b] The University of Queensland (UQ), School of Public Health

Abstract

This study applied the Theory of Planned Behaviour (TPB) and the Technology Acceptance Model (TAM) to assess drivers' a priori acceptance of Conditional (SAE Level 3) and Full (SAE Level 5) automated vehicles (AVs). Queensland drivers' ($N = 505$) were invited to complete a 20 minute online survey. The findings revealed that the TPB predictors of attitudes, subjective norms, and perceived behavioural control and the TAM predictors of perceived usefulness and perceived ease of use explained variance in future intentions to use Conditional and Full AVs.

Background

Automated vehicles (AVs) offer the potential to reduce crashes associated with human error. However, for AVs to be of benefit to the community, drivers' need to be willing to accept these vehicles. The Theory of Planned Behaviour (TPB; Ajzen, 1991) and the Technology Acceptance Model (TAM; Davis, 1989) are two theories which can be applied to assess technology acceptance. The TPB proposes that attitudes, subjective norms, and perceived behavioural control (PBC) influence intentions, which in turn, influence actual behaviour. While the TAM proposes that perceived usefulness and perceived ease of use are predictors of intentions.

This study applied the TPB and TAM to assess drivers' a priori acceptance of Conditional (SAE Level 3) and Full AVs (SAE Level 5). It was anticipated that attitudes, subjective norms, and PBC would be significant predictors of future intentions to use Conditional and Full AVs. It was further anticipated that perceived usefulness and perceived ease of use would also be significant predictors of future intentions to use these vehicle types.

Method

Drivers' ($N = 505$) aged 17-81 years (Mage = 33.96, $SD = 18.79$; 278 female) were recruited via email, a paid Facebook advertisement, and the university's online recruitment system to complete a 20 minute online survey. Prior to responding to the TPB and TAM items, participants were provided with a short definition of Conditional and Full AVs. Specifically, the definitions provided were as follows, Conditional AV: *The driver is not required to watch the road, but must take back control of the vehicle when requested. The vehicle can drive itself some of the time*" and "Full AV: *The driver is never required to take action as the vehicle will drive itself all of the time. There won't even be a need for a steering wheel*." Questions were counterbalanced so that half of the participants read and responded to questions about Conditional AVs first, followed by the questions about Full AVs and vice versa.

Results

The TPB constructs explained 66.3% of variance in intentions to use Conditional AVs, $F(3,463) = 304.29$, $p < .001$. Attitudes and subjective norms were significant positve predictors of future intentions and PBC was a significant negative predictor of future intentions to use Conditional AVs (see Table 1). Additionally, the TPB constructs explained 67.8% of variance in intentions to use Full AVs, $F(3,451) = 317.82$, $p < .001$. Attitudes and subjective norms were significant predictors of future intentions to use Full AVs. PBC was not a signficant predictor of future intentions (see Table 1). One possibility for the difference in PBC findings between the Conditional and Full AVs may be that participants perceived that the scale items reflected control of the vehicle rather than control over whether or not to use an AV.

The TAM constructs explained 49.2% of variance in intentions to use Conditional AVs, $F(2,475) = 231.30$, $p < .001$. Perceived usefulness and perceived ease of use were both significant predictors of future intentions to use Conditional AVs (see Table 1). While for Full AVs, the TAM constructs explained 50.9% of variance in intentions to use such vehicles, $F(2, 473) = 245.80$, $p < .001$. Perceived usefulness and perceived ease of use were both significant predictors of future intentions to use Full AVs (see Table 1).

Conclusions

This work extends previous research undertaken outside Australia which had found the TPB and TAM useful to assess drivers' acceptance of advance driver assistance systems (Rahman, Lesch, Horrey, & Strawderman, 2017) and Conditional AVs (Buckley, Kaye, & Pradhan, 2018). On the basis of overall amount of variance explained in each regression model, the results suggest that the TPB factors were able to account for more variance in intentions than factors from the TAM. Findings also provide initial insights into factors that policy makers may consider when attempting to motivate drivers to use AVs and could assist with informing public education messages regarding AVs.

Table 1. Linear Regressions of the TPB and TAM Predictors of Intentions to use Conditional and Full AVs

	B	SE B	*β*	*p*
TPB (Conditional AVs)				
Attitudes	.646	.036	.604	>.001
Subjective norms	.351	.040	.297	>.001
PBC	-.065	.033	-.054	.048
TPB (Full AVs)				
Attitudes	.700	.037	.642	>.001
Subjective norms	.322	.043	.257	>.001
PBC	-.049	.032	-.041	.125
TAM (Conditional AVs)				
Perceived usefulness	.646	.037	.591	>.001
Perceived ease of use	.354	.050	.243	>.001
TAM (Full AVs)				
Perceived usefulness	.654	.037	.605	>.001
Perceived ease of use	.315	.047	.228	>.001

Note. TPB = Theory of Planed Behaviour; TAM = Technology Acceptance Model; PBC = Perceived Behavioural Control; AVs = automated vehicles.

References

Ajzen, I. (1991). The theory of planned behaviour. Organizational Behavior and Human Decision Processes, 50, 179-211.

Buckely, L., Kaye, S- A., & Pradhan, A. K. (2018). Psychosocial factors associated with intended use of automated vehicles: A simulated driving study. Accident Analysis & Prevention, 115, 202-208.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13, 319-340.

Rahman, M., Lesch, M. F., Horrey, W. J., & Strawderman, L. (2017). Assessing the utility of TAM, TPB, and UTAUT for advanced driver assistance systems. Accident Anlysis & Prevention, 108, 361-373.

The effect of digital billboards at intersections on driving performance

Paul Roberts

Australian Road Research Board

Abstract

The impact on driving performance of digital billboard installations at intersections was evaluated. Lane drift and stopping over the line errors were assessed through video recording of vehicle movements before and after activation of the billboards. While it is very plausible that digital billboards at demanding locations will create enough distraction to negatively affect vehicle control performance, the current evaluation found that, in general, vehicle control performance either improved or was unaffected by the digital billboard's presence.

Background

Digital billboards have the potential to cause driver distraction by diverting the driver's attention away from the driving task, potentially compromising safety. Driving environments which are cognitively demanding, such as intersections and high traffic areas, have generally been assumed to increase this safety risk.

An evaluation of the impact on driving performance of new digital billboards installations at two intersection locations was conducted. This evaluation took the form of a video survey of vehicle control at two locations and two additional matched control sites, both before and after the digital billboards were installed.

Method

The digital billboards were loaded with typical content and static images were displayed. For Site 1, the dwell times were; 8sec, 16sec and 24sec. At Site 2, the dwell times were; 10sec, 20sec and 30sec.

This video data in these periods were coded to extract:

- Lane drift (number of instances of drifting outside of the lane in each time period)
- 'Stopping-over-the-line' (number of instances of stopping over the stop line in each time period)
- Incidents (number of instances in each time period)

Results

No incidents were recorded at any of the sites.

Change scores ('before' – 'after') were calculated for both the lane drift and stopping over the line observations. Thus, a positive change score reflects a decrease in lane drift and stopping over the line behavior while a negative change score reflects an increase. Change scores at billboard sites were then compared to the equivalent change at control sites using Bonferroni-corrected t-tests ($p < .05$ equivalent).

With only one exception (to be discussed below), for both billboard sites and all three dwell times, the presence of active digital billboards either reduced, or had no effect, on the occurrence of lane drift and stopping over the line errors. As an example, figure 1 below depicts the effect for lane drift at Site 1.

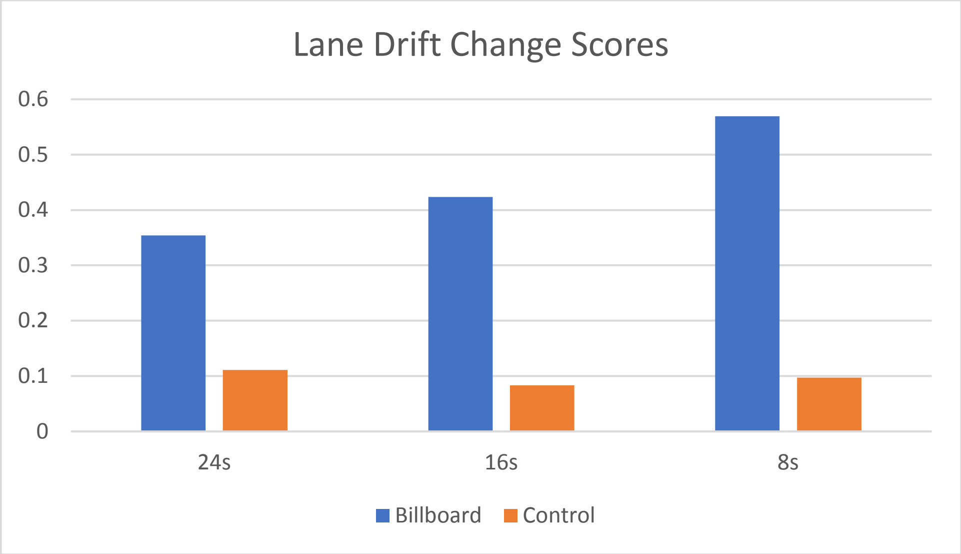


Figure 1. Lane drift change scores

Conclusions

The current evaluation found that, at all dwell times (with one exception[1]), vehicle lateral control and stopping over the line performance either improved or was unaffected by the digital billboard's presence.

These results beg the question of why previous research has often demonstrated a negative impact on vehicle control from visual distraction (e.g. Kountouriotis & Merat, 2016; Liang & Lee, 2010). A possible explanation is that the source of visual distraction in these studies usually comes from a source that requires drivers to take their eyes off the forward roadway. For example, Schieber et al. (2014) placed the billboard off to the side of the road under conditions that encouraged drivers to take their eyes off the forward roadway. By contrast, in the current evaluation, the billboards were straight ahead for the assessed drivers. As a result, the billboards did not require drivers to move their eyes from the forward roadway in order to apprehend the content of the billboards.

References

Kountouriotis, G. K., & Merat, N. (2016). Leading to distraction: Driver distraction, lead car, and road environment. Accident Analysis and Prevention, 89, 22–30.

Liang, Y., & Lee, J. D. (2010). Combining cognitive and visual distraction: Less than the sum of its parts. Accident Analysis & Prevention, 42(3), 881–890.

Schieber, F., Burns, D., Myers, J., Gilland, J. & Willan, N. (2004) Driver Eye Fixation and Reading Patterns while Using Highway Signs under Dynamic Night-time Driving Conditions: Effects of Age, Sign Luminance and Environmental Demand. USD Technical Report.

[1] The explanation for this anomaly is unclear at this stage. However, post hoc analysis of the logs of the material presented during the study shows that the anomalous dwell time missed out on a subset of the adverts and received a higher proportion of the remaining adverts than the other dwell times.

The effect of dwell time, location and content on the distraction impact of digital billboards

Paul Roberts[a], Lynn Meuleners[b]

[a]Australian Road Research Board, [b]University of Western Australia

Abstract

An experiment was conducted utilizing an advanced driving simulator to investigate the effect of three variables on driving performance:

- Dwell time (20, 40 and 60 seconds)
- Location (verge versus overhead gantry)
- Content (complex versus simple)

In general, only the 60 second dwell time did not have a negative impact on driver performance. However, the results also demonstrated a number of complex interactions that can be used to assess the relative safety of existing digital billboard installations and proposals for the installation of new digital billboards.

Background

While there is now a substantial body of evidence that digital billboards have the potential to be distracting, the research to date has typically not been directed at answering questions that could easily be used to inform road authority guidelines. As a result, it is unclear, for example, exactly how much more distracting a 20 second dwell time (duration of message display) is than a 40 second dwell time. Similarly, critical questions for road authorities, such as the relative impact of placement and content differences remain unexplored.

Method

96 Perth-based participants aged between 18 and 80 years with a current WA C class licence (passenger vehicle) were put through a freeway driving simulation. Twelve scenarios were simulated which consisted of a combination of three levels of dwell time (20 seconds, 40 seconds and 60 seconds), two different billboard locations (overhead on a bridge versus post mounted on the side of the road) and two billboard content designs (complex versus simple). The simulated driving scenarios consisted of 3D models which represented approximately ten kilometers of generic Western Australian freeways. In each of the twelve driving scenarios there was a three-lane carriageway separated by a median strip with identical traffic flowing in both directions.

Results

In this study driver performance is operationalized as speed variability. There was significantly more variability in speed ($p<.001$) when driving in the vicinity of a billboard (mean = 10.50, SD = 0.44) compared to no billboard (mean = 1.54, SD = 0.44).

There was a significant two way interaction between billboard presence and dwell time ($F(2,552) = 3.99$, $p<.05$). This was the result of the 60 second dwell having significantly ($p<.05$) less impact than the other two dwell times on speed variability.

There were three significant three-way interactions. First, there was a significant three way interaction between billboard presence, content and dwell time ($F(2, 552)=4.11$, $p<.05$). A breakdown of this interaction found that the simple content presented for 60 seconds had significantly ($p<.01$) less adverse effect on speed variability.

The second significant three way interaction was between billboard presence, content and location ($F(1, 552)=4.53$, $p<.05$). This crossover interaction showed that while simple content had less negative impact when presented on an overhead bridge structure, the opposite was true for complex content (represented in figure 1 below by scores derived from subtracting the ‘billboard present’ value from the ‘billboard absent’ value).

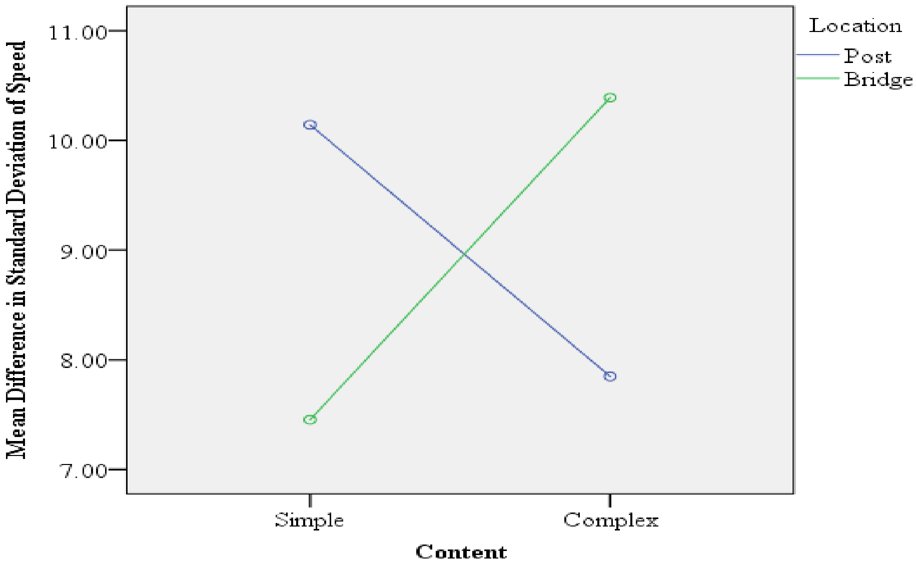


Figure 1. Interaction between Content and Location

The third significant three way interaction was between billboard presence, dwell time and location ($F(2, 552)=3.23$, $p<.05$). A breakdown of this interaction showed that only post mounted billboards showed the relative immunity from a negative impact on driving performance observed for the 60 second dwell time. This was not the case for bridge mounted billboards.

Conclusions

These results show that, in general, dwell times less than 60 seconds have the capacity to be distracting enough to impair driving performance. The finding of higher order interactions between content complexity and billboard location suggest that shorter dwell times may not always negatively impair driving performance provided that billboard location and content complexity are appropriately matched.

Modelling New Zealand Road Deaths to 2025

Colin Morrison [a], Ernest Albuquerque [a]

[a] New Zealand Transport Agency

Abstract

New Zealand is developing an integrated road safety intervention logic model. This paper describes a core component of this wider strategic research: a baseline model that extrapolates New Zealand road deaths to 2025. The baseline will provide context to what the NZ Transport Agency is trying to achieve.

Several time-series models were investigated; these produced a range of forecasts of road deaths in the New Zealand context.

In the final modelling an Autoregressive integrated moving average (ARIMA) model and two differing autoregressive distributed lag (ARDL) models were developed. A preferred model was identified and used to forecast.

Background

The NZ Transport Agency is leading the development of an integrated road safety intervention logic model with sector partners including NZ Police, Ministry of Transport (MoT) and the Accident Compensation Corporation (ACC). The Integrated Intervention Logic Model (IILM) is a tool to inform strategies aimed at improving safety across the network. New Zealand is working hard to reduce road trauma by implementing current and proposed interventions. The model allows users to select a suite of actions and activities, the treatment and for them to prescribe the degree of each, the dose. The model then calculates potential deaths and serious injuries (DSI) savings from that combination of interventions. The dependency, union, dominance or independent nature of the interventions are used in determining the combined effect. The model also accounts for changes in effectiveness of an intervention dependent on the dose and using a projected baseline the effect of implementing over time.

The main aim of the study presented here was to model a baseline of road deaths in New Zealand from 2018 to 2025. It is considered that time-series models are appropriate for this purpose.

There is a large literature on factors that influence the underlying frequency of road trauma. A review (NZTA, 2019) of major studies carried out in New Zealand, Australia and selected overseas countries (BITRE, 2014; Chukwutoo et al., 2018; Commandeur et al., 2013; Ministry of Transport, 2017; Oreko et al., 2017; Sanusi et al., 2016).

Methodologies used to model road deaths vary widely and have included simple and multiple regression analyses, Poisson regression analyses, negative binomial regression models, logit and probit models, random parameters models, fuzzy logic models and ARIMA models.

Successful time-series forecasting depends on fitting an appropriate model to the underlying time-series.

Method

Quality data at set intervals over a reasonable timeframe is necessary for the best predictive models. Data was sought from 1990 to 2017. The range collected was extensive; over 50 variables were collected and correlations between pairings of the most promising variables were tested.

Several time-series models were investigated; these produced a range of forecasts of road deaths in the New Zealand context. ARIMA and ARDL models proved most successful in forecasting road deaths. In the final modelling an ARIMA model and two differing ARDL models were developed.

The explanatory variables used in the final modelling of road deaths as stated above were: petrol price, unemployment, young population and GDP. All have strong Pearson correlation coefficients.

Explanations for these relationships, although out of scope, are discussed in the research report (NZTA, 2019), as it is necessary to understand, especially regarding the relationships to road use.

Results

All three models show that both petrol prices and unemployment are negatively/inversely related to road deaths. In other words, if petrol prices and unemployment decrease, road deaths increase.

The ARIMA model (1,0,1) forecast indicates that road deaths will continue to rise from 2018 to 2025, influenced by the recent rising trend from 2014 to date and the spike in 2017. These recent factors do not reflect the time-series. The results show that the ARIMA model underestimated road deaths, on average by around five percent.

Both ARDL models forecast a flattening trend in road deaths: a slow rise early in the forecast period followed by a decline. This has now been seen to have happened since completing the modelling to date. The ARDL model 2 differs from ARDL model 1 as it includes a demographic variable: population of persons aged 15 to 24. ARDL model 2 shows that, in addition to the economic variable (petrol prices) and socio-economic variable (unemployment), the number of people aged 15 to 24 in the population acts positively on road deaths. ARDL model 2 is the preferred model because of this.

ARDL Model 2 is summarised in Table 1 and Figure 1. It should be noted that the Adjusted R-squared of both ARDL models is around 0.8. All variables in both models have the correct signs.

Table 1: ARDL Model 2 summarised

Variable	Coeff.	Std. Err	P-Value	95% CI
Lag 1 log road deaths seasonally adjusted	0.2952571	0.0921223	0.002	0.1126157 0.4778984
Lag 1 log petrol price real and seasonally adjusted	-0.5380974	0.1360431	0.000	-0.8078161 -0.2683786
Lag 1 log unemployed seasonally adjusted	-1.171861	0.2040765	0.000	-1.576463 -0.7672598
Lag 1 log population aged 15-24 years	1.308681	0.4113065	0.002	0.4932258 2.124136
Constant	15.62295	2.421833	0.000	10.82143 20.42447
Adjusted R-squared	0.8008			

Engle-Granger Cointegration Test

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t) -11.029	-3.507	-2.889	-2.579

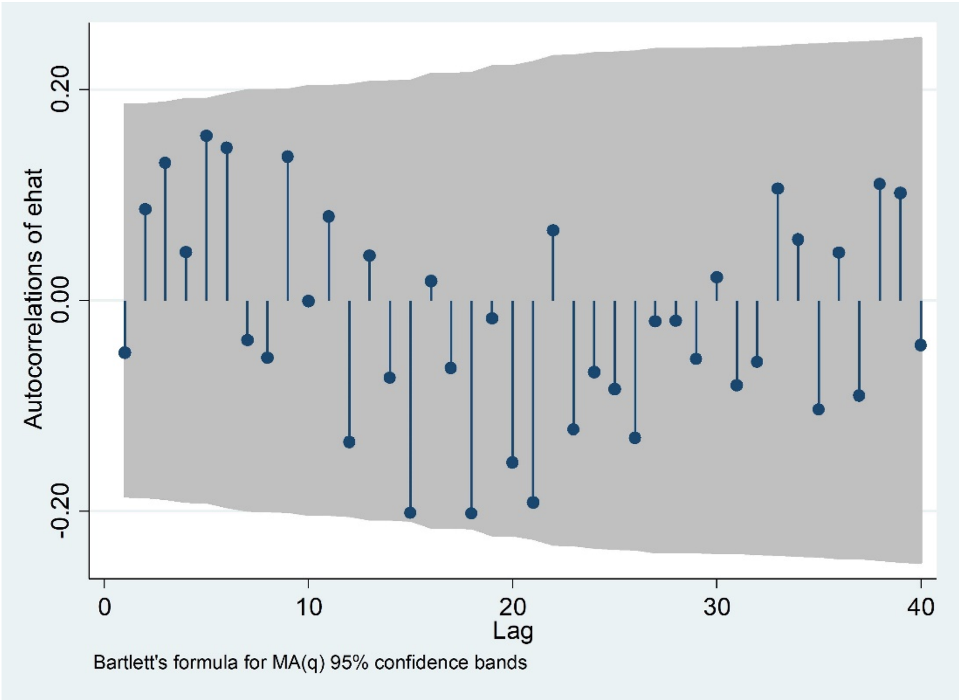
Breusch-Godfrey LM test for autocorrelation

Lags (p)	chi^2	Df	Prob > chi^2
1	1.585	1	0.2080

Durbin's alternative test for autocorrelation

Lags (p)	chi^2	Df	Prob > chi^2
1	1.521	1	0.2174

Residual Correlogram of ARDL Model 2



Results of ARDL Model 2 Quarterly Road Deaths 1990 to 2025

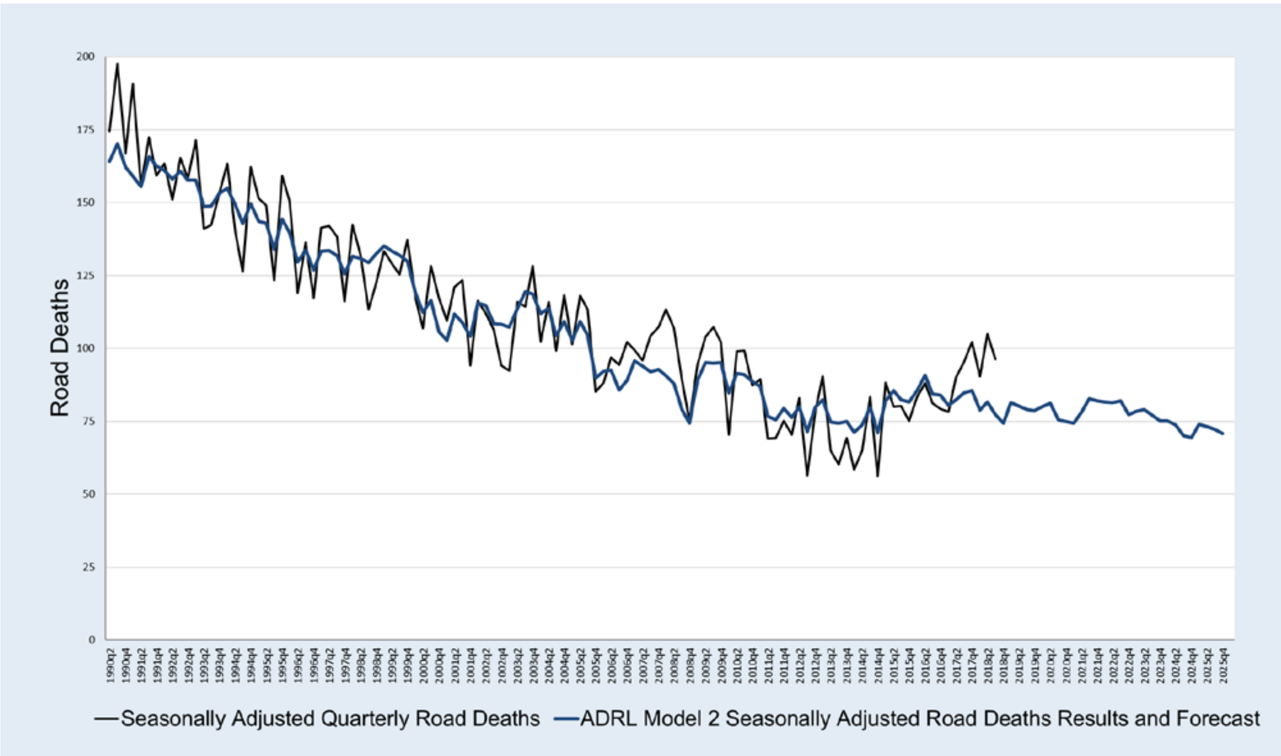


Figure 1: Residual Correlogram and Results of ARDL Model 2

Forecast

The reliability of the forecast is dependent on the accuracy of forecasting future youth population, petrol prices and unemployment. The approach taken in forecasting these explanatory variables was to use the Holt-Winters algorithm, a seasonal exponential smoothing algorithm (ETS AAA) and harmonic analysis of unique longer waveform periods of each variable. The forecast variables were used in conjunction with the ARDL model 2 coefficients to forecast quarterly road deaths to 2025.

Conclusion

The selected ARDL model was, after much trial and experimentation, identified as the preferred time-series approach for forecasting road deaths in New Zealand. The predicted results will in time be exposed with hindsight, but at this early stage the forecast from this ARDL model looks to be valid and is being used for predicting the baseline of the integrated road safety intervention logic model being developed in New Zealand.

References

Australian Bureau of Infrastructure, Transport and Regional Economics (BITRE). (2014). *Road Safety: Modelling a Global Phenomenon.* Canberra, ACT, Australia. BITRE.

Chukwutoo et al. 2018. Tracking and Appraisal of Road Traffic Accidents: An Analysis for Anambra State *Nigeria Journal of Engineering and Applied Sciences 13*, 12-24.

Commandeur et al. 2013. On statistical inference in time series analysis of the evolution of road safety. *Accident Analysis and Prevention. 60.* pp. 424-434.

Ministry of Transport. (2017). *Qualitative and Quantitative Analysis of the New Zealand Road Toll: Final Report.* Wellington, New Zealand. Ministry of Transport.

NZ Agency (NZTA). (2019). *Modelling New Zealand Road Deaths to 2025*. Wellington, New Zealand: NZ Transport Agency.

Oreko et al. 2017. Modelling the impact of intervention measures on total accident cases in Nigeria using Box-Jenkins methodology: A case study of federal road safety commission. *Cogent Engineering. 4.*

Sanusi et al. 2016. Cases of Road Traffic Accident in Nigeria: A Time Series Approach. *Mediterranean Journal of Social Sciences.* Vol 7 No 2 S1, 542-552.

Does cannabis exacerbate the effect of alcohol on the risk of crashing? A close look at the best epidemiological evidence

Michael White[a]

[a]School of Psychology, University of Adelaide, South Australia

Abstract

Does the co-use of cannabis exacerbate the effect of alcohol on the risk of crashing? A literature search identified eleven epidemiological studies of the effect of cannabis on the risk of crashing, where the recent use of cannabis was indicated by the detection of THC in oral fluid or blood. Ten of the studies also investigated interactions between cannabis and alcohol, but only one claimed to have found an exacerbation effect. That study was of questionable validity. The review concludes that there is no good epidemiological evidence for an exacerbation effect.

Background

The Vicroads road safety website claims that "if you combine cannabis with alcohol, the risk of crashing is higher than with either drug alone". Consistent with that claim, there is a special high-penalty 'cocktail' offence in Victoria for the combined use by drivers of illegal drugs and alcohol. The purpose of this study is to see if that offence can be scientifically justified in relation to cannabis.

Methods

Eleven epidemiological studies of the effects of cannabis on the risk of crashing that used the presence of THC in blood or oral fluid as a marker of the recent use of cannabis were identified from five published reviews (Asbridge, Hayden & Cartwright, 2012; Hartman & Huestis 2013; Hostiuc *et al*., 2018; Li *et al*., 2012; Rogeberg & Elvik, 2016).

Depending on the statistical model being employed, a drug-crash interaction effect is normally defined as either supra-additive or supra-multiplicative ('synergistic'). The low-bar criterion adopted here for an interaction ('exacerbation') effect is simply whether the co-use of cannabis causes *any* increase in the risk of crashing over that attributable to alcohol alone.

The strength of a drug-crash effect is measured in terms of odds ratios (ORs). The measurement of a drug-alcohol exacerbation effect can involve two steps or one. In the two-step procedure, an alcohol crash OR is compared with an alcohol+THC crash OR. If the combined OR is the greater, and the two 95% confidence intervals do not overlap, it would be concluded that cannabis had exacerbated the effect of alcohol. In the single-step procedure the odds of crashing for the alcohol+THC drivers are compared directly with the odds for the alcohol-only drivers. If the single-step 'exacerbation' OR is significantly greater than 1.00, it would be concluded that cannabis had exacerbated the effect of alcohol.

However, there is a confounding factor to be considered. Williams *et al*. (1985, p. 19) noted that drugs are "typically found in combination with high blood alcohol concentrations". Where that situation pertains, an exacerbation OR will artefactually reflect the high crash risk of the high-BAC drivers. This 'high-BAC artefact' can be remedied by the use of multiple logistic regression (MLR) analyses where BAC is included as a covariate.

Results

Table 1. Summary of evidence that cannabis exacerbates the effect of alcohol on the risk of crashing

Study (First author and year)	OR for Alcohol Only (Step 1 OR)	OR for Alcohol and Cannabis (Step 2 OR)	Single-Step OR	Evidence of an Exacerbation Effect?	Is the High-BAC Artefact Addressed?
Terhune 1982	4.50 (2.6-7.9)	1.59 (0.6-3.8)		No	n/a
Williams 1985	5.02 (2.2-11.3)	8.78 (2.9-26.8)		No	n/a
Terhune 1992	4.83 (3.6-6.5)	8.35 (2.0-35.0)		No	n/a
Longo 2000	8.05 (5.3-12.3)	5.37 (1.2-24.0)		No	n/a
Mura 2003	3.8 (2.1-6.8)	4.6 (2.0-10.7)		No	n/a
Drummer 2004	6.0 (4.0-9.1)	Not provided	2.9 (1.1-7.7)	Yes	Yes
Laumon 2005	8.51 (7.2-10.1)	14.0 (8.0-24.7)		Marginal	Probably
Gjerde 2013	125 (69-225)	Not provided	0.83 (0.2-4.3)	No	n/a
Hels 2013	9.79 (8.2-11.7)	Not provided	-	-	-
Poulsen 2014	13.69 (4.3-43.8)	6.90 (3.0-16.0)		No	n/a
Lacey 2016	5.10 (3.4-7.7)	4.75 (2.0-11.6)		No	n/a

Table 1 summarizes the results. The only researchers who claimed to have demonstrated a statistically significant exacerbation effect were Drummer *et al*. (2004). They reported a single-step MLR-based exacerbation OR of 2.9 (1.1-7.7) which statistically controlled for the possibility of a high-BAC artefact.

A major concern with the Drummer *et al*. (2004) study is that the statistical analyses underlying the calculation of the exacerbation OR were flawed by having different sampling timeframes for the drivers with alcohol alone (10 years) and the drivers with both alcohol and THC (two years). Furthermore, Poulsen, Moar and Pirie (2014) designed their responsibility study to replicate Drummer's study, but failed to replicate the exacerbation effect.

Conclusion

The epidemiological evidence does not support the Victorian government's introduction of a cocktail offence for the combined use of cannabis and alcohol.

References

Asbridge, M., *Hayden*, J. A., & Cartwright, J. L. (2012). Acute cannabis consumption and motor vehicle collision risk: Systematic review of observational studies and meta-analysis. *British Medical Journal (BMJ), 344:e536* (Published 9 February, 2012), 1-9.

Drummer, O. H., Gerostamoulos, D., Batziris, *et al*. (2004). The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident Analysis and Prevention*, *36*, 239-248.

Hartman, R. L., & Huestis, M. A. (2013). Cannabis effects on driving skills. *Clinical Chemistry, 59* (3), 478-492.

Hostiuc, S., Moldoveanu, A., Negoi, I., & Drima. E. (2018). The association of unfavorable traffic events and cannabis usage. *Frontiers in Pharmacology, 9*, Article 99, 1-14.

Li, M-C., Brady, J. E., DiMaggio, J., Lusardi, A. R., Tzong, K. Y., & Li, G. (2012). Marijuana use and motor vehicle crashes. *Epidemiologic Reviews, 34*, 65-72.

Poulsen, H., Moar, R. & Pirie, R. (2014). The culpability of drivers killed in New Zealand road crashes and their use of alcohol and other drugs. *Accident Analysis and Prevention, 67*, 119-128.

Rogeberg, O., & Elvik, R. (2016). The effects of cannabis intoxication on motor vehicle collision revisited and revised. *Addiction*, *111* (8), 1348-1359.

Williams, A. F., Peat, M. A., Crouch, D. J., *et al*. (1985). Drugs in fatally injured young male drivers. *Public Health Reports, 100* (1), 19-25.

Early findings from First Australian Connected Light, Privately-owned Vehicle Trial

Anna Chevalier[a], Selena Ledger[a], Vanessa Vecovski[b], Chris Wright[b], Kerry Shaz[b], Tam McCaffery[b], John Wall[b]

[a]Australian Road Research Board, [b]Centre for Road safety, Transport for NSW

Abstract

This Field Operational Test (FOT) involves 55 consenting members of the public having their light vehicles fitted with cooperative intelligent transport systems (C-ITSs) and telematics equipment as part of Transport for NSW's Cooperative Intelligent Transport Initiative (CITI). CITI is the first Australian large-scale, long-term C-ITS initiative. The FOT included three safety alerts: harsh-braking ahead, intersection collision and red traffic light warnings. Participants were evenly split by gender (52.7% males), the majority aged 40-59 years (67.3%, 37/55), and 94.5% had held their driver licence 10+ years. End-of-study survey findings will be presented, including participants' experience of the human-machine interface (HMI).

Aim

This study aims to improve understanding of:

- Deploying C-ITSs into privately-owned vehicles
- Participants' experience with the HMI and acceptance of the system
- The benefits of C-ITS safety applications, including:
  - Harsh-braking ahead (vehicle-to-vehicle (V2V))
  - Intersection collision (V2V)
  - Red traffic light warnings (vehicle-to-infrastructure (V2I))

Methods

Participants' vehicles were fitted for approximately 10 months with technology to provide alerts and monitor driving. This before/after study involved participants not receiving alerts during the baseline period. Prior to the alerts being activated, participants were trained in what to expect from the alerts and troubleshooting equipment issues. Monthly, participants met a researcher to exchange memory-cards storing the driving data. Participants completed online-surveys during the study, and some participated in a focus group at the end.

The C-ITSs were configured to enable communication among vehicles and traffic signals fitted with the equipment, with messages transmitted over a dedicated radio frequency within the geofenced-testbed, including most of Sydney (excluding the northern beaches and far west) and extending south to Kiama. Up to 60 trucks, 11 public buses, two light fleet vehicles, 1 fleet motorcycle and three signalised intersections operated within the testbed.

Participant eligibility criteria were designed to ensure CITI vehicles came into frequent contact, and included:

- 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

The first recruitment wave was parents/carers with a child attending one of the supporting schools nearby Wollongong's Central Business District (CBD) and drives to/from the school 3+ times/week. A second wave was undertaken via market research company of Illawarra residents driving to/from/through the CBD 3+ times/week.

This study has been approved by the University of Wollongong / Illawarra and Shoalhaven Local Health District Human Research Ethics Committee, NSW Department of Education, and Catholic Diocese of Wollongong. Principals approved school's involvement in the study.

Study progress results

Thirty-three parents recruited via schools expressed interest in the study, and 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.

Participants were evenly split by gender (52.7%, 29/55 males); 14.5% (8/55) were aged 21-39 years, 67.3%, 37/55) 40-59 years, and 18.2% (10/55) 60-79 years. Most (94.5%, 52/55) had held their driver's licence for 10+ years, and 61.8% (34/55) reported being the only driver of the vehicle. Five participants (9.1%) self-reported being involved in a single crash during the three-years prior to the study resulting in a towed vehicle or injured person. Most participants' vehicles (89.1%, 49/55) were successfully fitted with the study equipment.

Next steps

Results from the end-of-study survey will be presented, including participants' experience of the HMI. Findings will provide greater understanding of the road safety benefits and limitations of C-ITS technology and inform policy considerations about the future of this technology within NSW.

Major Risk Factors Contributing to Pedestrian Crashes in Low and Middle-Income Countries

Ali Zayerzadeh[a], Hamed Marouf[b]

[a] Road Safety Pioneers NGO, Iran, [b] Department of Traffic Safety, RMTO, Iran

Abstract

Walking, an alternative mode of transport, is encouraged because of its health benefits and the reduction in vehicle use. The WHO global status report on road safety 2018, reports that low and middle-income countries (LMICs) have the worst road safety situation, being twice that of high-income countries (HIC's). Vulnerable road users (VRU's) including pedestrians, cyclists and motorcyclists comprise half of these fatalities. This research investigates the major risk factors which may cause fatal pedestrian crashes. 25 international road safety experts completed pedestrian safety related questionnaires. The results were analysed using Ishikawa and AHP methods and showed that street lighting, crossing facilities and proper land use design were among priorities which should be addressed to improve pedestrian safety.

Background

There are clear regional and national differences in the distribution of road user mortality. Vulnerable road users tend to account for a much greater proportion of road traffic deaths in LMICs, than in HICs. The type of traffic, the mix of different types of road users, and the type of crashes in LMICs differ significantly from those in HICs.

The WHO global status report on road safety, shows that LMICs have 90% of global road traffic deaths and fatality rates twice that of HICs (WHO, 2018). VRU's including pedestrians, cyclists and motorcyclists comprise half of these fatalities.

VRU's safety situation

Identifying ways to address VRU road safety is expected to lead to significant improvement in overall road safety, including VRUs. However, the likelihood of being killed in a traffic crash as a pedestrian varies by region, country and even state, as represented in Table 1. The African Region has the highest percentage of pedestrian deaths at 39% of all road traffic deaths and the lowest rating is South-East Asia with 13% (WHO, 2018).

Table 1. Percentage of Road traffic deaths by type of road user and WHO Region

	Pedestrians	**Cyclists**	**2-3 wheelers**	**Car Occupants**	**Other**
Europe	26	4	9	51	10
Eastern Mediterranean	27	3	11	45	14
South-East Asia	13	3	34	16	34
The Americas	22	3	20	35	21
Africa	39	4	7	40	11
Western Pacific	23	7	34	22	14
World	**22**	**4**	**23**	**31**	**21**

In the WHO report, 76 middle income countries have reported the percentage of pedestrian fatalities with the average being 31.7% (±13.66%). This demonstrates the magnitude of the problem.

(Sklet, 2002) Last year more than 4200 pedestrians died in road traffic crashes in Iran which accounts for 23.2% of all its road fatalities (RMTO, 2018). While Iran is a middle income country, because of the high rate of pedestrian fatalities, lessons may be learned from this research.

The average pedestrian victims' proportion for 48 high-income countries is 23.1 percent. 30 countries in the report are categorized as low-income and only 14 of them have reported pedestrian share of total traffic deaths. The average for these 14 countries is 29.6% with maximum of 49.1% reported by Malawi. The summary of described situation of pedestrians' fraction of total road deaths are presented in Table 2:

Table 2. Pedestrian Fatalities by Country Income Group

	Ave. Percentage of Pedestrian Fatalities	Total Countries in the Category	No. of Countries with Reported Percentage	Max. %
High-Income	23.1	52	48	50
Middle-Income	31.7	96	76	76.5
Low-Income	29.6	30	14	49.1

Method

To assess the different risk factors contributing to pedestrian crashes, a questionnaire was developed and was sent 35 road safety experts from 25 middle-income countries. Experts were selected based on their self-reported skills on LinkedIn and then those shortlisted were contacted to confirm their credentials 27 experts completed the questionnaire and after review for the re-focused second round, 25 complete forms were considered for analysis. In the questionnaire, they were asked in an open ended question to list all issues and factors that affect the safety of pedestrians in their country.

The important factors identified by the experts were synthesized to form a comprehensive list. Using the Ishikawa fishbone diagram, factors and issues were categorized into 6 main groups comprising Driver, Pedestrian, Post-crash, Vehicle, Management and Road related causes. Figure 1 shows the primary and secondary causes listed by these road safety experts. At the second round, experts were asked to prioritize these causes in each category using AHP method.

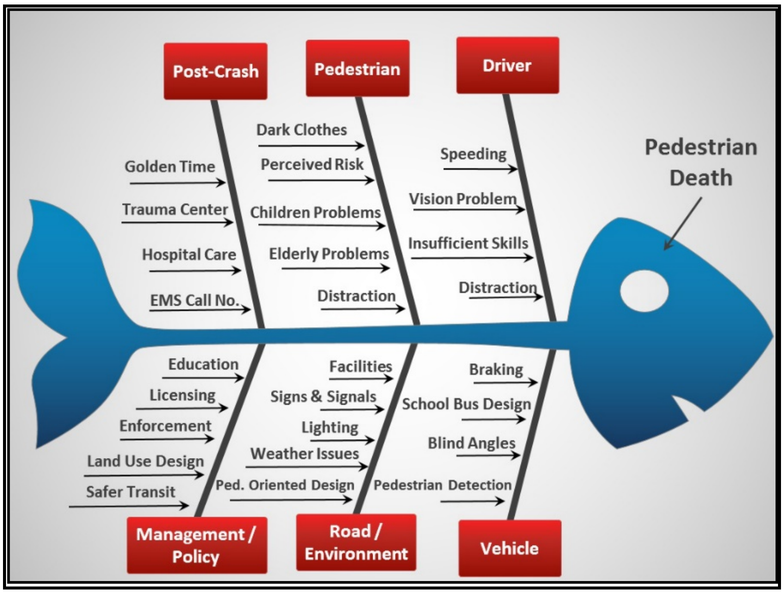


Figure 1. Fishbone diagram of pedestrian deaths root causes

Results and Conclusions

The study identified 6 categories as the most important factors impacting pedestrian related crashes. These were; efficient road safety education; road users' perceived risk; crossing facilities; land use design; timely emergency services and speed enforcement. The main difference between the level of pedestrian safety in LMICs and HICs arise from the quality of these reform activities and having a long-term plan to improve them. These findings are valuable as a road safety contribution to Iran and other LMIC's.

References

World Health Organization. (2018). WHO Global status report on road safety.

Sklet, S. (2002). Methods for accident investigation. Trondheim: Gnist Tapir.

RMTO, 2018, Annual Fatality Accidents Report.

Embrey, D., & Henderson, J. (2013) Addressing The Problems of Root Cause Analysis: A New Approach To Accident In1vestigation.

Latino, R. J., Latino, K. C., & Latino, M. A. (2011). Root cause analysis: improving performance for bottom-line results. CRC press.

Understanding road user attitudes and behaviours to improve heavy truck safety: Findings from recent NSW attitudinal research

Hannah Parnell[a], Ruth Graham[a], Angela Pearce[a], David Jordan[a], Michael Trigwell[b]

[a]Centre for Road Safety, Transport for NSW [b]Taverner Research

Abstract

Crashes involving heavy trucks are often more serious because of their size and weight, regardless of who is at fault. An increase in fatal heavy truck crashes in 2017 as well as construction projects in Sydney led to the need for research to help inform future strategy, policy and communications in this space. Mixed-method attitude and behaviour research was conducted among heavy truck drivers, fleet managers, enforcement personnel and other road users. The findings are discussed.

Introduction

Compared to 2016, during 2017 there were 15 more fatal heavy truck crashes, and 23 more fatalities from heavy truck crashes.. A range of countermeasures are targeted towards improving heavy truck safety. This research aimed to understand how the behaviour of all drivers can be improved by enhancing these, or introducing further measures.

Methodology

The study involved:

- qualitative research with heavy truck drivers, fleet managers, enforcement personnel and other road users (car/van/ute drivers, motorcycle/scooter riders, bicycle riders and pedestrians) ,
- quantitative research of n=402 face-to-face surveys with NSW licenced heavy truck drivers and n=1,894 online surveys with other road users.

Results

Perceptions of the heavy truck industry

'Trucks on the road' were not seen as a key contributor to the road toll among other road users compared to factors such as speeding, drink and drug driving, mobile phone use and driving while tired. However words spontaneously associated with heavy trucks include their large size then danger, and crashes. Feelings of nervousness (45%) or fear (38%) when around heavy trucks were also expressed, significantly more among females than males.

Behaviour of truck drivers on NSW roads

The unsafe behaviours considered most often engaged in by other truck drivers were tailgating, driving when tired, using a hand-held mobile phone and speeding. Unsafe behaviours self-reported as most frequent were driving while tired, speeding, being distracted by devices/controls in the cabin, not wearing a seatbelt and using a hand-held mobile phone.

Experiences of truck drivers

Pressure from truck companies on their drivers does not appear to be extensive but does exist – most frequently in relation to meeting delivery schedules and time slots, and pressure to drive through mandatory rest breaks.

The majority of truck drivers said other road users cut in front of them or travel in their blind spot at least weekly (94% and 81%). Just over half (55%) reported other road users overtaking them when trying to turn on a daily basis.

Attitudes and behaviours of other road users

Other road users' main concerns of truck drivers were: them driving while tired; driving after taking illegal drugs; speeding, using a hand-held mobile phone and driving when over the legal BAC limit.

Around two-thirds (64%) of other road users claim they never cut in front of heavy trucks and almost three-quarters (73%) claim not to overtake heavy trucks when turning. However, these risky behaviours were more likely to be admitted by drivers 17-39 years.

Safety initiatives in the workplace

While nearly all truck drivers reported feeling safe driving for their company, 30% believe their company puts productivity above safety. This rises to 37% among metro based drivers.

Conclusions

Findings suggest that each group has concerns about the other regarding road safety behaviour. However, these behaviours are not frequently self-reported by the respective groups; indicating there is work to be done to improve the behaviour of each group and ensure they are aware of the impact their driving has on other road users.

The Crash Investigation Alliance – a Gold Coast based Local and State Government partnership

Sonny Suharto[1] and Chris Smith[2]

[1] Transport and Traffic Branch, Transport and Infrastructure Directorate, City of Gold Coast, Queensland, Australia; [2] Road Policing Command, Road Policing Unit Coomera, Queensland Police Service, Queensland, Australia

Abstract

The Crash Investigation Alliance (CIA) is localised shared responsibility between the City of Gold Coast (the City) and Queensland Police Service (QPS). The CIA combines its road safety, traffic engineering, fatal crash investigation and enforcement resources to investigate fatal and serious injury (FSI), separate to ongoing QPS investigations. Benefits of the CIA include escalation of crash treatment selection processes, localised post-crash enforcement strategies and reporting to stakeholders for sites where a FSI crash has occurred. This paper aims to describe the CIA's crash investigation process, post-crash strategies and summarise the investigations undertaken since its inception in August 2017.

Local and state government partnership

The City's Gold Coast Road Safety Plan 2015-2020 (GCRSP) supports the CIA to investigate and respond to FSI crashes to determine engineering treatment options while respecting confidentiality of ongoing Police investigations (City of Gold Coast, 2015). The CIA reports quarterly to the Gold Coast Road Safety Partnership Advisory Group (PAG) which also provides direction on the implementation of the GCRSP. Its membership comprises of representatives of local and state government road authorities, enforcement agencies, academic institutions and road safety advocates.

QPS's Strategic Plan 2018-2022 supports the CIA through its vision of delivering safe and secure communities through innovation, collaboration and best practice (Queensland Police Service, 2018). CIA investigations and recommendations are reported into Queensland Police Records and Information Management Exchange (QPRIME), a database that captures and maintains information for all reported traffic incidents.

Prior to the CIA

Prior to this partnership there was no effective process for both organisations to share critical and confidential information about FSI crashes. Similarly, there was no effective process to provide information on what remedial treatments were proposed where FSI crashes occurred. Exchanging this information often encountered lengthy delays resulting in investigations by the City solely relying on crash data alone. This did not allow the proper understanding of road conditions, road user activities and behaviours prior to a crash.

CIA resources

The CIA combines its skills, knowledge and expertise to manage a process that can be initiated within 72 hours following a FSI crash.

The City provides resources from its Transport and Traffic Branch. This comprises of officers with qualifications, skills and experience in road safety audit, traffic engineering and road asset planning. These officers inform the development and implementation of crash treatments and road safety messaging initiatives.

QPS provides resources from its Road Policing Command (RPC) which oversees crash investigations by the Forensic Crash Unit (FCU) and gathers intelligence collected on crashes from QPRIME. The RPC activates the CIA for FSI crashes occurring on the City's local road network only incidents on private property are excluded. Hospitalisation crashes that are not investigated by QPS are examined by the CIA at the discretion of the City or QPS. QPRIME provides critical information and intelligence about road conditions, road user activities and behaviours prior to the crash occurring. This is gathered from CCTV footage (where available), accounts from witnesses and information from sources such as next of kin, family and associates.

CIA investigations

Sites are inspected as a group to observe and document existing road conditions, identify safety issues and share information about road environment conditions and road user behaviours prior to the crash.

Since its inception in August 2017, the CIA has investigated 20 FSI crashes across all road user types (pedestrians, cyclists, motorcyclists and drivers). Investigations have taken place in coastal, urban and hinterland settings. Road environment issues investigated relate to intersection control, pedestrian crossing facilities, sight distance, roadside delineation, road alignment, pavement condition and street lighting. Road user behaviours investigated include driver inexperience, elderly drivers, alcohol and drugs in the system or a combination of speeding with alcohol/drugs in the system and misuse of pedestrian crossings. Alcohol and speeding accounted for three-quarters of these investigations.

Road user behaviours identified

In the 12 month period leading up to February 2019, 11 fatal and two serious injury crashes were investigated. CIA established the following road user activities and behaviours that contributed to these crashes.

- Pedestrians
  - Older pedestrian's familiarity with the local area and assumptions of vehicle movements leading to impaired judgement or limited personal awareness when crossing between two signalised pedestrian crossings.
  - Older mobility scooter rider's familiarity with the local area and assumptions of vehicle movements leading to impaired judgement or limited personal awareness when crossing a marked pedestrian crossing.
  - e-Skateboard rider on a well-lit, high speed road under the influence of drugs and alcohol at night, in off-peak conditions, leading to high risk activities with oncoming traffic.
- Drivers
  - Driving impatiently after a long day's work leading to excessive speeding on a congested road.
  - Driving at night in off-peak conditions on a windy road leading to risky behaviour and excessive speeding between following vehicles.
- Motorcyclists
  - Riding the next morning when possibly over the legal blood alcohol content limit influencing excessive speeding and risky behaviour.
  - Rider and pillion passenger not wearing helmets riding at night in off-peak conditions influencing risky behaviour and excessive speeding.

The identified road user behaviours enable the City to implement road safety messaging through its social media channels and on its network of portable and permanent variable message signage.

Crash treatments post CIA investigation

From these investigations the City is able to install low cost remedial treatments in a short time frame to make a site safer. Also, the justification for further investigations such as a road safety audit process, speed limit review or crash treatment identification can be escalated if required. This results in the establishment of larger-scale projects that aim to reduce FSI risk. A summary of typical treatments is noted below.

- Less than half the crashes resulted in low-cost remedial treatments (maintenance of the roadside verge, installation of intersection control, line marking, signage, improved delineation or lighting maintenance).
- Road safety audits are programmed at two sites where the FSI crash rate is low but are higher-order roads with mixed road use and mixed urban land use (close to a shopping centre or multi-use sports complex).
- At one site, a road safety audit recommended upgrading a priority controlled intersection with a roundabout. This site was awarded Federal Black Spot funding.
- At one site, no crash treatment could be advised given causal factors of the crash (very low speed).
- At one site, no crash treatment could be advised given causal factors of the crash (rider and pillion passenger not wearing helmets).
- At one site, no crash treatment could be advised given the causal factors resulting in a rear-end crash (very high speed).
- At one site, no crash treatment could be advised given the causal factors resulting in a rear-end crash (medical condition).

Enforcement activity post CIA investigation

CIA investigations add value to informing QPS enforcement operations on and around roads where a FSI crash has occurred. QPRIME data is also analysed to develop a profile of traffic incidents or crash occurrences to determine which aspects QPS Fatal 5 (distraction, drink driving, speeding, fatigue, and unrestrained occupants) needs to be enforced. This approach has been advantageous in supporting engagement and enforcement initiatives in the City's hinterland areas where there is a history of motorcyclist FSI crashes. A major example to note is a rural road where a FSI crash occurred. QPRIME identified a history of traffic incidents relating to speeding vehicles but no enforcement strategies had previously been deployed. This led to a new enforcement program being introduced into this area conducting high visibility presence, mobile radar and vehicle registration checks.

Conclusion

The CIA is an example of a road safety initiative that provides meaningful state and local government collaboration. The CIA has received, via the PAG, positive feedback and ongoing support from internal stakeholders, representatives of local and state government road authorities, enforcement agencies, academic institutions and road safety advocates. This support demonstrates that this initiative has been a success. To ensure longevity of the initiative the City's new Road Safety Plan 2021-2026 (in development) will also include actions to retain the CIA in future years.

References

City of Gold Coast. (2015, April). *Gold Coast Road Safety Plan 2015-2020.* Retrieved from City of Gold Coast: http://www.goldcoast.qld.gov.au/gold-coast-road-safety plan-31543.html

Queensland Police Service (2018). Queensland Police Service Strategic Plan 2018-2022 Retrieved from Queensland Police Service: https://www.police.qld.gov.au/corporatedocs/research/Documents/2018%20QPS%20Strategic%20Plan.pdf

The safety impacts and program benefits of Safe System Assessments

Blair Turner[a], Wayne Moon[b]

[a]Austrailan Road Research Board, [b]Regional Roads Victoria

Abstract

This paper provides results from a project that was intended to identify the estimated Fatal and Serious Injury (FSI) crash reductions application of from Safe System Assessments (SSAs). A sample of 85 SSAs were analysed based on data extracted from the SSA reports. SSAs were undertaken for three different design scenarios – normal designs, high Safe System alignment designs, and mid level planning Safe System designs. The results indicated that an additional 60-100% saving in Fatal and Serious Injury crashes can be achieved by applying Safe System principles via Safe System assessments.

Background

Despite around 15 years of the Safe System approach in Australia, there is still slow progress in embedding Safe System principles within infrastructure projects. Turner et al. (2016) developed a Safe System Assessment Framework, designed to help road agencies methodically and practically consider Safe System objectives in road infrastructure projects. Safe System Assessments (SSAs) are being conducted on VicRoads projects to determine the extent to which existing conditions and / or a proposed project align with Safe System principles, specifically with the objective to eliminate crashes that can result in fatal and serious injuries.

The purpose of this project was to determine the potential road safety benefits from SSAs. More specifically, the intention is to identify the estimated Fatal and Serious Injury (FSI) crash reductions from a program perspective (i.e. an amalgamation of various projects).

Method

A sample of 85 SSAs was analysed based on data extracted from the SSA reports. SSAs were undertaken, and FSI outcomes estimated for three different design scenarios – normal designs (original designs), high Safe System alignment designs (where Safe System principles have been applied as far as practically possible), and mid level planning Safe System designs (the design product at concept design / preliminary design stage).

Results and Conclusions

Key results from the assessment include that significant additional savings in FSI crashes can be achieved by applying Safe System principles via Safe System assessments. The results indicated that there could be expected to be a total estimated 2221 FSI crashes in the case studies based on no assumed improvement in safety (projected over a 20 year period). The estimated benefits for different types of design can be seen in Figure 1.

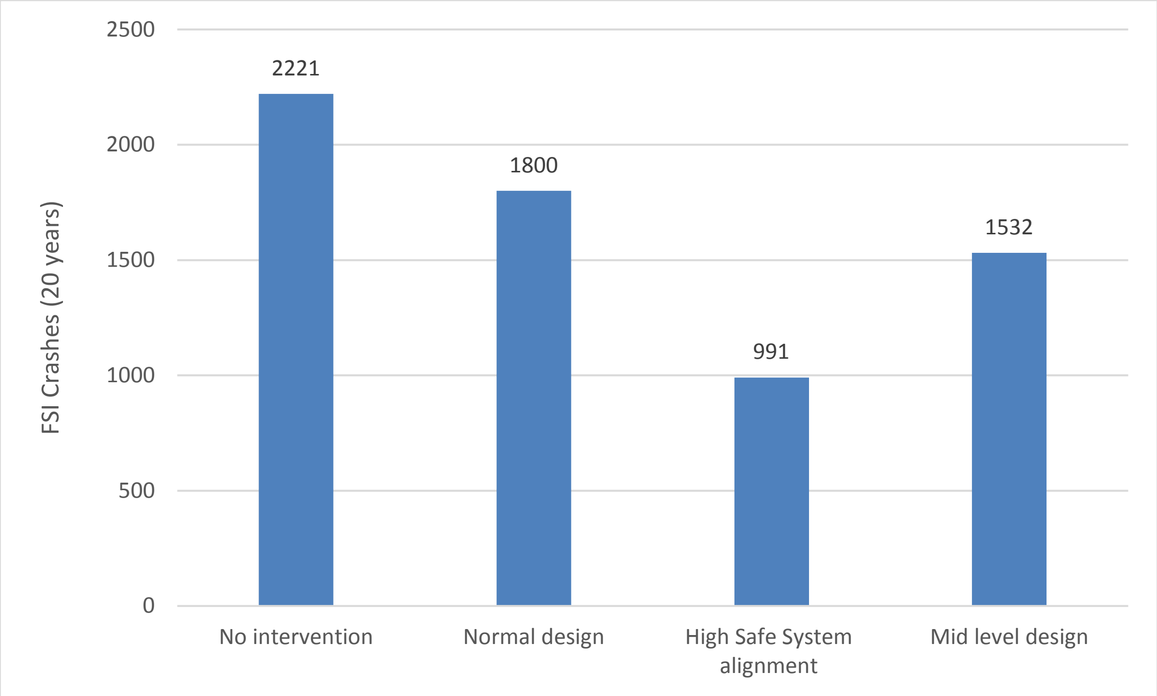


Figure 1. FSI estimates for different options

The greatest benefits for FSI crash improvement are from designs with high Safe System alignment, but there is still a substantial additional benefit (additional over and above normal design) for business case Safe System designs.

It was also identified that high Safe System alignment designs produce substantial benefits, but do not eliminate FSIs. Greater efforts are needed to achieve Safe System outcomes, including more substantive design, further innovation, and improvements in vehicle design and safety features. Given that the final mid level planning Safe System designs did not produce safety benefits as great as high Safe System alignment designs, methods have been identified to embed Safe System design principles into the business cycle Safe System designs. Methods are also required to ensure Safe System design elements are retained as part of detailed design as well as eventual construction to ensure that safety benefits are maximised.

A number of limitations were identified, but these generally led to more conservative estimates. This means that the true benefit of SSAs is likely to be greater than indicated above.

References

Turner, B, Jurewicz, C, Pratt, K, Corben, B & Wolley, J, 2016 Safe System Assessment Framework, AP-R509-16, Austroads, Sydney, NSW.

Importance of vehicle features and in-vehicle technology in the purchase decisions of older drivers'

Anna Crump[a] and Charles Mountain[a]

[a]Royal Automobile Association of South Australia

Abstract

Advances in vehicle technology may assist older drivers to remain driving for longer and improve the rate of crashes involving older motorists (Yannis, Antoniou, Vardaki, & Kanellaidis, 2010). Therefore, encouraging the adoption of in-vehicle technology by older consumers is vital. An online survey was used to explore the importance placed on vehicle features by older drivers, and to investigate the uptake of advanced vehicle technologies. The study identified vehicle safety features as the most important purchase consideration for older motorists, followed by the manufacturer's credentials. Most would consider reversing cameras, blind spot monitoring and adaptive cruise control essential features in a new vehicle purchase.

Background

Government and motoring groups advocate to all motorists the benefits of vehicle safety features in reducing the road toll and crash risk, together with promoting safety as a priority when buying a vehicle. However, older drivers are more likely to find new technologies challenging compared to the younger population, and may be wary of using them (Vrkljan & Anaby, 2011, Yannis *et al*., 2010). Therefore, understanding older drivers' perceptions of in-vehicle technology will assist industry and road safety advocates in the promotion of safer vehicles to the older demographic. The current study was undertaken to gain a better understanding of vehicle technologies considered important by older drivers, and which vehicle attributes feature strongly in their purchase decisions.

Method

An online survey was distributed by email to RAA Member Panel participants aged over 65 years (n=1,444), with a sample size of 769 individuals obtained. Respondents included a higher percentage of males (75%), metropolitan residents (64%) and those aged 65-74 (68%). The survey was administered via Typeform (Typeform S.L., Barcelona, Spain). Data were analysed in Microsoft Excel using a combination of descriptive techniques.

Results and Conclusions

Uptake of in-vehicle technologies by the older population was reasonably strong with more than 65% of respondents indicating they have Bluetooth in their current vehicle (Table 1). Technologies such as adaptive cruise control, reversing cameras and dynamic stability control were also relatively common (>40%). Interestingly, while 65% have Bluetooth in their current vehicle, only 49% would consider this technology essential in future vehicle purchases. A similar trend was shown for keyless engine start, rain sensors, hill-start assist control and voice control, in which the percentage of people who consider these features essential in future vehicle purchases was lower than the percentage that have the feature in their current vehicle. Most would consider reversing cameras (67.8%), blind spot monitoring (59.2%) and adaptive cruise control (55.9%) essential in their next vehicle purchase.

When asked to rate the effect of in-vehicle technologies on their confidence and feelings of safety while driving, 20% feel much more confident and a quarter of respondents feel much safer.

Table 1: ***Percentage of respondents with in-vehicle technology in their current vehicle, compared to the percentage that would consider the technology essential in a future vehicle purchase.***

	Current vehicle	Future vehicle
Bluetooth	65.7%	48.9%
Adaptive cruise control	49.9%	55.9%
Reversing camera	46.4%	67.8%
Dynamic stability control	42.8%	45.4%
Navigation / Real-time traffic	37.4%	51.2%
Automatic headlight activation	34.3%	39.7%
Speed alert system	33.4%	54.3%
Key-less engine start	31.6%	28.0%
Rain sensors	26.2%	25.4%
Hill-start Assist Control	23.6%	20.7%
Park assist / distance control	21.4%	40.4%
Electronic differential lock	21.1%	24.3%
Tyre pressure monitoring	19.9%	49.6%
Adaptive suspension	18.0%	22.2%
Auto start/stop	17.9%	19.9%
Brake-pad wear indicator	17.5%	43.9%
Blind spot monitoring	16.2%	59.2%
Voice control	14.5%	12.4%
Lane keep assist	13.6%	40.5%
Autonomous emergency braking	10.5%	35.4%
Fatigue detection	7.4%	44.5%
Emergency response system	7.0%	38.0%
Pedestrian sensing bonnet	6.3%	23.9%
None of the above	3.7%	4.7%
All of the above	1.4%	9.9%
Other	1.1%	1.1%

Safety features are considered most important for older consumers when buying a new vehicle, followed by the manufacturer's reputation, reliability and warranty. The features considered least important overall to the purchase decision are seating capacity and performance. Females placed a greater importance on fuel economy compared to males, while those aged 75+ were more likely to value an automatic transmission. Females and those aged 75+ place a greater importance on ease of parking. Conversely, males and those aged 65-74 placed a higher value on internal storage space.

Conclusion

Results from this study indicate that certain vehicle features are considered more important than others in the purchase decisions of older drivers, with differences in importance observed across gender and age variables. This information could assist targeted campaigns which aim to increase awareness and usage of in-vehicle technology by older drivers.

References

Vrkljan, B.H., and Anaby, D., 2011. What vehicle features are considered important when buying an automobile? An examination of driver preferences by age and gender. Journal of Safety Research, 42, 61-65.

Yannis.G., Antoniou. C., Vardaki., S., and Kanellaidis G., 2010. Older Drivers' Perception and Acceptance of In-Vehicle Devices for Traffic Safety and Traffic Efficiency. Journal of Transportation Engineering, 136, 5, 472-479.

Community attitudes towards road safety initiatives in South Australia

Anna Crump[a] and Charles Mountain[a]

[a]Royal Automobile Association of South Australia

Abstract

Community support is essential to achieve National and State-based road safety targets. An online survey was used to explore attitudes towards road safety and enforcement strategies used in South Australia (SA). The study identified that a significant proportion of the community are more concerned now regarding the road toll than they were in the past. Driver distraction and impatience are considered the leading contributors towards the state road toll, and community members believe that visible policing and driver training are amongst the most effective strategies for reducing the number of road crashes.

Background

Advances in road design, vehicle safety and driver education have contributed to reductions in road fatalities across Australia. The *National Road Safety Strategy* (Australian Transport Council, 2011) has set national targets to achieve by 2020, with a recent review identifying 12 key recommendations that are supported by RAA. Similarly, the SA Government aims to reduce the annual state road toll to less than 80 people killed by 2020 (Government of South Australia, 2011).

Public support of these action plans is essential to achieve road safety targets. Objectives of the current study were to explore community attitudes towards road safety and enforcement strategies used in SA.

Method

An online survey was disseminated by email to the RAA Member Panel (an opt-in list comprising 3,100 members), with a sample size of 1,063 individuals obtained. Respondents included a higher percentage of males (68%) and those aged over 55 years (81%). The survey was administered via Typeform (Typeform S.L., Barcelona, Spain). Data were analysed in Microsoft Excel using a combination of descriptive techniques.

Results and Discussion

When surveyed, a significant portion of the community indicated they are more concerned now regarding the road toll compared to 12 months ago (43%), and compared to 5 years ago (48%). Interestingly, whilst 69% agreed that a voluntary road rules refresher course for drivers could be an effective measure for reducing the road toll, only 44% would readily support its introduction in SA.

The most recent *Community Attitudes to Road Safety Report* (Australian Government, 2018) highlighted a shift in perceptions regarding the cause of road crashes, which is supported by the results of the current study. Many believe that driver distraction and impatience are the leading contributors to the SA road toll, whilst speeding is thought to be implicated to a lesser extent.

More than half of those surveyed consider visible policing, driver training and penalties for drink/drug driving as the most effective methods for reducing the road toll (Table 1). Conversely, less support was shown for reduced speed limits. Crash data shows a reduction in urban crashes since default speed limits were introduced in SA (Government of South Australia, 2011), indicating a need for greater public awareness regarding this initiative.

Differences were seen between metropolitan and rural samples, with rural residents considering infrastructure safety programs to be the most effective method of reducing the road toll, while metropolitan residents feel driver training is most effective.

Table 1: ***Percentage of respondents indicating that road safety and enforcement strategies are effective methods for reducing the road toll in South Australia***

	Total Sample (n=1063)	**Metro Sample* (n=801)**	**Rural Sample* (n=259)**
Visible policing including RBT's	51.6%	51.7% (2)	51.7% (3)
Driver training	51.3%	52.4% (1)	47.8% (4)
Penalties for drunk / drug driving	50.0%	48.7% (3)	54.8% (2)
Infrastructure safety programs	46.6%	42.7% (4)	59.0% (1)
Black spot programs	42.2%	41.9% (5)	42.8% (5)
Use of seatbelts and child restraints	37.7%	39.4% (6)	32.4% (7)
Graduated licensing schemes	36.5%	37.7% (8)	32.8% (6)
Courses / education	35.5%	37.8% (7)	28.1% (8)
Alcohol interlock programs	32.5%	32.4% (10)	32.4% (7)
Unmarked police cars	31.9%	33.7% (9)	26.2% (10)
Penalties for speeding	27.6%	28.0% (11)	25.9% (11)
Vehicle technology	27.4%	27.3% (12)	27.4% (9)
Prevention campaigns and advertising	24.6%	26.3% (13)	19.3% (12)
Speed and red-light cameras	21.2%	22.1% (14)	18.1% (13)
Demerit points	18.8%	19.0% (15)	18.1% (13)
Variable message boards	14.5%	14.3% (16)	14.2% (14)
50km/hr default speed limit	10.7%	11.7% (17)	7.3% (15)

*rank within a column shown in brackets, with 1 being 'most effective'

Enforcement measures used in SA were largely supported, with 89% agreeing with the use of RBT's. However, less support was indicated for the use of speed cameras (53%). This aligns with recent public negativity towards the use of speed cameras in SA, and suggests a need for greater transparency in their use and contribution to revenue.

South Australians would like greater focus on tourists and heavy vehicles in future road safety campaigns, but are less supportive of promoting alternative transport options (i.e. public transport) as a measure for reducing the road toll.

Conclusions

These results highlight the need for greater community education regarding the effectiveness of strategies which aim to reduce the road toll, and could be used to facilitate a shift in community support for specific road safety and enforcement campaigns.

References

Australian Government, 2018. *Community Attitudes to Road Safety – 2017 Survey Report*, DIRDC, Australia.

Australian Transport Council, 2011. *National Road Safety Strategy 2011-2020*, ATC, Australia.

Government of South Australia, 2011. *Towards Zero Together: South Australia's Road Safety Strategy 2020)*, DPTI, Australia.

Te Ara Haepapa (The Journey) – Maori road safety education programme

Claire Dixon[a], Rachel Elisaia-Hopa[a] and Marutawhao Winiata Delamere[a]
Auckland Transport, New Zealand

Abstract

Te Ara Haepapa (The Journey) was developed in 2017 to address the high proportion of Maori (indigenous people) involved in deaths and serious injury road crashes in Tamaki Makaurau, Aotearoa (Auckland, New Zealand). It is the only comprehensive Maori road safety programme in Aotearoa delivered via Marae (community meeting places), Kura (schools), Kohanga (pre-school) and community. The programme is delivered within a holistic Maori cultural context by fluent Te Reo (Maori language) speaking staff and covers a wide range of high-risk road safety prevention themes, including child restraint and seat belt use, sober driving, speed and Driver Licensing. This presentation highlights the cultural approach used to successfully engage the uptake of formal Driver Licensing amongst hard-to-reach at-risk young Maori drivers in Tamaki Makaurau in the past two years 2017 and 2018.

Background

The Kaihautū (Driver) programme delivers driver licensing workshops which include educational road safety behaviours and the New Zealand road code to Rangatahi (young adult) Maori aged between 16-24 years and their whanau (extended family). The aim is to have more Kaihautū (drivers) on the road who understand and apply the road rules, keeping themselves and their whanau (extended family) safe from harm. The programme also aims to heighten awareness of other road safety issues (sober driving, speed, & restraints) and to prepare Rangatahi (young adult) Māori and their whanau to sit their Raihana Ākonga (Learner Driver) and Raihana Whītiki (Restricted Driver) licences with confidence and accountability.

Maori are over-represented in road deaths and serious injuries (DSI) in Tamaki Makaurau (Auckland) and were involved in 15% of all DSI in 2017 while making up only 10% of the resident population. Maori DSI has increased by 108% from 60 in 2014 to 125 in 2017. Rangatahi (young adult) Māori aged 16-24 years made up 26% of total Māori DSI in 2017, and many of these were vehicle Drivers.

Historically, there has been a larger number of Rangatahi Maori involved in DSI who do not have a formal Drivers License, and 55% of Rangatahi Maori aged 16 to 24 years in the NZ Justice System, have ended up there as a result of driving related offences (NZ Police data – Source?).

Methodology

The aim of the Kaihautu (Driver) community-based programme was to increase the number of Rangatahi Maori attaining a formal Drivers License in Tamaki Makaurau, along with introducing attitude changes and increased knowledge of road safety, while successfully progressing through the Graduated Driver License system. The measures of success included:

- Increased Rangatahi Maori Driver License participation
- Increased Rangatahi Maori Driver License pass-rates

- Reduced road deaths and serious injuries among Rangatahi Maori drivers in Tamaki Makaurau

The Kaihautu (Driver) programme development was unique, in that it was delivered within a holistic Māori cultural setting where Rangatahi (young adult) Māori had the ability to learn in a familiar environment according to Maori tikanga (protocols), foster whakawhanaungatanga (relationships and kinship ties), and receive additional whanau (extended family) support. These cultural elements enhanced Rangatahi (young adult) Māori participation, chances for achieving Driver Licensing understanding and pass-rates, and also increased the prestige of holding and valuing a Drivers License as a taonga (valuable gift) within the wider whanau. Success in attaining a Drivers License also increased the mana (self-worth) of Rangatahi Maori, as it opened up additional employment and educational opportunities for some.

The programme also created a longer-term sustainable community and whanau (extended family) committment through Kaiwhakahaere Raihana konga (Train the Trainer) development. This training provided for Māori Kaimahi (?), kaiako (?), kaiāwhina (?) and whanau to train as Driver Licensing Trainers and continue the programme within their rohe (tribal boundaries). The Kaihautū programme also works alongside Government partners such as NZ Police, who are culturally supportive. The assistance from NZ Police opens a new and valuable perspective for Ranagatahi Maori by providing positive interactions with authority.

Results

The inital 2017 Kaihautu Programme included 107 Raihana Ākonga (Learner Driver) participants, and 92% of those who sat the Raihana Ākonga (Learner Driver) test passed. This is a pass-rate higher than the Tamaki Makaurau average for all young drivers aged 16 to 24 years in 2017 (74%) (see Table 1).

The 2018 Kaihautu Programme increased the number of Raihana Ākonga (Learner Driver) participants to 218, and 95% of those who sat the Raihana Ākonga (Learner Driver) test passed. This is a pass-rate higher than the Tamaki Makaurau average for all young drivers aged 16 to 24 years in 2018 (74%). Also in 2018, a Raihana Whītiki (Restricted Driver) programme was introduced for a small number of participants, of whom the majority passed the Raihana Whītiki (Restricted Driver) test (see Table 1).

While it is difficult to directly link Driver Licensing uptake from the Kaihautu Programme among Rangatahi Maori and road death and serious inury (DSI) outcomes for the same population in Tamaki Makaurau, it has been encouraging to note a 46% reduction in Rangatahi Maori Driver-related DSI from 15 in 2017 to 8 in 2018 (see Table 2)

Conclusion

The Kaihautu Programme has sucessfully engaged a greater number of hard-to-reach at-risk Rangatahi Maori in Tamaki Makaurau's Graduated Driver Licensing System. Participants have also achieved higher than average Driver Licensing pass-rates. The use of a holisitic Maori cultural setting and approach has been key to this success, including the Kaiwhakahaere Raihana konga (Train the Trainer) development among commuity and whanau. There are also early encouraging signs of reduced road deaths and serious injuries (DSI) among Rangatahi Maori Licensed Drivers.

Table 1. **Kaihautu Driver License courses participation and pass rates 2017 and 2018**

Kaihautu Driver Licensing course	Number participating in course	Number sitting test	Number passing test	Kaihautu % pass rate	Comparison % pass rate for all of Tamaki Makaurau
2017 Raihana Ākonga Learners Licence	107	95	88	92.6%	74%
2018 RaihanaĀkonga Learners Licence	218	110	104	95%	74%
2018 Raihana Whītiki/Tūturu Restricted Licence	16	8	7	87.5%	90%

Table 2. Rangatahi Maori Road Death & Serious Injury data for 2014 to 2018

Rangatahi Maori (Young Driver) 16 to 24 years Road Deaths & Serious Injuries (DSI) in Tamaki Makaurau					
Year & License Status	2014	2015	2016	2017	2018
Full License	2	3	2	2	1
Learner License	3	6	5	3	2
Restricted License	1			4	
Never Licensed	1	1	2	6	3
Unknown Status		2	3		2
Total	7	12	12	15	8

Source: NZ Transport Agency Crash Analysis System (CAS). Note: Maori Road Death & Serious Injuries are under-reported in CAS due to ethnicity not always being identified by NZ Police.

Making Tasmanian Roads Motorcycle Friendly: Lake Leake Road Demonstration Project

Craig Hoey[a], Sophie Bannon[a], Kenn Beer[b]

[a] Department of State Growth, Tasmania [b]Safe System Solutions Pty Ltd. Brunswick, Victoria.

Abstract

Lake Leake Road, a popular Tasmanian motorcycle touring route, also presents as the State's highest risk motorcycle road. To consider optimum risk mitigation strategies: (a) experienced motorcycle riders alongside road safety auditors both examined the road on instrumented bikes that recorded road conditions and the riders' observations; and (b) the results were workshopped with representatives from major stakeholder groups.

This method is observed to have both technical validity and social validity by covering all of the elements of the Safe System – Safer Roads, Safer Speeds, Safer Vehicles, Post-Crash Care and Safer People.

Background

Touring and recreational motorcyclists have more serious injury crashes than other motorcyclists (Austroads, 2015). Tasmania has many popular motorcycle touring routes for both local riders and tourists. The motorcycle crash risk index developed by the Department of State Growth identifies Lake Leake Road as Tasmania's highest risk motorcycle route (Figure 1). Between 2013 and 2018, 15% (80 of 517) of motorcyclists seriously injured or killed on Tasmanian roads were non-Tasmanian residents. Between 2008 and 2018, 40% (11 of 27) of all motorcycle crashes, and 28.5% (4 of 14) of serious casualties, on Lake Leake Road were non-Tasmanians.

With the launch of Towards Zero, the Tasmanian Government (2017) reinforced their commitment to addressing road trauma, especially motorcycle safety. Because Tasmania's popular motorcycle touring routes include their highest trauma routes, possible mitigation approaches were developed. The Lake Leake Road project investigated best practice from the Making Roads Motorcycle Friendly guide (VicRoads, 2014) for maintenance and treatments for existing roads (Beer, 2016) as opposed to roads under construction (Beer et al., 2017).

Method

Safe System Solutions Pty Ltd arranged a Safe System Road Safety Audit – firstly with a preliminary consultation with local engineers, motorcycle safety experts, motorcycle riders, police, and policy makers to confirm the pilot route. Then road safety auditors and experienced motorcyclists rode the route with instrumented motorcycles. They then collectively identified areas of high risk and issues and finally held a full day World Café workshop to develop possible solutions.

Results

Knowledge is obtained by the alchemy of transforming data into information. Good data complemented by good analysis, such as in Figure 1, is needed before workshopping. All motorcycle crashes on Lake Leake Road occurred in dry conditions and in the daytime. All crashes were on bends/curves (9 Left, 5 Right). There is a high severity ratio for motorcyclists (3:5:6, Fatal: Serious Injury: Minor). Thirteen of the fourteen crashes were single vehicle loss of control.

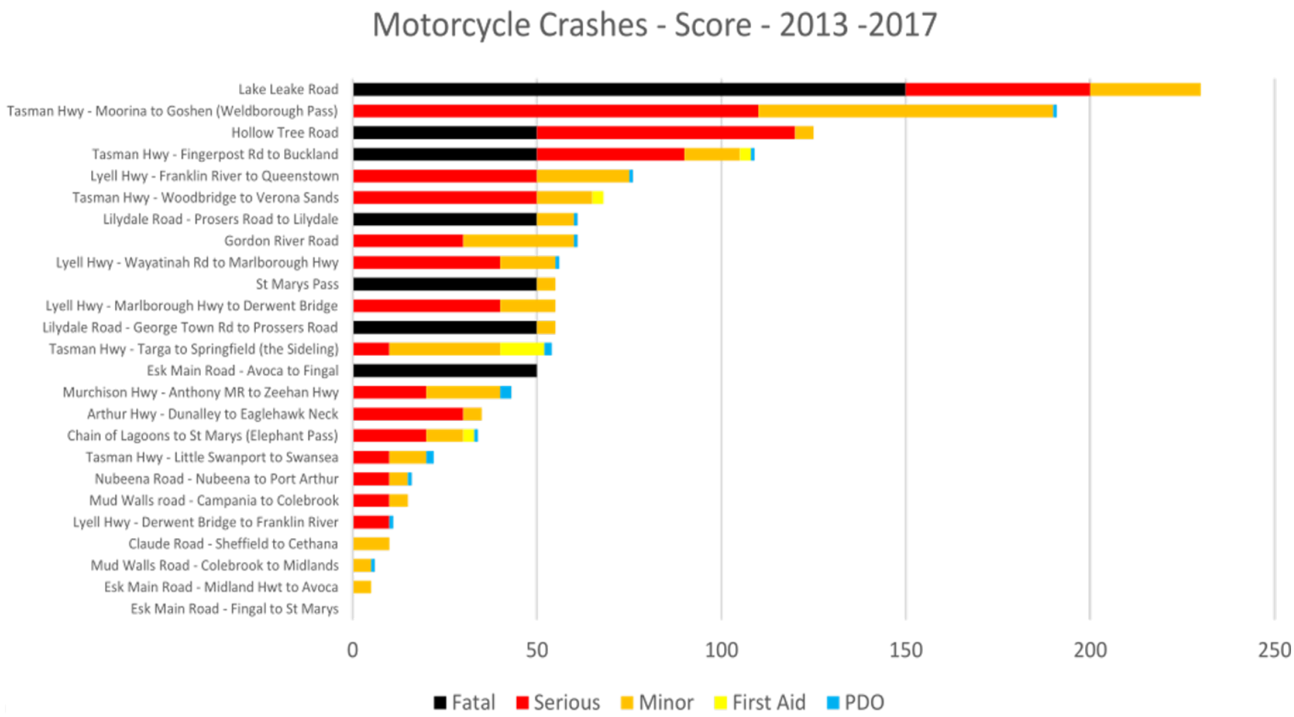


Figure 1. Motor cycle crash scores indicate that Lake Leake Road has the highest motorcycle crash risk index of Tasmanian roads

World Café Workshop Format

The value of any workshop relies on capturing a 'broad church' and encouraging participation. Stakeholder engagement is critical, and the time and effort to bring people together is crucial to success. Presentations and discussions generated ideas for countermeasures as in Table 1. World Café tables were:

- Safer Roads and Roadsides
- Safer Speeds
- Safer People (riders and drivers)
- Safer Vehicles, Gear and Post-Crash Care

Conclusion

The Lake Leake Road project methodology appears valid. Because it is based on technical analyses covering firstly which road to examine, and then secondly detailed technical analysis of the road itself (Beer, 2016) it has technical validity. It also attains social validity through consultation and workshops incorporating the views of stakeholders covering all elements of the Safe System.

The final list of counter-measures resulted in an action plan. We are confident that implementation of the action plan will reduce crashes on Lake Leake Road.

Table 1. Representative countermeasures selected from the comprehensive list developed by World Café participants

Safe System Pillar	**Countermeasure**	**Comment**	**Cost/Time**	**Achievability/ Impact**
Safer Roads and Roadsides	Remove trees on some corner exits (visibility).	Looking for opportunities to improve sight lines through a small amount of vegetation removal/trimming	Low/Quick	Low/High
Safer Speeds	Advisory signs (speed)	Effective well-established treatment. See Audit for more details.	Low/Quick	Medium/High
Safer Vehicles (Motorcycles)	Reward scheme at service station free coffee/water for tyre pressure check	Initiative has merit. Trial at service stations	Low/Quick	Medium-Low/High
Safer Gear	5 Star rating system for gear for Safety and for Comfort	Promotion of the new national Star rating website is encouraged. Will look for ideas to promote to riders in this area.	N/A	N/A
Safer Post Crash Care	G-force / mercury switch sensor to alert emergency services to crash ie Rally Safe	This idea has merit. Implementation will require a business case. Not expected to have high benefit. This is wider than the Lake Leake Road, but has been noted and communicated to the Road Safety Advisory Council for consideration.	N/A	N/A
Safer People (Riders)	Protect yourself Personal responsibility Attitude Manners Respect	There are all valid points. We will look for actions that promote these sentiments	N/A	N/A
Safer People (Drivers)	Situational Awareness Education – vulnerability of motorcyclists	There are all valid points. We will look for actions that promote these sentiments	N/A	N/A

References

Austroads. 2015. Motorcycle in-depth crash study, Report AP-R489-15, Austroads, Sydney.

Beer, K., 2016. Enhanced Maintenance Strategies for Popular Motorcycle Routes, Proceedings of the 2016 Australasian Road Safety Conference, 6-8 September, Canberra, Australia.

Beer, K., Williamson, D., Rose, G., 2017. Design for motorcyclists. In Delbosc, A. & Young, W. (eds) Traffic Engineering and Management 7th edition, Monash Institute of Transport Studies, pp459-485.

Tasmanian Government, 2017. Towards Zero. Tasmanian Road Safety Strategy 2017-2026. Available at: https://www.transport.tas.gov.au/roadsafety/towards_zero

VicRoads. 2014. Making Roads Motorcycle Friendly: a guide for road design, construction and maintenance, Available at: https://www.vicroads.vic.gov.au/-/media/files/technical-documents-new/miscellaneous-guidelines/making-roads-motorcycle-friendly.ashx

Safer Summer – the Public Perceptions and Efficacy of a 4-Year Enhanced Speed Enforcement Programme

Robyn Gardener [a], James Newton[b], Graham Wood[c], Maxwell Cameron[d], Nils van Lamoen[e], Ian Wentworth[f],

[a]Accident Compensation Corporation, [b]Stantec, [c]Consultant Statistician, [c]Monash University, [d]New Zealand Police, [e]KantarTNS

Abstract

Safer Summer is an enhanced speed enforcement partnership between Accident Compensation Corporation and NZ Police.

Safer Summer provided tactical social-marketing to complement Police's targeted summer holiday enforcement operations. Safer Summer informed the public of Police's introduction of a reduced speed enforcement threshold over the summer holidays, with the intention of moderating speeds and getting more homogeneous travel flows. Lower speeds were expected to result in safer travel with reduced numbers of crashes and fewer fatal and serious injuries.

Share the learnings from this programme using social marketing, advertising, children and poetry to engage the public with Police enforcement.

Introduction

This paper reviews Safer Summer 2013-17, following progress from pilot through a stage-gate in 2016 to final campaign in 2017.

The Safer Summer programme began in 2013/14 with a pilot after Police's operations to implement a reduced speed enforcement threshold received mixed responses by public commentators in the media and the public at the roadside. Three social-marketing campaigns followed from 2014/15 to 2016/17, each evaluated and building on findings from the previous summer's campaign. As part of the campaign, Police increased their visibility on the road and implemented a highly publicised reduced speed enforcement threshold.

The paper considers the implementation of a variety of methods of engaging with the driving public and the resulting key findings. These include a major public launch in 2013/14, billboards, social media, advertising, in-car children's games, contributions by Z-Energy, IAG Insurance and TR Group, through to the final 2016/17 Holiday Haiku initiative bringing poetry and iconic New Zealand poet Sam Hunt on-board to spread the safer speeds message.

Discussion

Safer Summer was designed to enhance Police's targeted summer holiday enforcement operations by publicising Police's intentions to enforce a lower threshold for speeding during the busy summer holiday period. Encouraging reduced driving speeds when traffic was heavy was expected to result in safer travel with reduced numbers of crashes and fewer fatal and serious injuries.

The right messaging was crucial as the Safer Summer programme sat below the national strategic behaviour-change programme managed by NZTA. To make sure Safer Summer was complementary to the national campaign messaging, ACC, Police, NZ Transport Agency and advertising consultants worked closely together.

Evaluating each social-marketing campaign year-by-year provided up-to-date information on what was and wasn't working. These learnings enabled informed changes to be made as the programme progressed to make sure that what was delivered resonated with our customers and achieved the desired result.

Core to message development was a shift in public perceptions from "enforcement as revenue-gathering" to "enforcing for safety". Segmentation of the driving public was used to develop messaging, channels and touch points for targeted groups of drivers.

Results

An early evaluation was completed for the pilot operation in the summer of 2013/14. This indicated that the rate of speeding significantly and substantially decreased and that a reduction in fatal, severe and minor crashes occurred, but there was insufficient crash data to provide statistically robust estimates for the change in crashes (van Lamoen, 2014).

Preliminary results from the evaluation of the enhanced enforcement package over the three campaign periods refined the findings of the 2014 analysis, estimating that some 30 deaths and 100 serious injuries were prevented annually on rural roads by the programme.

Conclusions

A campaign of this type involving a well-publicised reduction in the speed enforcement threshold is unusual internationally and there is little speed-related research to support an intervention of this type. The findings from the finalised evaluation (early-2019) will inform ACC strategies for road safety messaging and successful co-investment and NZ Police's ongoing approach to speed enforcement, seasonal operations and operational policy.

References

Van Lamoen, N., (2014). *Evaluation of the "Safer Summer" Road Safety Campaign*. Wellington, New Zealand Police. Retrieved from http://www.police.govt.nz/sites/default/files/publications/safer-summer-campaign-evaluation-report.pdf

Blame of Crash Causation Across Varying Levels of Vehicle Automation

Joanne M. Bennett[a], Kirsten Challinor[a], Oscar Modesto[a], Prasannah Prabhakharan[b]

[a]Australian Catholic University
[b] Research Centre for Integrated Transport Innovation, University of New South Wales

Abstract

The question over "who is responsible" for a crash involving automation has been debated however it is important to ascertain public perceptions in order to guide the development of legal frameworks for managing crashes at varying levels of automation. Undergraduate students responded to a series of vignettes with the automation level manipulated, answering questions about blame. Participants assigned blame to six possible stakeholders (driver, pedestrian, car, government, manufacturer, programmer), with 37.4% blaming the driver in the fully automated scenario. Participants called for either an improvement in or avoidance of automation. These findings have implications for the development of legal frameworks and for trust in autonomous vehicles.

Background: Public opinion towards automated vehicles (AVs) is largely favourable (Kyriakidis, Happee & deWinter, 2015). Despite this, there are a number of recurrent concerns around AVs, including legal responsibility in the event of a crash (Schoettle & Sivak, 2014). Theoretical papers have debated the complexities surrounding the legal responsibility of crashes involving AVs, with opinions ranging from the driver is always accountable to the impossibility of holding machines responsible (Gless, Silverman, & Weigend, 2016). Whilst "who is responsible" for a crash involving different levels of automation has been debated, little is known about public opinion on blame in automated crashes. It is important to understand public perceptions of responsibility for accidents involving different levels of automation, and the perceived consequences of that responsibility, in order for policy makers to develop frameworks legal frameworks.

Method: Participants in this study were 129 undergraduate psychology students from the Australian Catholic University. Ages ranged from 19 – 61 (*M*=24.6, *SD*=7.64), 78% female, with less than 5 years driving experience. Four vignettes presented a crash scenario with the automation level manipulated (manual driving, partially automated, highly automated and fully automated driving). An example vignette is: '*A 35 year old male is crossing a suburban street during the day at the zebra crossing. At the same time, a manually driven car is going down the same straight street. The driver is on their phone. The pedestrian is hit.'* Participants were asked three open-ended questions; 'Where do you assign blame?', 'Based on where you assign blame, what course of action would you take from here?', and 'How could this event be prevented in the future?'.

Results: Participants attributed blame to six broad stakeholder categories (driver, pedestrian, car, government, manufacturer and programmer). As automation increased, the proportion of respondents who blamed the driver decreased, whilst those blaming the manufacturer increased (see Figure 1). 37.4% continued to blame the driver in the fully automated scenario. Participants commonly identified legal action against the driver, the manufacturer or both as their course of action. The proportions varied across automation, with legal action against the driver still named by 11.9% when fully automated. Possible prevention strategies included ensuring the driver is more attentive (manual 40.3%, partial 50.8%, highly 37.2%, fully 14%). As level of automation increased, there were increased calls for automation to be improved (9.3%, 12.5%, 24.8%, 34.9%), or avoided (1.6%, 10.2%, 17.8%, 24.9%).

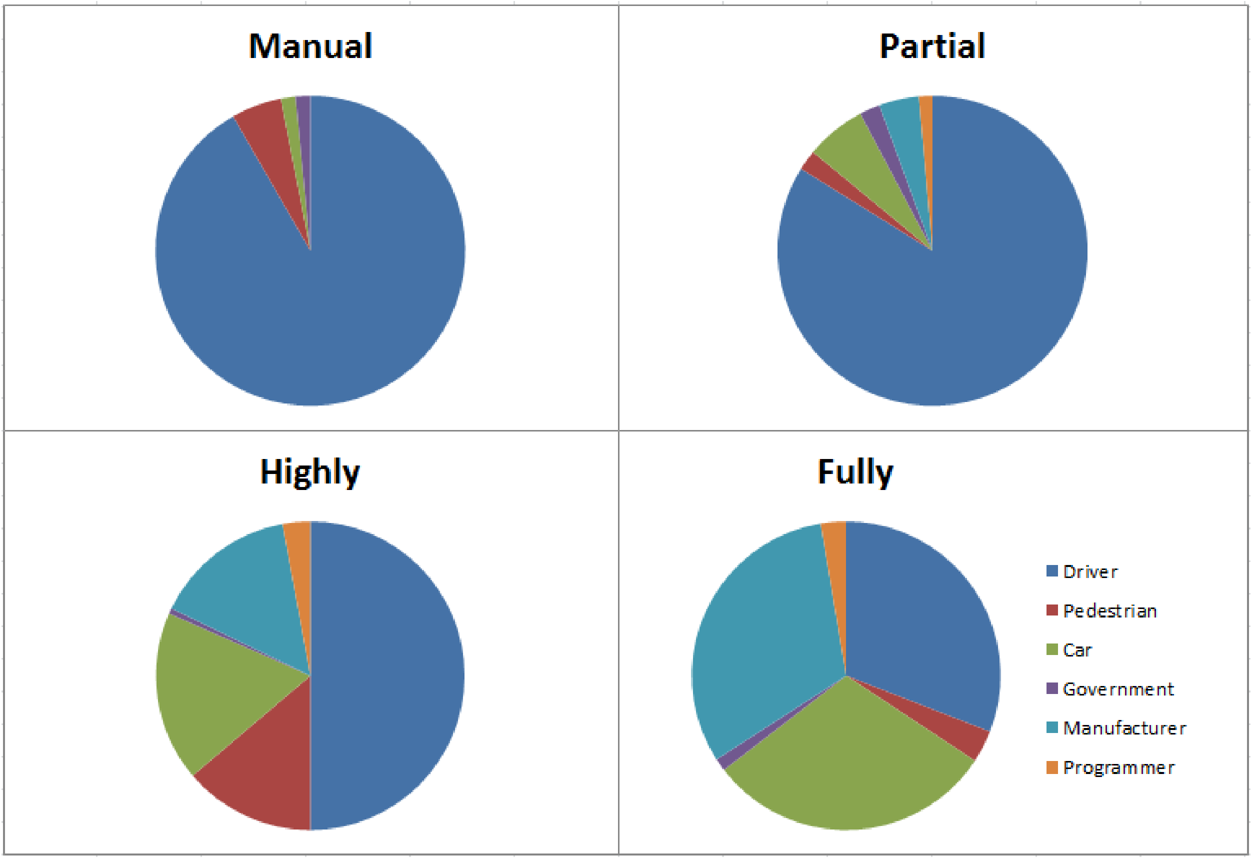


Figure 1. Proportion of blame assigned to key stakeholders by level of automation.

Discussion: The present study established that there is no consensus regarding responsibility for crashes for varying levels of automation. Areas of discrepancy were highlighted during cases of highly or fully automated, suggesting that this is a legal grey area. Of note, the driver is deemed responsible, with legal consequences, for a crash in fully automated scenarios when there is no steering wheel. This study suggests that there may be a greater need to protect drivers from liability in crashes involving higher levels of automation. Given that in cases of high levels of automation, participants called for either an improvement in AVs or they would avoid AVs, these findings will have implications for manufacturers on how to manage the fallout from crashes.

References

Gless, S., Silverman, E., & Weigend, T. (2016). If robots cause harm, who is to blame? Self-driving cars and criminal liability. *New Criminal Law Review*. < http://ssrn.com/abstract=2724592>

Kyriakidis, M., Happee, R., & deWinter, J.C.F. (2015). Public opinion on automated driving: Results of an international questionnaire amoung 5000 respondents. *Transportation Research Part F: Traffic Psychology and Behaviour, 32*, 127-140. doi:10.1016/j.trf.2015.04.014

Schoettle, B. & Sivak, M. (2014). A survey of public opinion about autonomous and self-driving vehicles in the U.S., the U.K., and Australia. Michigan, USA. <http://deepblue.lib.umich.edu/bitstream/handle/2027.42/108384/103024.pdf>

Toward Safe System Infrastructure – Application and Development of Safe System Assessment in Victoria

David Williamson

VicRoads

Abstract

Safe System Assessment (SSA) is now widely used by VicRoads during the planning and design of road infrastructure projects to assess alignment with Safe System objectives. The methodology closely follows the Austroads framework (Turner et al, 2016). Based on experience and lessons learned when conducting SSAs, VicRoads has developed *Safe System Assessment Guidelines* (VicRoads, 2018) that provide enhanced guidance on when, how and who should conduct an assessment. The Guidelines mandate that SSA is to be undertaken on all projects with an estimated cost exceeding $5 million. SSA will also be used to measure safety performance under VicRoads Movement and Place framework.

Background

The Safe System philosophy was introduced in Victoria more than 15 years ago, and was quickly adopted as the guiding principle to underpin the state's road safety strategies and action plans. While the basic principles of the Safe System relating to human error and limiting the forces that the human body can tolerate when a crash occurs are now widely understood, the ongoing challenge has been to translate the principles into practice.

In 2016, Austroads published the report *Safe System Assessment Framework* (Turner et al, 2016). The framework provides a method to assess how well a proposed infrastructure project aligns with Safe System objectives and ultimately eliminate crashes that can result in fatalities and serious injuries. Safe System Assessment (SSA) is a tool that aids project planners, developers and designers to bridge the gap between Safe System theory and practice.

Safe System Assessment in VicRoads

VicRoads began conducting SSAs on major infrastructure projects approximately two years ago, applying the *Safe System Assessment Framework* methodology. It is estimated that more than 150 assessments have now been conducted.

This experience highlighted several areas where additional guidance was required to assist those undertaking assessments and to promote consistency, including in the reporting of findings. Areas identified for enhanced guidance included:

- The stage(s) in the project development cycle that a SSA should be conducted;
- Which projects should be subject to SSA;
- The level of detail required when conducting an assessment;
- Who should conduct a SSA and whether assessors should be independent;
- Clarification of which crash types / users are considered under each column of the SSA matrix;
- Additional guidance on scoring – e.g. should scores be whole numbers?
- Clarification of exposure measures and factors affecting likelihood; and
- How to sub-divide large or complex projects for assessment.

In addition, it became clear that policy was necessary to ensure that SSAs would be conducted and that Safe System principles would be considered during the development of all infrastructure projects.

VicRoads Guidelines

In July 2018 VicRoads released *Safe System Assessment Guidelines* (VicRoads, 2018) which address the areas of need identified above.

The Guidelines include VicRoads policy on which projects are to be subject to SSA. Table 1 is a summary of VicRoads requirements. Two levels of assessment have been identified – Full SSA and Rapid SSA. The former is a comprehensive assessment which includes all components of Austroads *Safe System Assessment Framework*. A Rapid SSA is an abridged version with the Safe System Assessment Matrix being the main component. Report templates have been developed for each type of assessment.

Safe System Assessment in Movement and Place

VicRoads is developing a comprehensive Movement and Place framework to ensure that the needs for movement and placemaking will be considered in the planning and development of the state's road network. Road safety performance will be incorporated into the framework, with the level of Safe System alignment to be used as the performance indicator. Safe System Assessments, specifically the Safe System Matrix scores, are to be used as the measure of alignment with Safe System.

Table 1. VicRoads Requirements for Safe System Assessments

Project Cost	SSA Requirements	Type of Assessment
> $5M	A SSA **must** be conducted (including all projects submitted to the Project Review Committee)	Full SSA for **ALL** projects Rapid SSA may be conducted if a Full SSA has been undertaken at an earlier stage (i.e. for a repeat assessment)
$2M to $5M	A SSA is **desirable** and is the preferred method to consider alignmenet with Safe System principles. Where a SSA is not undertaken, documentation of how the project has considered Safe System alignmenet shall be provided within the PRC / RRC report, design report, or other suitable record.	Full SSA for: • Complex projects • Projects with a significant risk of FSI crashes • Innovative projects Rapid SSA for: • Projects with a low risk FSI crashes • Repeat assessments for projects for which a Full SSA has been undertaken at an earlier stage
< $2M	A SSA is **optional**. The benefits of conducting an SSA and the risk factors associated with the project should be considered in determining the need for a SSA. Where a SSA is not undertaken, documentation of how the project has considered Safe System alignmenet shall be provided within the Regional Review Committee (RRC) report, design report, or other suitable record.	Rapid SSA where it has been determined that a formal assessment is required.

Note: From VicRoads 2018, p. 4.

References

Turner, B., Jurewicz, C., Pratt, K., Corben, B. and Woolley, J. (2016). Safe System Assessment Framework, Research Report AP-R509-16. Austroads, Sydney, NSW

VicRoads (2018). Safe System Assessment Guidelines V1.0. VicRoads, Kew, Vic.

High Risk Rural Intersection Towards Zero

Sarah Morris (Department of Transport) and Paul Mihailidis (Trafficworks Pty Ltd)

Safe System Road Infrastructure Program, Department of Transport

Abstract

Intersections pose a significant risk to drivers on the rural road network in Victoria with 41% of total fatal and serious injuries (FSI) occurring at intersections.

As such, the Victorian Government has invested $25 million to deliver treatments for over 200 high-risk, high-speed rural intersections. Under the program, government collaborated with road safety consultants in an interactive process to develop and design treatments in a timely manner.

The investment is expected to save 17 lives and 177 serious injuries over the average 10-year treatment life with a projected completion date of June 2020. Treatments include side road activated speeds, electronic vehicle activated warning signs, turn lanes and delineation and visibility improvements.

Background

In Victoria, 41% of deaths and serious injuries occur at intersections and, according to an Intersection Risk Assessment, 68% of deaths and serious injuries occur within 50 m of an intersection. At such a high rate of occurrence, the social and economic costs of these crashes are considerable. In rural Victoria, there were 2,663 serious casualties caused by intersection crashes and 4,994 serious casualties caused by run-off-road crashes. This program will target over 200 high-risk intersections on high-speed rural roads by implementing effective low-cost treatments.

Despite the treatment of many high-risk intersections in the past, a considerable number of low volume rural intersections in high-speed zones remain untreated. These intersections do not generally achieve a BCR high enough to justify transformational Safe System treatments, such as roundabouts. Instead of ignoring these intersections, a proactive approach was utilised to assess the intersections, procure services to expedite the program, and implement treatments to achieve safety benefits sooner.

As part of the Towards Zero 2016-20 Strategy and Action Plan, the Victorian Government is investing $25 million on effective low-cost intersection treatments across regional Victoria. This is being undertaken through the Safe System Road Infrastructure Program (SSRIP).

Project costs will generally range between $50,000 and $250,000 per site. The benefits will be calculated using a 10-year crash period and treatment specific crash reduction factors (CRF) at each intersection.

Method

An analysis was undertaken to shortlist sites by using the VicRoads High-Risk Intersection Rating Tool. This tool measures crash density across intersections across the state based on crash data from the last ten years with a weighting applied to the last 5 years. Serious casualty risk is then measured by multiplying the number of crashes at each section by a severity factor, which is determined by the density of crashes at other intersections with the same attributes across the state. Once intersections were ranked by their predicted serious casualty crash risk, SSRIP shortlisted 500 sites that met the program criteria. This was further shortlisted to over 200 intersections following consultation with the regions and councils.

A 3-tier approach was developed to ensure that treatments are cost-effective. Each tier constituted different treatment and funding levels. The suitable tier for treatment at each intersection was determined based on crash history or high risk, high traffic volumes, intersection geometry, deliverability, and cost per serious casualty saved.

Results and Conclusions

This investment is expected to save 17 lives and 177 serious injuries over the average 10-year treatment life, a total of 194 serious casualties. The program is estimated to produce a net present value of $140.3m, a BCR of 6.2.

Trialling Automated Vehicles: Who, What and Where? Survey Results from Across Australia and New Zealand

Selena A. Ledger[a], Mitchell L. Cunningham[ab], Michael A. Regan[c], Anna Chevalier[a]

[a] Australian Road Research Board, [b] School of Psychology, University of Sydney, [c] Research Centre for Integrated Transport Innovation, The University of New South Wales

Abstract

To facilitate societal uptake of automated vehicles (AVs), it is important government, industry, and researchers become cognizant of group differences in public acceptance of AVs. The Australian and New Zealand Driverless Vehicle Initiative (ADVI) international survey investigated public awareness, understanding and likely acceptance of AVs, and received responses from 5102 Australians and 1049 New Zealanders. Survey results revealed males, younger respondents, Australian Capital Territory (ACT) and inner metropolitan residents are most likely to express interest in participating in trials involving AVs as a partially automated vehicle driver, or public-transport/ride-share passenger. These findings may inform stakeholders in government, industry and academia planning trials involving AVs.

Introduction

Automated vehicles, defined as "...[vehicles] in which at least some aspects of a safety critical control function (e.g., steering, throttle, or braking) occur without direct driver input", are predicted to bring about myriad societal, road safety and environmental benefits (Anderson et al., 2014; Fagnant & Kockelman, 2015). Consequently, AVs are currently being trialled internationally (Bloomberg Institute, 2019), and in Australia and New Zealand (NZ) (e.g., Flinders University, 2018; RAC, 2018). Information about public acceptance of AVs may help inform the future locations of AV trials, and provide a profile of individuals who may be interested in participating in these trials, as either a partially automated vehicle driver or public-transport/ride-share passenger. Nation-wide surveys have typically been employed to gauge likely public acceptance of AVs. However, except for a few recent studies (e.g., Eastlink, 2017, 2018; Pettigrew, Talati, & Norman, 2018; Schoettle & Sivak, 2014; RAC, 2016, 2018), there is a paucity of research examining likely AV acceptance in Australia, and none to the best of our knowledge focusing on NZ.

We will present select findings from the latest ADVI survey, one of the largest AV acceptance surveys internationally, involving a representative sample of respondents from Australia and NZ (Regan, et al., 2017).

Method

The 90-item survey was developed by the ADVI Survey Working Group (which included two of the co-authors), with members from academia, government and industry. It was distributed to over 6152 respondents across Australia and NZ through the online survey platform, Qualtrics.

Survey responses were analysed to address the following research questions:

1. *Who* in Australia and NZ are most interested in participating in trials of AV technology (i.e., are they more likely to be male or female, and younger or older)?

2. In *What* type of trial are respondents most interested in participating: (i) as a driver of a partially automated vehicle, or (ii) as a passenger of AV public-transport or ride-sharing services?
3. *Where*, geographically, in Australia and NZ are residents most interested in participating in trials of AV technology?

Results

Of all respondents, 59.4% (n=3640/6133) were interested in participating in an AV trial as a driver, and 58.2% (n=3568/6133) as a passenger. Respondents most likely to express interest in participating in driver or passenger trials involving AVs were:

- Males rather than females for both driver (males: 68.1%, n=1947/2857, females: 51.7%, n=1688/3263, $X^2(1)=170.23$, $p<0.001$) and passenger (males: 65.7%, n=1876/2857, females: 51.6%, n=1684/3263, $X^2(1)=123.65$, $p<0.001$) trials
- Younger rather than older (driver: Spearman's rho correlation=-0.069, p<0.01; passenger: rho=-0.086, p<0.01)
- Residents of the ACT (driver: 67.9%, n=74/109; passenger: 70.6%, n=77/109) and inner metropolitan areas (driver: 65.9%, n=1158/1758; passenger: 66.7%, n=1173/1758) compared to other areas.

Educational attainment and self-reported early adoption of new technologies were also significantly related to interest in participating in both driver and passenger trials. Residents of the ACT and inner metropolitan areas were more likely to report higher levels of educational attainment and early adoption of new technologies compared to other areas. In part, these factors may explain our finding those in the ACT and inner metropolitan areas were most likely to express interest in participating in trials of AV technologies.

Conclusion

These findings are derived from the most recent iteration of the ADVI survey assessing public opinion and acceptance of AVs in Australia and NZ. Given the rapidly growing interest in the development of AV trialling protocols across both Australia and NZ, these findings are helpful in informing government, industry and academic stakeholders involved in establishing and facilitating these trials.

References

Anderson, J. M., Nidhi, K., Stanley, K. D., Sorensen, P., Samaras, C., & Oluwatola, O. A. (2014). Autonomous vehicle technology: A guide for policymakers. Rand Corporation. Santa Monica, California.

Bloomberg Philanthropies (2019) Is your city getting ready for AVs? This is a guide to who's doing what, where, and how. New York, USA. Retrieved from https://avsincities.bloomberg.org/

Eastlink (2017). Eastlink announces results of first annual Victorian self-driving vehicle survey. Melbourne, Australia. Retrieved from: https://www.eastlink.com.au/images/news/171009-EastLink-Announces-Results-of-First-Annual-Victorian-Self-Driving-Vehicle-Survey.pdf

Eastlink (2018). Results of 2018 Annual Victorian Self-Driving Car Survey. Melbourne, Australia. Retrieved from: https://www.eastlink.com.au/images/news/181120-Results-of-2018-Annual-Victorian-Self-Driving-Vehicle-Survey.pdf

Fagnant, D. J., & Kockelman, K. (2015). Preparing a nation for autonomous vehicles: opportunities, barriers and policy recommendations. *Transportation Research Part A: Policy and Practice, 77*, 167-181.

Flinders University (2018) FLEX takes to the streets. Adelaide, Australia. Retrieved from https://news.flinders.edu.au/blog/2018/06/19/autonomous-shuttle/

Pettigrew, S., Talati, Z., & Norman, R. (2018). The health benefits of autonomous vehicles: public awareness and receptivity in Australia. *Australian and New Zealand journal of public health, 42*(5), 480-483.

Schoettle, B., & Sivak, M. (2014). A survey of public opinion about autonomous and self-driving vehicles in the US, the UK, and Australia. Michigan, USA. Retrieved from: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/108384/103024.pdf

Regan M.A., Cunningham, M.L., Dixit, V., Horberry, T., Bender, A., Keeratunga, K. et al. (June, 2017) *Preliminary Findings from the first Australian National Survey of Public Opinion about Automated and Driverless Vehicles*. Adelaide, SA; The Australian Driverless Vehicle Initiative. ISBN: 978-1-876592-85-1

Royal Automobile Club (RAC) (2016). Autonomous vehicle survey 2016. Perth, Australia. Retrieved from: https://rac.com.au/-/media/files/rac-website/about-rac/community-programs/publications/reports/2016/autonomous-vehicles-survey.pdf

Royal Automobile Club (RAC) (2018) Australia's first on-demand, automated vehicle — the RAC Intellicar — arrives in Perth. Perth, Australia. Retrieved from https://rac.com.au/about-rac/media/media-releases/september-2018/australias-first-on-demand-automated-vehicle-the-rac-intellicar-arrives-in-perth

Accelerometer-based Safety Surrogate Measures

Selena A. Ledger[a], Anna Chevalier[a]

[a]Australian Road Research Board

Abstract

A literature review was conducted to identify telematics-detected accelerometer-based safety surrogate measures (SSMs) used in peer-reviewed, published road safety studies. Five types of SSMs were identified, including: longitudinal deceleration, longitudinal acceleration, lateral acceleration, jerk and yaw. Findings for each measure were categorised into those associated with crashes and near-crashes (CNCs) and/or incidents, and those used as SSMs. This presentation will describe these SSMs; discuss the aims, methodology and results of the literature review; and make recommendations for potential SSM definitions and thresholds, and methods for data validation and reduction for use in future on-road driving studies.

Introduction

Crash frequency and severity are direct measures of road safety (Tarko, Davis, Sunier, Sayed, & Washington, 2009), but are relatively 'rare' events. Due to sample size limitations, near-crashes are often analysed with crashes to assess road safety. However, identification of CNCs require long periods of driving and data collection using costly equipment and data reduction procedures (e.g. the use of video cameras requiring manual review of footage).

CNCs can be used to develop and validate SSMs, which have the advantage of allowing the evaluation of road safety at a reduced financial and time cost. However, no standards exist for researchers for definitions or minimum thresholds for telematics-detected, accelerometer-based SSMs. Therefore, the aim of this research was (i) to identify what accelerometer-based SSMs and associated thresholds have been used in peer-reviewed, published road safety studies, (ii) examine the validity of these SSMs and thresholds in identifying CNC, and (iii) make recommendations for potential outcome measures based on these findings.

Method

Relevant literature was identified through academic databases and search engines using key search terms. Papers were reviewed if they documented (i) the development and validation of accelerometer-based measures associated with CNCs and/or incidents, or (ii) the use of these measures as SSMs in road safety studies.

Results

Five types of SSMs were examined: longitudinal deceleration, longitudinal acceleration, lateral acceleration, jerk and yaw. Several studies used common datasets, with three naturalistic driving studies (NDS) datasets used in four or more individual studies. These included: the 100-Car Study (Dingus et al., 2006), the Teenage NDS (Simons-Morton et al., 2011), and the Second Strategic Highway Research Program NDS (Kluger et al., 2016).

Each type of accelerometer-based SSM and brief results of the literature review are described here:

Longitudinal deceleration and acceleration (measured on the x-axis) refer to movement in a straight line in either a forward or backward direction, and deceleration and acceleration refer to the rate of change of velocity (speed in a given direction) per unit of time. Thirty studies employed longitudinal deceleration measures with thresholds ranging from 0.10g to 0.75g. Nineteen studies employed longitudinal acceleration measures with thresholds ranging from 0.10g to 0.75g.

Lateral acceleration describes acceleration measured on the y-axis (sideways). Seventeen studies were reviewed which employed lateral acceleration measures with thresholds ranging from 0.30g to 0.75g

Jerk refers to the rate of change of acceleration or deceleration per unit of time. Nine studies employed various measures of jerk, including jerk deceleration, jerk acceleration, and peak-to-peak jerk.

Yaw refers to the oscillation (twisting) of the vehicle around a vertical axis (measured on the z-axis). When used as a kinematic threshold, the angle of rotation is specified within a defined timeframe. Twelve studies reviewed employed measures of yaw with a wide variety in the degree and rate of yaw thresholds.

Conclusion

Based on the findings of this literature review, we will present recommendations for thresholds for each type of accelerometer-based SSM to detect CNC. It is envisaged these recommendations will inform government, industry and academic stakeholders planning on-road driving studies, particularly in cases where large datasets are involved and video footage from participant vehicles may not be available.

References

Dingus, T. A., Klauer, S. G., Neale, V. L., Petersen, A., Lee, S. E., Sudweeks, J., ... & Bucher, C. (2006). The 100-Car Naturalistic Driving Study. Phase 2: Results of the 100-Car Field Experiment (No. FHWA-JPO-06-056). United States. Department of Transportation. National Highway Traffic Safety Administration.

Kluger, R., Smith, B. L., Park, H., & Dailey, D. J. (2016). Identification of safety-critical events using kinematic vehicle data and the discrete fourier transform. *Accident Analysis & Prevention, 96*, 162-168.

Simons-Morton, B. G., Ouimet, M. C., Zhang, Z., Klauer, S. E., Lee, S. E., Wang, J., ... & Dingus, T. A. (2011). The effect of passengers and risk-taking friends on risky driving and crashes/near crashes among novice teenagers. *Journal of Adolescent Health, 49*(6), 587-593.

Tarko, A. P., Davis, G., Saunier, N., Sayed, T., & Washington, S., (2009). Surrogate measures of safety. In *Safe Mobility: Challenges, Methodology and Solutions* (pp. 383-405). Emerald Publishing Limited.

Development of Road Safety Performance Indicators in NSW

Ralston Fernandes[a], Rae Fry[a], Antonietta Cavallo[a] & Bernard Carlon[a]

[a]Centre for Road Safety, Transport for NSW

Abstract

Setting evidence-based road safety targets relies on the development of safety performance indicators linked to trauma outcomes. The use of safety performance indicators is an internationally recognised approach to improving road safety management, and are now being developed in NSW. Safety performance indicators will assist in monitoring progress of road safety actions in the Road Safety Plan 2021 and focusing on the key drivers of road trauma so that priorities can be refocused if necessary. They can also assist strategic planning for future activities that will drive further trauma reductions beyond 2021.

Background

The 2018 provisional NSW road toll of 354 fatalities unfortunately remains above the target required to meet the State Priority Target of a 30 per cent reduction by 2021. The Road Safety Plan 2021 (the Plan), launched in February 2018, will deliver targeted and proven initiatives to address key trauma trends on NSW roads.

The Plan includes an action to set road safety targets to drive the investment strategy for the state network, including targets for the proportion of travel on four and five star roads, and the proportion of the road network with safety features. The Plan also commits to setting new road safety targets every 10 years. Setting evidence-based road safety targets relies on the development of safety performance indicators linked to trauma outcomes.

Issue

Most jurisdictions focus on outcome measures (e.g. fatalities) to indicate a level of road safety performance. However, this does not allow us to understand whether specific initiatives are having any impact in affecting trauma reductions. Focusing on intermediate measures of system performance (i.e. safety performance indicators) will address this issue, and has become an internationally recognised approach to improving road safety management. For example, Sweden has achieved one of the lowest fatality rates in the world through successful interventions which are guided by development and ongoing performance monitoring of safety performance indicators. Example indicators include proportion of vehicles with critical safety features, proportion of the road network with safety barriers, and proportion of motorists complying with speed limits.

Methods and Approach

The process to identify appropriate road safety performance indicators included:

- A review of current road safety performance and reporting measures in NSW
- A review of NSW crash data to determine the key drivers of road trauma
- A review of performance indicator models developed or proposed elsewhere
- An environmental scan of available research evidence to support specific road safety performance indicators
- Subject matter consultation across Transport for NSW and with key experts in this area

The following criteria were then considered in selecting a core set of indicators, based on best-practice:

- There should be scientific research evidence to support a relationship between each indicator and trauma outcomes
- Indicators should be readily measurable
- There should be a practical total number of top-line indicators that measure how well key elements of the transport system is operating in safety terms
- Each indicator should link to practical safety measures that need to be implemented to achieve the desired outcome

Findings and Implications

A core set of safety performance indicators are now being finalised for NSW. The proposed set of indicators is not intended to capture all areas of road safety activity. They are intended to:

- Provide a practical number of indicators for regular monitoring and reporting of progress against the Plan and beyond
- Focus attention on the key drivers of road trauma
- Help refocus priorities where needed to achieve reductions in road trauma
- Enable a better understanding of the how well the key elements of the system are operating
- Be able to be understood by stakeholders, the community and senior management

Measurement, collection and monitoring of performance indicator data for the selected factors will provide a means of measuring progress over time, alongside delivery of road safety actions and tracking of outcomes, so that priorities can be refocused if necessary. This will also support strategic planning of future activities to drive further trauma reductions toward zero.

Evaluation of the NSW older driver licensing reforms

Julie Thompson[a], Lisa Keay[b], Ralston Fernandes[a] & Rae Fry[a]

[a]Centre for Road Safety, Transport for NSW; [b]The George Institute for Global Health

Abstract

This evaluation assessed the impact of a set of licensing changes for older drivers that were implemented in NSW in 2008. These changes were designed to balance the safety of road users and the general community with the continuing independence and mobility of older drivers. The evaluation showed that, overall the changes did not negatively impact safety and were generally supported by older drivers and their family members and carers. Opportunities to enhance the current system were also identified.

Background

In November 2011, the Minister for Roads and Ports approved an Older Driver Taskforce to review the current NSW licensing arrangements for older drivers. The Taskforce made specific recommendations relating to the evaluation of changes to the older driver licensing system introduced in 2008.

2008 Older Driver Licensing Changes

In 2008, the following changes were made to the licensing system in NSW for drivers aged 75 years and over, to balance the safety of all road users with the continuing mobility of older drivers:

- The commencement age for annual medical assessment for driving was reduced from age 80 to age 75 years.
- A modified licence option with distance-based restrictions was introduced for drivers from age 85 years, as an alternative to undertaking an on-road driving assessment.
- The frequency of the on-road driving assessment for drivers 85 years and over was reduced from annually to biennially.
- The design of the on-road driving assessment for drivers aged 85 years and over was changed, from a ‘full’ driving test to an assessment of safe driving ability.
- The option was introduced to undertake the on-road driving assessment with an accredited driving instructor.

Methods and Approach

Evaluation of the 2008 changes included:

- Estimation of crash rates per licensed driver for all drivers aged 65 years and older between 2005 and 2014, by age group.
- Comparison of licensing status before and after the changes for a cohort of older drivers between 2005 and 2014.
- Focus groups with current older drivers or those who had recently given up driving, and separately with family members or carers (n=49).
- Interviews with key stakeholders including clinicians, policy-makers, and driver trainers and assessors (n=25).

- Two state-wide telephone surveys: one with older and recently retired drivers (n=608), the other with 602 family members or carers of older drivers (n=602).

Findings and Implications

The evaluation found:

- While no change in crash rate for older drivers could be linked to the reforms, there was a gradual decline in crash rate per licensed older driver between 2005 and 2014.
- The crash rate for drivers 85 years or over with a modified licence was 18% lower than the rate for drivers in this age group with a full licence (adjusted rate ratio 0.82, 95% CI=0.73-0.91). While this may be due to reduced exposure among modified licence holders, total driving was not measured for the evaluation. After the 2008 changes, uptake of modified licences increased to 11% of drivers in this age group (compared to 2% pre-reforms).
- Driving was seen by older people as important to maintaining quality of life because it helps maintain mobility, independence and social connectedness. Opportunities to enhance the current system were identified, including improved information about alternative transport options for older people.
- The changes were generally well supported by older drivers and their family members and carers. For example, 90% of older drivers and 88% of family members/carers surveyed agreed the on-road driving test from 85 years was fair.

Data exploration and visualisation of crash risk at Perth Metropolitan Intersections

Fritha Argus[a], Alex Price[a], Ryszard Gorell[b], Hayley Lajszczak[a]

[a]Main Roads Western Australia, [b]GHD

Abstract

An issue facing all road agencies is ensuring lives saved per dollars invested are maximised. This is particularly challenging at metropolitan intersections, where strategic investment choices range between a small number of targeted high-cost treatments and a large number low-cost treatments applied across all metropolitan intersections that share similar characteristics.

In order to investigate the above, data exploration and analytics were used to provide insights into the viability of alternative treatment programs. Data visualisation was used to help communicate the data story, which improved understanding and acceptance by our stakeholders and decision makers.

Background

Over 16,500 people were injured as a result of crashes at Perth metropolitan intersections over the past 5 years (2013-2017), resulting in almost $3 billion dollars in associated injury costs. Nearly 50% of all casualty crashes in Western Australia occurred at metropolitan intersections. Main Roads Western Australia receives on average $5million per annum to invest at high-risk intersections in the Perth metropolitan region. Heretofore this has been focused on intersections with the highest numbers of killed or serious injury crashes. This has generally resulted in treating one or two intersections per year as the only viable treatment for these intersections is often major capital works (e.g. grade separation). However, is this the best approach to maximise lives saved? Could we treat more intersections with lower cost treatments and save more lives per dollars invested?

Method

A common issue that faces all agencies is ensuring data is clean and formatted in such a way to enable exploration and analytics which can result in meaningful insights. Main Roads stores data on all crashes that occur on the WA road network and inventory data on all state assets and some information on local government assets. Through extensive consultation with subject matter experts, information held by these individuals was transformed into usable data. System data (i.e. crash and inventory) and information obtained from subject matter experts was combined to result in a comprehensive set of data tables that was ready for exploration and analysis.

Our approach to developing a low cost treatment program had to be data driven due to the complexity of assessing and applying treatments to intersections on a large scale. We developed a data model that mapped the relationship between crashes at intersections, treatment eligibility at specific intersections and the estimated crash reduction effect of these treatments. We used a data visualisation tool, namely Power BI, to enable the presentation of the data model to stakeholders.

We presented this data visualisation at stakeholder workshops with a focus on demonstrating 1) crash problems at intersections, 2) the performance of the existing funding program and 3) the cost and safety benefits of different low cost treatments options across the Metropolitan network. In this way, we were able to enhance understanding and acceptance from important stakeholders early on, and throughout the process.

Conclusion

Maximising lives saved for dollars spent is an important issue that faces all road agencies, which is becoming increasingly more important with limited funds and competing priorities. Therefore, ensuring that available data is prepared in a suitable manner to allow for data exploration and the teasing out of insights is an important yet often overlooked step in using data for decision making. Furthermore, being able to visualise and present data to stakeholders and decision makers is an important step to ensuring their understanding and ultimately their approval of any new targeted programming.

Implementing a Learner Driver Mentor Program in a Local Government Area - Y Drive

Zoe Morgan
Eurobodalla Shire Council, NSW, Australia

Abstract

The Y Drive project is a community development project that assists young people reach the required 120 hours driving experience nescessary to achieve their ‘P’ plate licence. The program is aimed at disadvantaged young people who are homeless, Aboriginal, or have no licensed parent or family/carers with a car.

Through volunteer mentor support young people are taught to drive correctly, improving road safety, confidence and breaking the cycle of disadvantage with less unlicensed drivers on the road. It also improves life chances by providing connection to work, study and community.

Background

In 2017, Harrington and Callaghan (2017) wrote a needs analysis for the development of a Learner Driver Mentor Project in the Eurobodalla. Their paper concluded that Euroboalla with its high levels of socio economic disadvantage (ESC Community profile, 2018) would benefit from such a program.

The Department of Premier and Cabinet provided funds to assist Eurobodalla Shire Council establish a pilot project in 2017/18. This project successfully achieved its objectives (ESC 2017) and as a result further funding was sourced from the Department of Justice Community Safety Fund to run an extended project for 18 months.

Method

The pilot project ran for 12 months, on a minimal budget of $20,000 which funded a day’s wages. However, more hours were required so Council released the project officer from other work to allow time to manage the project. Youth Safe (2012) resources provided guidance for the development of the project and Council’s established volunteer engagement pathways (ESC, 2019), community networks and the communications team created awareness of the project.

The call for volunteer mentors resulted in over 30 registrations and a car was donated by a local car retailer which was branded with business partners. The steering committee identified 40 young people as potential participants. These were vetted down to 12 participants who committed to 120 hours of supervised driving time.

Of these, five completed the program and successfully gained their ’P’s in the 12 months and the remaining five were carried over to the next project. Additionally to the mentor instruction all learners undertook three professional driving lessons and participated in the Safer Driver (2017) program.

The second project received funding from Department of Justice which enabled employment of a project officer three days a week to support 30 young people, the purchase of resources and a second vehicle. The mentors from the pilot project willingly commited to mentoring the new recruits. Both vehicles were abosrbed into Council's car pool which ensured maintenace, insurance and running costs were accurate. The project is still in progress with additional programs including 'Y check' (a car maintenance program run by Council mechanics at Council depot) and 'Y budget' (how to save for a car) being added to the project to further develop young people's skills.

Results

Table 1. Y-drive participant results and post project achievements

	Pilot Project (12 month project)	Y drive (18 month project - 6 months in)
Project target numbers	12	30
Actual number of learners	10	29
Did not engage with program	2	2
Registered over 100 hours driving	4	15
Number to pass P plates	5	11
Number of mentors	10	21
Hours driven	479 hours	545 hours
Km's driven	21,697 kms	25,818 kms
Attended Y Check	N/A	16
Number of professional driving lessons and courses attended	30	66
Achievements post P's		
First person in family to get a licence	1	
Attending study	1	1
Got a job	5	4
Got their first vehicle	6	7
Green P's	1 particpant	
Drives child to child care	1	

Conclusion

Housing the project in a local government area has many benefits including flexiblity of staffing arrangements; capacity to back fill when staff are away; established systems and procedures in place for volunteers; vehicle maintenance; well established communication pathways and thorough accounting and auditing procedures.

Other critical elements of a successful project include: establishing consistent routine weekly driving schedules; highlighting the commitment required to achieve goals through strong guidelines and communication channels; engaging the right people; flexible work hours to cover calls 24/7; allowing time for participants to attain 120 supervised driving hours; and setting a benchmark of a 70% success rate to allow for unforseeable events that arise with young people from disadvantaged backgrounds.

References

Harrington, B., Callaghan, J. 2017. A needs analysis and program structure for a Learner Driver Mentor program in Eurobodalla. University of Canberra.

Centre for Road Safety. (2015). Younger drivers: national graduated licensing scheme. Retrieved from: http://roadsafety.transport.nsw.gov.au/research/gls/index.html

Eurobodalla Shire Council. (n.d.). Community Profile Statistics. Retrieved from: http://www.esc.nsw.gov.au/living-in/about/community-profile-and-population-forecasts

Eurobodalla Shire Council. (ESC) 2017 IAS Performance Report. Project ID 4-4R3AU8G. Department of Prime Minister and Cabinet.

Eurobodalla Shire Council. (ESC) 2019 Volunteer Induction Handbook. Eurobodalla Shire Council.

Proactive Safer Driver 2017 Safer Driver Course. Retrieved from: https://www.proactivesaferdriving.com.au

Youthsafe. (2012). Tool kit or developing learner driver mentor programs. Retrieved from https://youthsafe.org

Using Random Forest to Test If Two-Wheeler Experience Affects Driver Behavior When Interacting With Two-Wheelers

Mohammed Elhenawy[a], Gregoire S. Larue[a], Andry Rakotonirainy[a], and Narelle Haworth[a]

[a]Centre for Accident Research and Road Safety-Queensland (CARRS-Q), Queensland University of Technology

Abstract

Drivers are often at-fault in collisions with powered and unpowered Two-Wheelers (TW). In this paper, we propose a framework based on the random forest algorithm to investigate whether TW experience influences driver interactions with TWs. Sixty-nine drivers completed a 10-minute driving simulator session which included five interactions based on common car-TW crash types. The TWs were initially positioned in front of, or at right angles to, the driven vehicle. The proposed framework detected a statistically significant difference between drivers with TW experience and those without despite the small sample size.

Background

Failure to give way by motor vehicles is a factor in many serious collisions with both powered and unpowered two wheelers (TWs). Motor vehicle drivers often report that they did not see the TW, but research has shown that motor vehicle drivers who have experience riding a motorcycle are less likely to be involved in motorcycle crashes or be at fault (Brooks & Guppy, 1990; Magazzu et al., 2006). It is not known whether bicycle riding experience has the same protective effect. The research reported here examines whether this phenomenon extends to all types of TW experience.

Method

A total of 69 participants with car-only (n=19), car plus motorcycle (n=18), car plus bicycle(n=15), and car plus bicycle plus motorcycle (n=17) experience (later categorised as Car-only and TW-experienced) completed a 10-minute session in the CARRS-Q advanced driving simulator. The driving scenario comprised an Australian urban setting which included five interactions based on common car-TW crash types.

Framework

We defined an interaction period (IP), which covers the driver interaction between the TW. Several measures of speed and time to collision (TTC) were calculated within the IP as shown in Table 1.

Table 1: Measures applied to create features

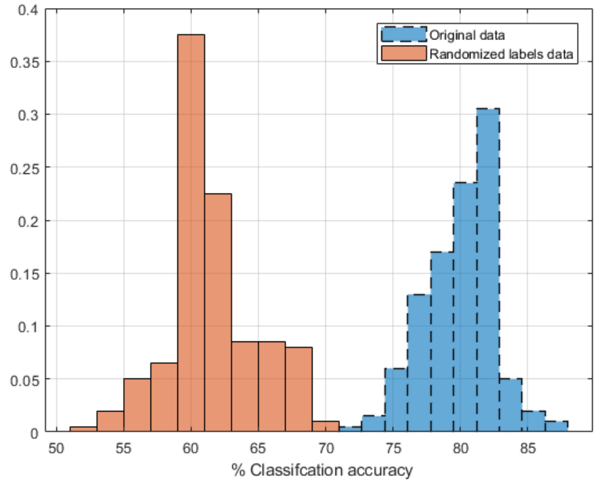
Measure	Measure
min(diff(driven car speed))	min(diff(TTC))
max(diff(driven car speed))	max(diff(TTC))
mean(diff(driven car speed))	mean(diff(TTC))
Standard deviation of (diff(driven car speed))	Standard deviation of(diff(TTC))
mean(driven car speed)	mean(TTC)
Standard deviation of (driven car speed)	Standard deviation of(TTC)

*diff is the first difference function

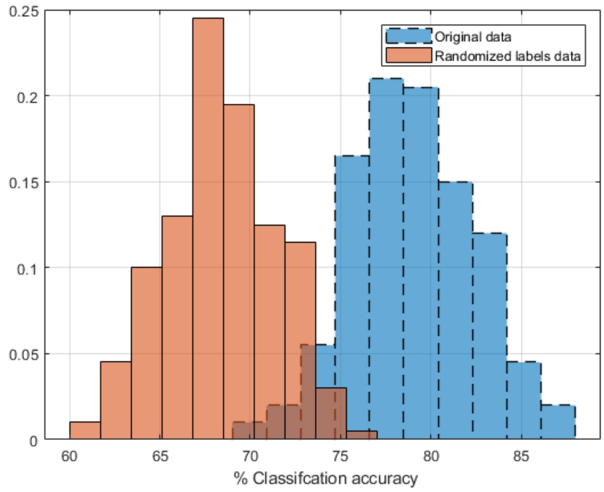
In this paper, we test the null hypothesis that TW experience does not influence drivers when interacting with a TW. The sample size is small, making it difficult to detect any differences between the two groups of drivers using traditional statistical tests. Therefore, we used the random forest algorithm to train a classifier that predicts whether drivers have TW experience based on the measures of TTC and driven car speed extracted from the IP. This tests the association of the assigned driver's labels $y \in \{1,2\}$ based on their riding experience with one type of two-wheeler and the values of the measures vectors x observed inside the IP. Evidence exists of an association between x and y if the multi-dimensional distribution of x differs between the driver categories. In other words, if the x has discriminative power to classify the two driver categories then we can obtain a classifier that has classification accuracy greater than the one trained using the same dataset but with randomly permuted labels.

Result and conclusion

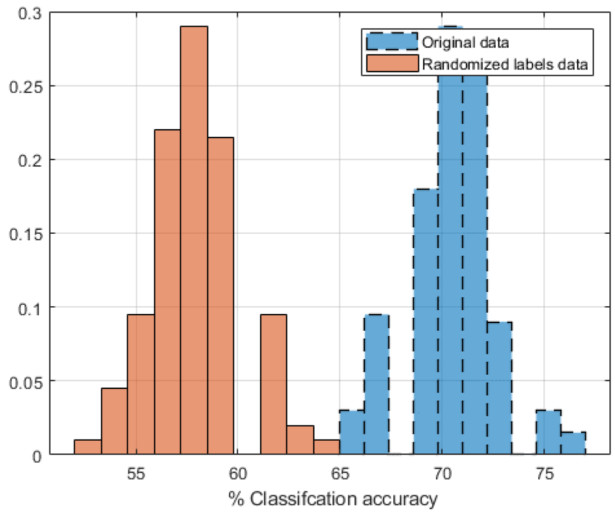
The proposed framework was used to test the null hypotheses for each interaction separately. Figure 1 demonstrates the clear separations between classification histograms for the original data and the permuted data for each interaction. Moreover, the p-value of the two-sample t-test of each interaction is < 0.0001. These results show the features, which are extracted from the speed and TTC within the IP, can discriminate between drivers with and without TW experience. Therefore, we conclude that TW experience influences drivers' interactions with TWs.



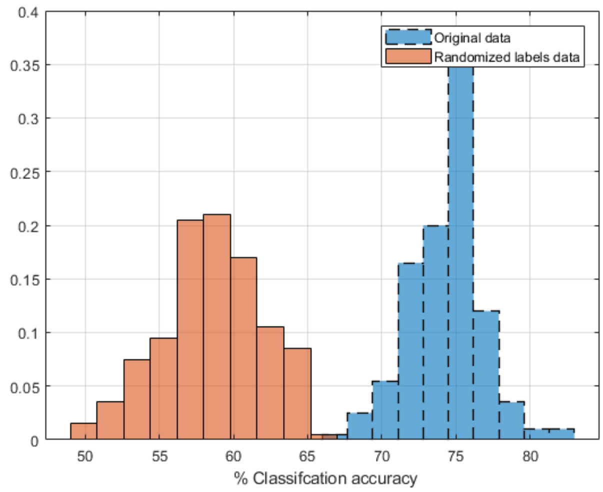
(a) Interaction 1 - driver turns right across the bicycle's path of travel



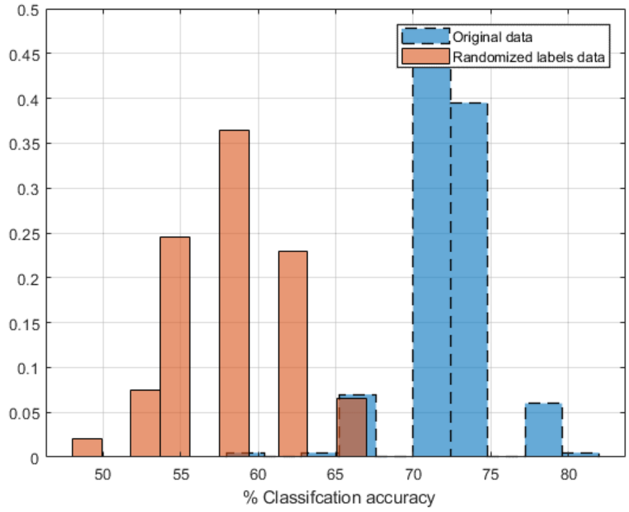
(b) Interaction 2 - driver turns right across the motorcycle's path of travel at an unsignalised intersection



(c) Interaction 3 – driver enters roundabout on which motorcycle was travelling



(d) Interaction 4 - driver enters roundabout on which cyclist was travelling



(e) Interaction 5 - driver turns left to exit from roundabout with cyclist travelling in the left lane

Figure 1. The classification accuracy histogram of the original data and the permuted data

Data collection was funded by an NRMA-ACT Road Safety Trust Grant entitled "Understanding interactions between Two Wheelers (TW) and car drivers in a driving simulator"

References

Brooks, P. & Guppy, A. (1990). Driver Awareness and Motorcycle Accidents. *Proceedings of the International Motorcycle Safety Conference, 2(10)*, 27–56.

Magazzu, D., Comelli, M. & Marinoni, A. (2006). Are car drivers holding a motorcycle licence less responsible for motorcycle–car crash occurrence? A non-parametric approach. *Accident Analysis and Prevention*, *38*, 365–370.

Where Should We Focus For Road Safety Improvement? Case Study Of a Pedestrian Crash Investigation Using Socio-technical Approach In Bangladesh

S Hasanat-E-Rabbi[a], M S Hoque[b], J Akter[a], R C McIlroy[c], K A Plant[c], N A Stanton[c]

[a] Accident Research Institute (ARI), Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

[b] Department of Civil Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

[c] Transportation Research Group, University of Southampton, Highfield, Southampton, SO51 7JH, UK

Abstract

Pedestrians, the most vulnerable road user group in road-transport system, are over-represented (about 49%) in road fatalities in Bangladesh. In traditional approaches to road crash investigations, only drivers' speeding and recklessness have been identified as the causes of road crashes. Some other factors e.g. poor road design, vehicle body modification etc. have also been ascertained as secondary causes in small number of investigations by local road safety experts. In this study, a socio-technical systems approach has been employed to investigate a pedestrian crash occurred in Dhaka with an aim to unveil the other factors at higher levels of the road safety system.

Background

Due to attributing 'over-speeding and reckless driving' as causes of road crashes - an almost constant outcome of traditional crash investigations in Bangladesh - the focus usually goes to fining drivers, along with some awareness programs for road safety improvement; however, many other factors responsible for those incidents remain untouched. Having both 'social' and 'technical' elements, the road transport system can be expressed as 'socio-technical' system (Walker et al., 2008) and investigation of accidents within such systems can be explored using Rasmussen's (1997) Risk Management Framework (see McIlroy et al., 2019). Aiming at identifying the contributing other factors, in this study we applied the extension of Rasmussen's AcciMap approach (Parnell et al., 2017), a method that provides graphical representations of accidents that can be used to identify the cause-consequence flow of actions of various actors within a complex socio-technical system.

The said crash occurred in May 2018 on a weekday. An older pedestrian (> 60 years) was hit by a bus while he was crossing a very busy intersection was severely injured. Police arrested the driver and he had been jailed after trial. This pedestrian crash was selected for investigation using AcciMap as this type of incident (crash during road crossing and driver jailed) is very common in Bangladesh except the relatively higher age of pedestrian.

Method

First, we developed an ActorMap. This incorporates all the relevant actors (organizations) in seven different levels, from end user and equipment at the bottom, to national committees at the top. In the second step, the specific actions performed by those identified actors were incorporated in order to produce an AcciMap. The relevant information came from CCTV footage, personal interview with the driver, the bus owner, the victim, local police staff and relevant stakeholders. The information related to driver license, vehicle route permit etc. had been verified by the licensing authority (Bangladesh Road Transport Authority- BRTA).The developed AcciMap framework is presented in Figure 1. Analysis started from the bottom and propagated to the top of the system.

Results

At the environment and equipment level, there are several factors contributing to the crash. For example, at the incident spot there were no Work Zone Safety (WZS) measures despite on-going road improvement works. Due to the lack of designated crossing facilities the victim of this crash was crossing even though the signal for vehicle was green. Poor geometric road configuration led other vehicle drivers to push the said bus to the right in order to accommodate themselves within the lane and ultimately the bus hit the pedestrian.

At the end user level, it was found that the bus driver was driving heavy vehicle with license issued for light vehicles. The owner of the bus was unaware of this. Moreover, the driver was driving along the wrong route. All these illustrate the weaknesses of regulatory authorities i.e., Police and BRTA. Additionally, the bus driver's poor knowledge regarding traffic sign-marking reflects the inefficient driving license issuing system maintained by BRTA. Dhaka Transport Coordination Authority (DTCA) had insufficient monitoring system to check whether the consultants and contractors took any WZS measures.

Inefficient coordination and monitoring system was found as the common deficiency at the central government and national committee level which made the organizations at lower level non-answerable to their duties.

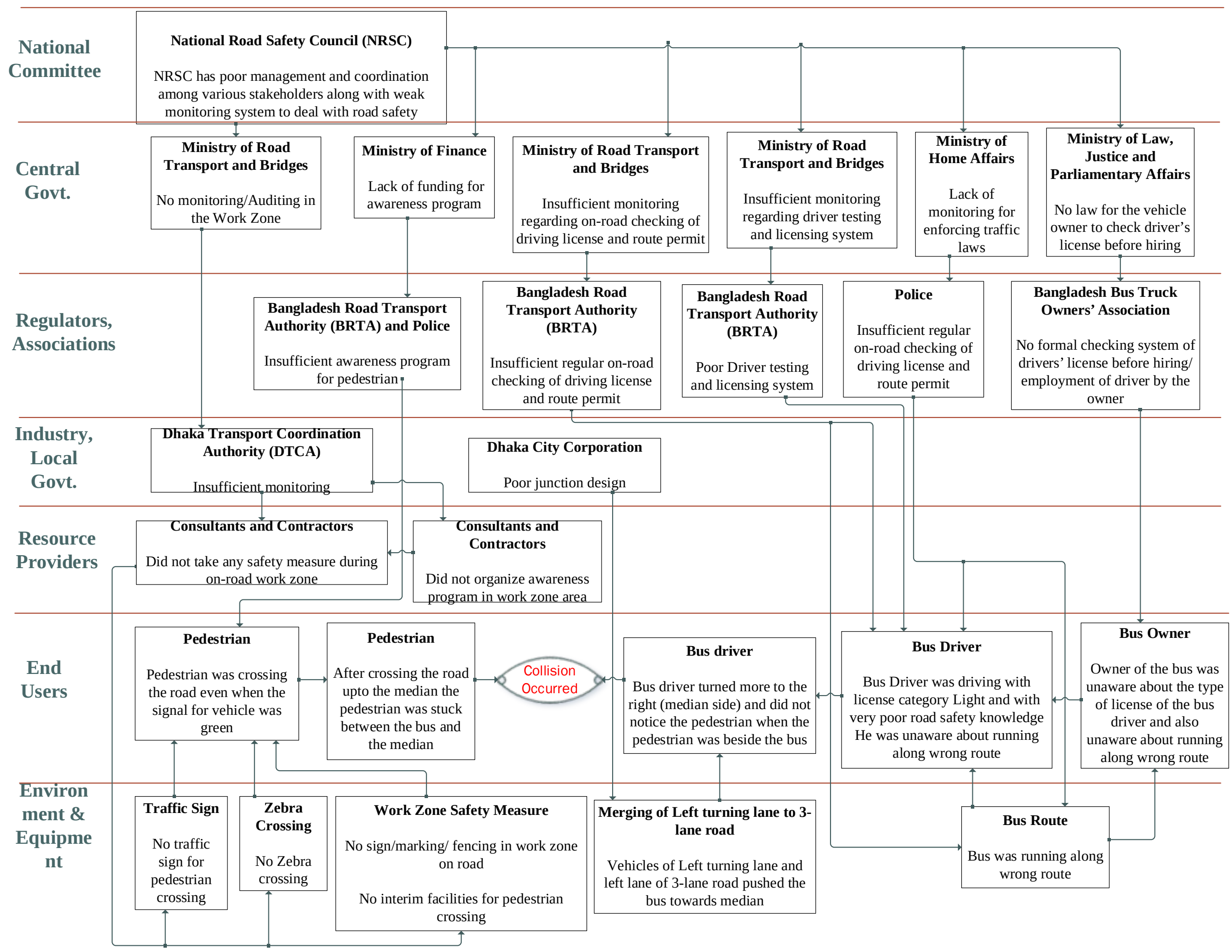


Figure 1.AcciMap representing the various interrelated factors contributing to the said pedestrian crash

Conclusions

Despite some limitations (e.g. pedestrian age along with his perception and attitudes towards risky crossing could have played a role, however, we could not infer anything as detailed information was not available), the Accimap analysis revealed that various authorities at the upper level and road environment as well as end users (e.g. driver, pedestrian) at lower level had played a significant role in this crash causation. Some may argue that road safety practitioners are doing work at different levels of the system to guarantee pedestrian safety. However, they usually work at individual levels (lower levels of the system), and very rarely work across levels. This highlights the importance of connections, or vertical integration, and the need to change the mentality towards blame. Therefore, aside from blaming drivers alone we should focus more on system (organizational interconnectedness) reformation and system management.

Acknowledgments

This research was commissioned by the National Institute for Health Research using Official Development Assistance (ODA) funding. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, or the Department of Health and Social Care.

References

McIlroy R.C., Plant K.A., Hoque M.S., Jianping W., Kokwaro G.O., Vũ N.H., Stanton N.A., 2018. Who is responsible for global road safety? A cross-cultural comparison of Actor Maps. Accident Analysis and Prevention, 122 (2019) 8–18

Parnell, K.J., Stanton, N.A., Plant, K.L.. 2017. What's the law got to do with it? Legislation regarding in-vehicle technology use and its impact on driver distraction. Accident Analysis and Prevention, 100 (2017) p1-14.

Rasmussen, J., 1997. Risk management in a dynamic society: A modelling problem. SafetyScience 27, 183–213.

Walker, G.H., Stanton, N.A., Salmon, P.M., Jenkins, D.P., 2008. A review of sociotechnicalsystems theory: a classic concept for new command and control paradigms.Theoretical Issues in Ergonomics Science 9, 479–499.

ISO 39001:2012 – Road traffic safety (RTS) management systems – Requirements with guidance for use

Mr. Peter Hartzell

SIS, Swedish Standards Institute, Sweden

Abstract

ISO/TC 241 has developed ISO 39001:2012, which is an important and integral part of the work of the United Nations Road Safety Collaboration/UNRSC and Decade of Action for Road Safety 2011-2020. Reference will be made to parts of ISO 39001 – for information, clarification, purpose and application. Examples of good practice of ISO 39001 will be presented. ISO 39001 is designed to work on its own, parallel or integrated with other ISO MSS, management system standards, in any size or type of private or public organization, to develop a structured and effective Road Traffic Safety/RTS system to save lives.

ISO 39001 – Road traffic safety management system standard

ISO/TC 241 has over 50 member countries (both developed and developing countries) and 20 international liaison organizations, including the World Bank and the World Health Organization.

ISO 39001:2012 specifies requirements for a road traffic safety (RTS) management system to enable an organization that interacts with the road traffic system to reduce, and ultimately eliminate, the incidence and risk of death and serious injuries related to road traffic crashes which it can influence. This focus can also result in a more cost-effective use of the road traffic system.

The requirements in ISO 39001:2012 include development and implementation of an appropriate RTS policy, development of RTS objectives and action plans, which take into account legal and other requirements to which the organization subscribes, and information about elements and criteria related to RTS that the organization identifies as those which it can control and those which it can influence.

The international standard ISO 39001 is applicable to any organization, public and private, regardless of size and product or service provided, that wishes to

- improve RTS performance;
- establish, implement, maintain and improve an RTS management system;
- assure itself of conformity with its stated RTS policy; and
- demonstrate conformity with this International Standard.

ISO 39001 identifies elements of good RTS management practice that will enable the organization to achieve its desired RTS results.

It can be used by internal and external parties, including certification bodies, to assess the organization's ability to meet the requirements.

International experience has shown that a decrease in death and serious injury can be achieved through the adoption of a holistic Safe System approach to RTS, with a focus on RTS results and evidence-based actions, supported by appropriate organizational management capacity.

Government cannot achieve these reductions alone. Organizations of all types and sizes, as well as individual road users, have a role to play. By adopting this International Standard, organizations should be able to achieve RTS results at levels that exceed what can be achieved through compliance with laws and standards alone, and, at the same time, contribute to the achievement of societal goals.

The management system specified in this International Standard focuses the organization on its RTS objectives and RTS targets and guides the planning of activities that will realize these goals by using a Safe System approach to RTS. Annex B in ISO 39001 describes categories of RTS results, the Safe System approach and a framework for good practice RTS management and shows how they can be aligned with this International Standard.

Annex A in ISO 39001 provides guidance on the implementation of this International Standard.

ISO 39001 can be integrated into, or made compatible with, other management systems (see also Annex C) and processes within the organization.

ISO 39001 promotes the use of an iterative (Plan-Do-Check-Act) process approach that will guide the organization towards delivery of the RTS results.

ISO 39002 – Good practices for implementing commuting safety management

The guidance standard ISO 39002 is under development by ISO/TC 241.

Peter Hartzell
Project Manager

Secretary
Secretariat ISO/TC 241 - Road Traffic Safety Management Systems
Department of Standardization
Direct: +46 8 555 520 29
Mobile: +46 707 64 56 99

SIS, Swedish Standards Institute
Box 45443
SE-104 31 Stockholm

Applying safe systems and increasing stakeholder engagement in a community speed education program in Local Government

Joanne Wilson-Ridley[a], Thomas Hogg[a], Edward Rzesnicki[a]

[a]Queanbeyan-Palerang Regional Council (QPRC)

Abstract

Analysis of crash data for QPRC network from 2013-2017 identified speed as the top contributing crash factor in 30.9% casualty crashes. QPRC revitalized its speed education program in 2016. A methodical and evidence-based process was adopted for site identifications for courtesy speed checks, a regime of data collection was deployed to evaluate the results and safe systems reviews were implemented for assessing and treating speed locations. Results consistently achieved reductions in 85th speed percentiles on urban roads with the program expanding to country roads. Increased community engagement has been noted along with enhanced involvement of local stakeholders including NSW Police.

Background

QPRC covers 5,319 km² including 1,059km sealed road and 752km unsealed roads. The CBD is a concentrated urban area (175 km²) with Council's roads majority in country areas. Crash analysis identified speed as top crash factor in 30.9% casualty crashes. Further analysis highlighted speed as a significant factor in FSI crashes contributing to 38.9%. Where FSI crash occurred on LG country roads speed was present in 59% of crashes.

Speed is the compelling road safety reason residents contact Council. Requests to address speeding with enforcement, speed humps and speed reductions are commonly received.

In 2015 Council's Size-B VMS trailer broke. Council used this opportunity to revitalise its speed program implementing an evidence-based safe systems approach with a new Size-C VMS trailer. Adopting a targeted process enabled Council to maximise it's efforts in addressing speeding on local roads. Collecting meaningful data for evaluating impact has lead to enhanced education with residents and increased sharing of important speed data with NSW Police. With the improved campaign achieving consistent reductions in 85th speeds over two-year period Council applied for funding to expand the progrom with a second VMS trailer. Council is now extending the speed program to country roads where speed's a significant presence in nearly 60% of FSI crashes.

Method

Sites were selected considering traffic counter results, speed crash history, known roads for speeding, road hierarchy, traffic volumes and community requests. Traffic data was collected for every speed site prior to deployment. VMS deployment was scheduled to maximize impact considering other causal factors such as school holiday speeding, commuter traffic, school zone traffic, time of year for crash history or environment impacts such roads experiencing large animal activity. Every site was inspected for trailer suitability and road crash history was reviewed to maximize location positioning. All sites had a safe systems assessment to identify possible treatments in other safe systems pillars.

Results

Between October 2016-December 2018 the VMS trailer had 29 deployments to 26 locations. All sites achieved a reduction in the 85th speed percentile from 3km/h up to 12km/h. On average 5-6km/h reductions were achieved at deployed sites. Reductions were also achieved for the percentage of vehicles exceeding the speed limit from 15% with some sites achieving 40-50% reductions. While most sites featured one deployment one site featured three deployments for successive school holiday periods. It saw an increased reduction on each deployment indicating an accumulative impact and benefit of repeat deployment. Safe Systems reviews resulted in additional speed treatments such as blackspot application, speed zone reviews, adjustment to traffic light phasing, give-way sign upgrades to stop-signs and installation of stop signs to improve intersection safety.

Conclusions

QPRC's community embraced the speed program lodging increasing requests for site locations. NSW Police are involved coordinating taskings and providing site suggestions. With the speed program's methodology and results proven for urban streets Council is expanding the program to rural areas and engaging with rural communities to tackle the significant road trauma from speeding on Council's country roads.

Table 1. Analysing speed as a contributing crash factor in QPRC crashes from 2013-2017

Severity Crash Type	**All Crashes**	**Number of crashes with speed as a contributing factor**	**Percentage of crashes with**
All crashes	1055	301	28.5%
Casualty crashes	618	191	30..9%
Fatal & Serious Injury (FSI) Only	93	37	39.8%
Fatality and Serious Injury Crashes (FSI) on just country and state road	62	34	54.8%
Fatality and Serious Injury Crashes (FSI) on local country roads	32	19	59%

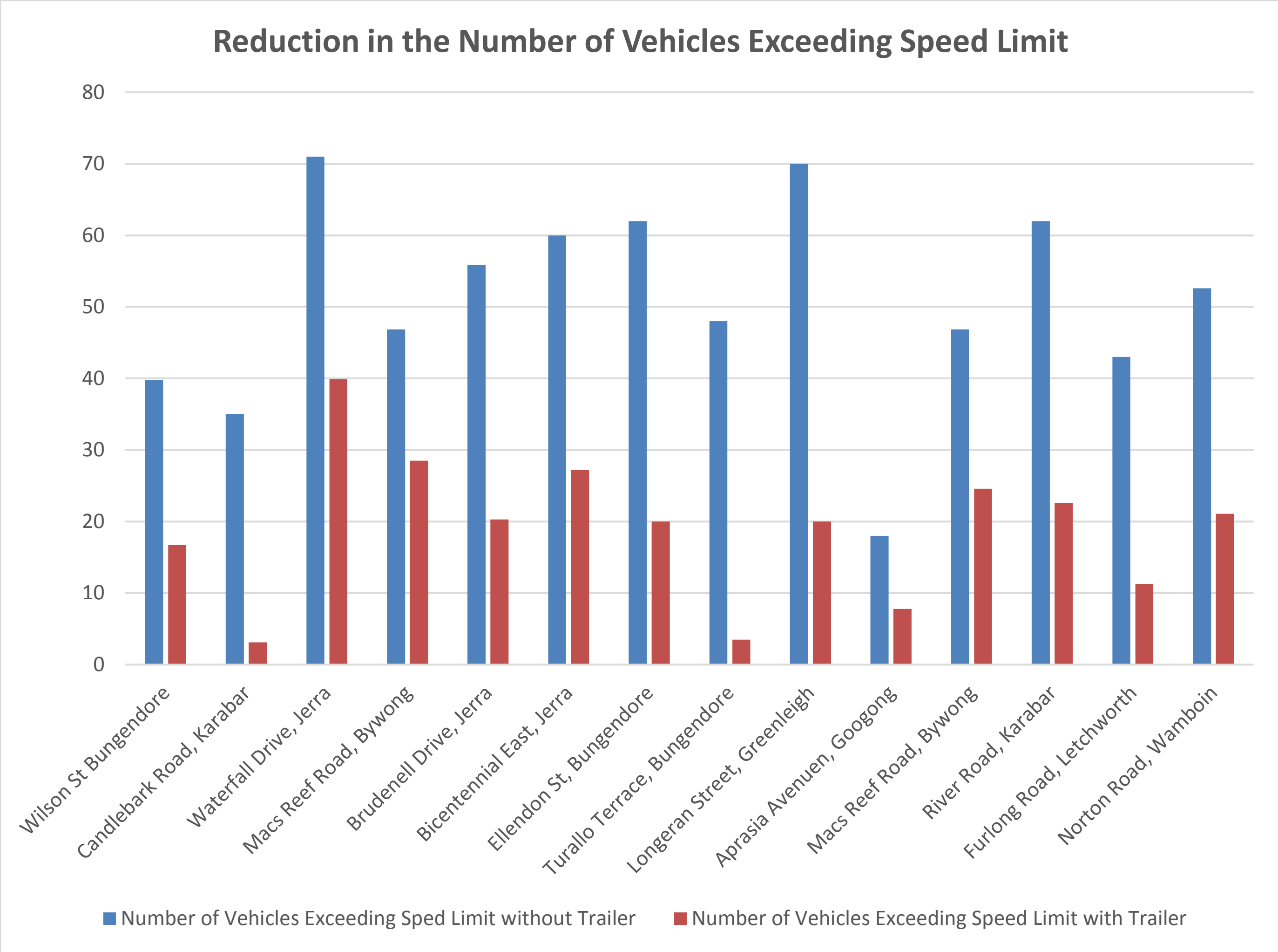


Figure 1. Reduction Results in Number of Vehicles Exceeding Speed Limit

References

Transport for NSW Crash Data – Detailed Crash Report for QPRC from 2013-2017.

Planning for motorcycling – A strategy to manage motorcycle risk on the West Coast of New Zealand

Marcus Brown[a], David Scarlet[b], Andrew Crofts[b] and Ben Zmijewski[a]

[a]Beca Ltd, [b]New Zealand Transport Agency

Abstract

The relative scarcity of motorcycle crashes can result in limited sample size on which to base decisions. This can lead to use of limited or outdated historic information and over focussing of effort on random incidents and locations. By reviewing motorcycle crash records, site features, rider feedback and asset management data it is possible to identify combinations of common underlying risk characteristics for route screening. By interrogating route-wide asset data, a risk-based treatment strategy comprising of a combination of reactive and proactive locations and treatments were determined.

Strategic context

Nationally between 2008-2017 there were 481 deaths and 4387 serious injuries involving motorcycles & mopeds. Deaths and serious injuries involving motorcyclists in New Zealand are disproportionate to the distance travelled, with the risk of being killed or seriously injured around 18 times higher than that of car drivers[1]. Motorcyclist safety is identified as a core road safety focus in the NZ Government's Safer Journeys Action Plan[2].

Project Background

SH6 is a scenic route on the west coast of New Zealand's South Island which includes mountainous and coastal terrain making it an attractive touring route for motorcyclists. The route is characterised by its curvilinear alignment, limited shoulder width, poor sight distance and unforgiving roadsides which include steep drop offs and rock walls. During the period 2008-2017 there were 102 crashes recorded of which 8 were fatal and 42 were serious on the 536km study length. Of these just 14% had a previous injury crash recorded at the same location within the previous 5 years. This means that by solely focusing on discreet crash locations using traditional crash density or blackspot mapping, underlying infrastructure risks may not be identified.

Methodology

Detailed review of motorcycle crash records, site features, rider feedback and asset management data were analysed to identify common characteristics featuring at crash sites. Review of the crash data showed almost half of the motorcycle crashes involved cornering in 100km/h speed zones and of these 64% occurred on curves with 45% occurring on moderate & severe curves. Common issues identified included surface condition (surface flushing, loose material/rockfall on the road, surface water, rutting and surface changes in the braking zone), poor forward sight distance and limited or no sealed shoulder.

Information from the Road Asset Maintenance & Management database was interrogated to identify features which were related to the risks identified. Overall 6 underlying characteristics were determined that featured highly in the data that had a high correlation with motorcycle crashes on SH6. These were mapped in GIS to enable spatial review of the various risk data. By interrogating network data, further locations were determined that exhibited common risks and could be reconciled into tangible route lengths for further evaluation and site inspection.

A programme of works was prepared which included remedial measures at sites and route sections with deficiencies. This included sites with both a history of crashes, and also at sites designated as having an elevated high potential for future motorcycle crashes based on the risk mapping.

Conclusion

The use of asset management data can be effectively used to supplement crash data and be used to proactively identify sites and routes with a high potential risk of motorcycle crashes. These in turn can be used to develop a programme of sites for further investigation. The resultant risk mapping can be used to inform the overarching motorcycle safety strategy and improvement projects, raise awareness of network risks and influence incremental improvements that can be administered through routine maintenance activities.

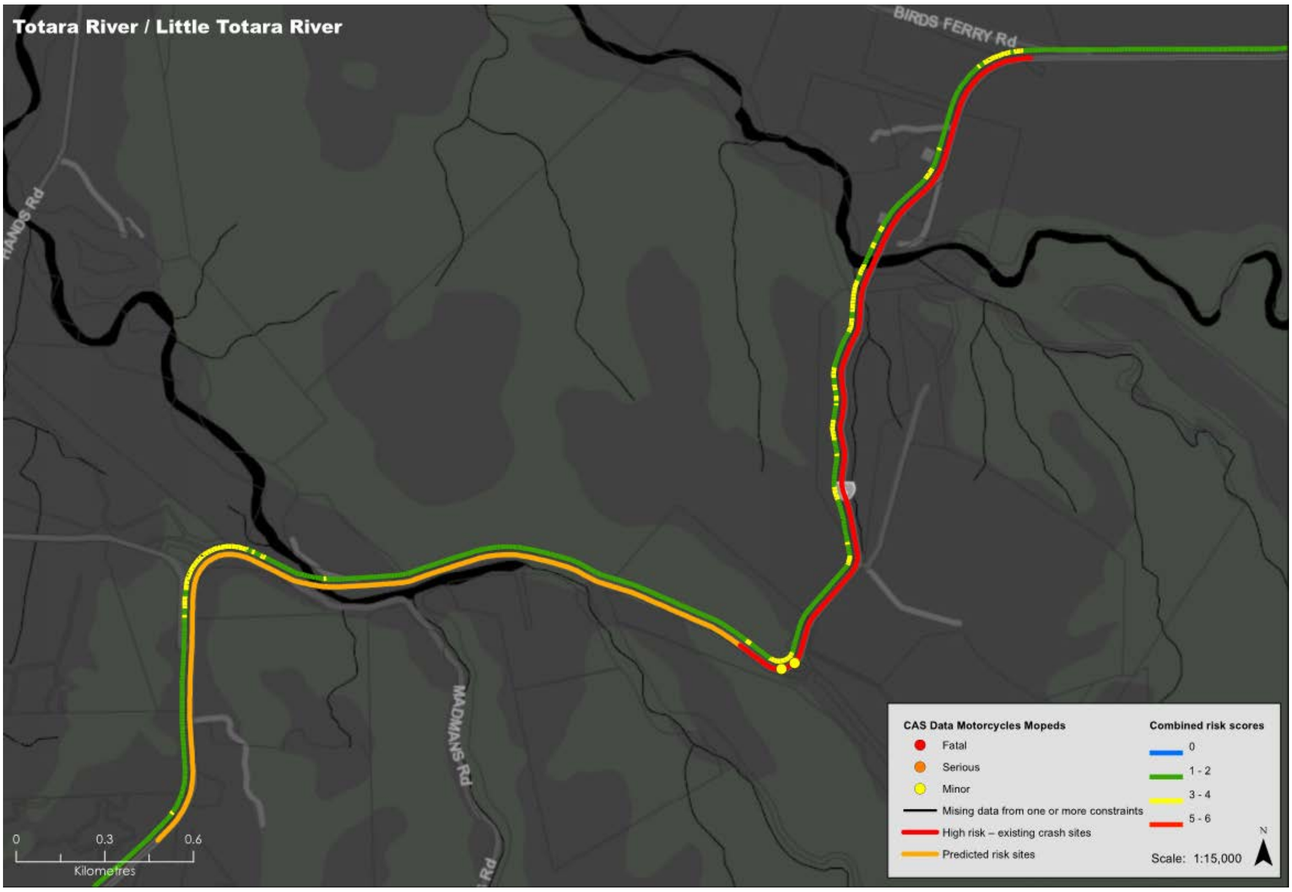


Figure 1. Motorcycle Risk Rating Mapping

References

1. https://msac.org.nz/assets/Uploads/pdf/NZTA-Safer-journeys-motorcyclists-web.pdf
2. https://www.saferjourneys.govt.nz/assets/Safer-journeys-files/Safer-Journey-Action-Plan-2016-2020.pdf

A proactive approach to identifying high risk road corridors for pedestrians in Auckland, New Zealand

Dale Harris[a], Dave Smith[a], Irene Tse[b]

[a]Abley Limited, [b]Auckland Transport

Abstract

Auckland Transport commissioned the development of network-wide proactive risk model to prioritise pedestrian crossing improvements across Auckland.

The location of fatal or serious (FS) pedestrian crashes were compared to the location of pedestrian generators, community facilities and road/roadside attributes. Strong relationships were found between FS injury crashes and three road/roadside attributes.

A model was developed to identify roads which were high or moderate risk to pedestrians, with 2.3% of the road network prioritised as high-risk accounting for 23.1% of FS pedestrian crashes. Auckland Transport can now apply this model to prioritise pedestrian crossing improvements across the Region.

Background

In order to target locations that present a greater risk of fatal or serious (FS) injury to pedestrians, Auckland Transport commissioned the development of a network-wide proactive risk model for identifying pedestrian risk. This would then assist them to prioritise urban pedestrian crossing improvements across Auckland.

Methodology

The locations of FS pedestrian crashes between 2013 and 2017 were analysed against the location of fourteen pedestrian generators, including public transport hubs and stops and community facilities. The distance from each crash to each facility was calculated as the crow flies using a geospatial 'near' analysis and compared to the location of FS pedestrian crashes.

The locations of FS pedestrian crashes were also compared to these road attributes from the Infrastructure Risk Rating (IRR) dataset (Zia et al., 2016):

- adjacent land use
- road stereotype
- traffic volume
- IRR risk band
- speed limit, and
- One Network Road Classification (ONRC).

Results

All the pedestrian generators analysed showed either no relationship, or a weak statistical relationship with the location of FS pedestrian crashes at a network-wide level, however it was noted that many of these locations already have safe pedestrian crossing facilities installed. The analysis concluded that the location of these generators demonstrated demand for crossing movements but did not correlate with increased risk to pedestrians.

The following road attributes had a moderate to strong relationship with FS pedestrian crash risk:

- Adjacent land use (from IRR)
- ONRC
- IRR risk band

Crash rates were calculated for these attributes (and combinations thereof) for the Auckland region, (Figure 1). Risk thresholds were also created to prioritise roads with relatively high rates of FS pedestrian crashes (Table 1).

Table 1. Risk/prioritisation thresholds

	Pedestrian crash rate (FS crashes/km/5yr)
High	≥ 0.5
Moderate	≥ 0.2 and < 0.5
Low	< 0.2

The factors that indicated a high or moderate risk to pedestrians were identified from these results.

<u>High</u> risk roads were identified where:

- land use is commercial strip shopping, or
- land use is commercial big box/industrial and IRR is medium-high or high, or
- ONRC is regional strategic, IRR is medium-high or high, and the land use is urban, or
- ONRC is arterial, IRR is high and land use is urban.

<u>Moderate</u> risk roads were identified where:

- land use is commercial big box/industrial and IRR is medium, or
- ONRC is regional strategic, IRR is low-medium or medium, and land use is urban, or
- ONRC is arterial, IRR is medium or medium-high and land use is urban.

Roads classified as <u>high</u> risk totaled 181.2km (2.3% of the Auckland network), accounting for 134 (23.1%) of FS pedestrian crashes between 2013-2017.

Roads classified as <u>moderate</u> risk totaled 457.5km (5.7% of the Auckland network), accounting for 136 (23.4%) of FS pedestrian crashes between 2013-2017.

Conclusion

The pedestrian risk and prioritisation model developed from this analysis will assist Auckland Transport to prioritise pedestrian crossing improvements across the Auckland Region. The model also represents a proactive approach to identifying high risk pedestrian corridors.

Reference

Zia, H., Durdin, P, Harris, D. (2016). An automated process of identifying high-risk roads for speed management intervention. Proceedings of the 2016 Australasian Road Safety Conference, 6-8 September, Canberra, Australia.

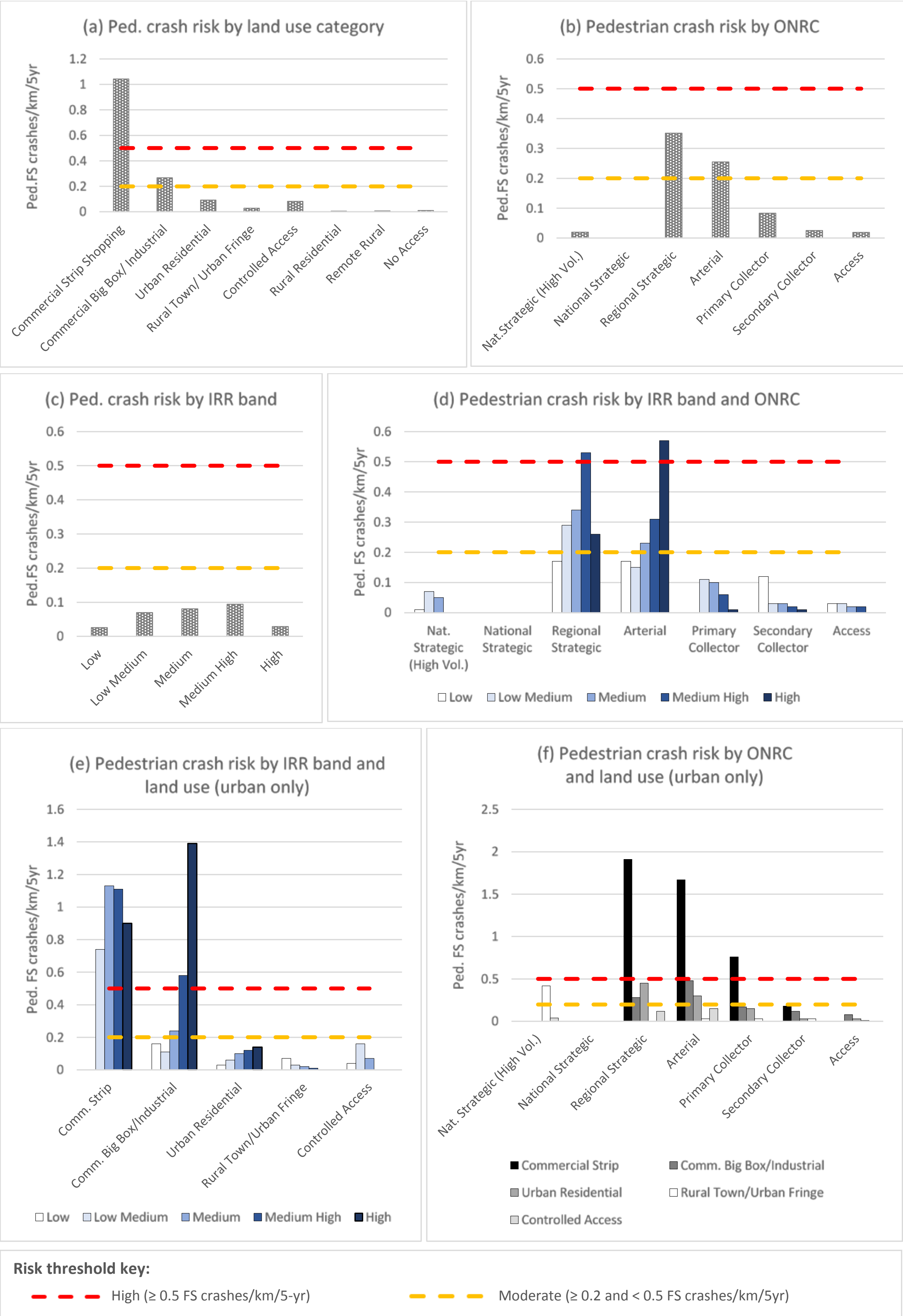


Figure 1. Graphs displaying pedestrian crash rates against IRR band, land use and ONRC

Safe System Review of Fatal Crashes in the ACT

Gage Hodgson[a], David McTiernan[a], Puck Imants[a], Anna Chevalier[a]

[a]Australian Road Research Board

Abstract

The ACT Justice and Community Safety Directorate engaged the Australian Road Research Board to undertake a Safe System review of ten years of fatal crashes in the ACT. The review identified common fatal crash factors across Safe System pillars (roads, speed, vehicles, people, and post-crash care) based on crash data and reports from the Australian Federal Police and Roads ACT. The method developed allowed analysis of crash factors and identification of crash patterns to determine 'gaps' in the System that likely contributed to the cause and/or severity of each crash. Using this, countermeasures were developed to address these gaps across the Safe System pillars.

Background

The ACT Justice and Community Safety Directorate sought to undertake a Safe System performance review of fatal crashes that occurred on the ACT road network over a ten-year period (2007-2016). The review covered an initial 114 fatal crashes that involved all road user groups.

Key aims of the study were to:

- Develop a method for evaluating fatal crashes that would assist identifying gaps in the Safe System approach to managing the ACT road network.
- Identify factors that contributed to cause and severity of fatal crashes broken down by Safe System pillar (roads, speeds, vehicles, people and post-crash response / care)
- Analyse the results of the Safe System review of ACT fatal crashes to inform the development of potential countermeasures to close these gaps, including infrastructure, road user education, policy and legislation

Method

Crash data and reports for each fatal crash were received from the Australian Federal Police and Roads ACT. The crash data and reports for each fatal crash incident were reviewed by a team of road safety infrastructure and human factors experts to identify causal and severity factors contributing to each crash These factors were categorised according to the Safe System pillars, including a proxy for post-crash care.

Contributing crash factors were analysed:

- Within each pillar to determine the common crash factors across the data set.
- By cross-tabulating various pillars to identify additional trends and links between pillars.
- To identify typical fatal crash profiles for each Safe System crash type.

Countermeasures were developed from the analysed results to address the identified Safe System gaps.

The bespoke database, crash factor coding, Safe System classification, and analytical methods developed during the crash review were based on a combination of road safety principals, existing crash dataset structures, previous studies, and project team experience.

Results / Recommendations

Primary Safe System gaps and potential countermeasures for the five typical crash profiles are shown in Table 1.

Table 1. Safe System gaps and potential countermeasures for typical crash profiles

Crash type	Primary Safe System gap	Potential countermeasure
Motorcycle (30%)	Inexperienced riders	Improve rider training including graduated licensing scheme
Run-off road (21%)	Non-frangible roadside hazards	Review hazard locations with regard to clear zone and speed limit
Intersection (19%)	Older drivers ’looking but not seeing’, or misjudging speed and distance	Review methods and procedures for ensuring fitness to drive
Head-on (13%)	Carriageways signed above Safe System speed for head-on collisions (70 km/h)	Reduce speed limit or consider need to separate carriageways (dual carriageway or median barrier)
Pedestrian (12%)	Speed limit exceeds Safe System speed for vulnearable road users	Reduce speed limit to 30 km/h in areas with high-pedestrian activity (commercial and retail districts, residential areas and areas with large numbers of child and elderly pedestrians)

Approximately 5% of crashes were considered atypical, and analysis did not reveal any patterns or trends within these crashes.

Other common factors identified across various crash types include:

- Increased severity for crashes where road users exceed Safe System speeds for the road environment
- Higher likelihood of younger male drivers being involved in a run-off road crash
- Drivers use of drugs and/or alcohol
- Older vehicles overrepresented across all crash types compared to age of entire ACT vehicle fleet
- Seagull intersections potentially exceeding safe traffic volume or speed

An additional outcome of this review was identifying the need for improved co-ordination and documentation of fatal (and serious injury) crashes, including identification of suicide crashes. It was concluded that such improvements would improve the efficiency and effectiveness of future Safe System assessments and provide road safety policy advisors and decision makers with a stronger evidence-based approach to developing holistic road safety strategies thus leading the way towards a zero death and serious injury future.

Hazard Perception and Younger Drivers: The Role of Cognitive Function

Caroline Moran[1], Joanne M. Bennett PhD[1], Prasannah Prabhakharan, PhD[2]

[1]School of Psychology, Australian Catholic University, Strathfield, NSW, Australia
[2]Research Centre for Integrated Transport Innovation, School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW, Australia

Abstract

Hazard perception is a complex cognitive process that is consistently linked to crash involvement. While research has focused on older populations for which cognitive declines are associated with poorer hazard perception, this study is the first to investigate the cognitive correlates of hazard perception in younger drivers. Ninety-eight undergraduates completed a hazard perception test and battery of cognitive tests. Cognitive function was positively related to hazard perception accuracy and response times; with inhibitory control, visuo-spatial skills, executive functioning and overall cognitive status important predictors of hazard perception. Future research could lead to training programs aimed at improving hazard perception in younger drivers.

Background, Method, Results and Conclusions

Background: Driving is a cognitively complex and dangerous task; with drivers under 25 years of age having the highest crash risk (Transport for NSW, 2017). Hazard perception, or the ability to anticipate potentially dangerous traffic situations, is a driving skill most consistently linked with crash risk (Horswill & McKenna, 2004). Governments recognise the importance of hazard perception to young drivers such that hazard perception testing has become part of licensing laws in Australia (Australian Government, 2018). Research has shown that hazard perception ability improves in young drivers who are undergoing brain maturation at the same time as they gain on-road experience (Borowsky, Shinar, & Oron-Gilad, 2010; Foy, Runham, & Chapman, 2016). Conversely, hazard perception deteriorates in drivers aged over 65 years who are experiencing age-related cognitive decline (Horswill et al., 2009). This suggests cognitive function may play a role in hazard perception ability. However studies have largely focused on older drivers and assessing fitness to drive (Aksan, Anderson, Dawson, Uc, & Rizzo, 2015). A recent study into younger drivers found specific cognitive domains were related to driver errors, including executive functioning, attention, visuo-spatial skills, memory, inhibition, psychomotorskills and overall mental status (Ledger, Bennett, Chekaluk, & Batchelor, 2019). This study is the first to investigate the neuropsychological correlates of hazard perception in younger drivers.
Method: Ninety-eight undergraduates, aged 18-48 years (M = 22.90, SD = 6.59, 68.5% female) with a minimum of a provisional drivers licence were recruited. Participants completed a newly created computer-based hazard perception test (HPT) that involved watching live video clips of potentially hazardous traffic events displayed from the driver's perspective. The HPT measured accuracy and captured response times when anticipating the hazard and/or when action was required to avoid a crash, such as braking. The battery of cognitive tests included Rey-Osterrieth Complex Figure, Grooved Peg Board, Trail Making Test, Visual Object and Space Battery, Mini-Mental Status Exam and Stop-signal task.
Results: Cognitive function was positively related to hazard perception accuracy, and a multiple regression was found to be significant, $F(10,87) = 2.44$, $p = .013$, $R^2 = .219$, accounting for 21.9% of variance. A backwards elimination to resulted in a significant parsimonious model, $F(3,94) = 7.35$, $p < .001$ that included inhibitory control, mental status and visuo-spatial skills. The model for hazard anticipation response times was not significant, $F(10,87) = 1.56$, $p = .132$, $R^2 = .152$. A backwards elimination resulted in a significant model, $F(3,94) = 3.87$, $p = .012$, and included

inhibitory control, mental status and executive function. The multiple regression predicting hazard action response times was not significant, $F(10,87) = 0.81$, $p = .623$, $R^2 = .085$ with a backwards elimination resulting in no predictors remaining in the model.

Conclusion: The present study showed specific cognitive domains including inhibitory control, overall mental status, executive functioning and visuo-spatial skills were related to hazard perception accuracy and anticipation response times in younger drivers. Future research could extend findings to enhance training programs to improve driving skills in younger drivers.

References

Aksan, N., Anderson, S., Dawson, J., Uc, E., & Rizzo, M. (2015). Cognitive functioning differentially predicts different dimensions of older drivers' on-road safety. *Accident Analysis & Prevention*, *75*, 236-244. doi: 10.1016/j.aap.2014.12.007

Australian Government (2018) Driver's licence application. Retrieved from https://www.australia.gov.au/information-and-services/transport-and-regional/drivers-licence-application

Borowsky, A., Shinar, D., & Oron-Gilad, T. (2010). Age, skill, and hazard perception in driving. *Accident Analysis & Prevention*, *42*, 1240-1249. doi:10.1016/j.aap.2010.02.001

Foy, H., Runham, P., & Chapman, P. (2016). Prefrontal cortex activation and young driver behaviour: A fNIRS study. *PLOS ONE*, *11*(5), e0156512. doi: 10.1371/journal.pone.0156512

Horswill, M.S. & McKenna, F.P. (2004). Drivers' hazard perception ability: Situation awareness on the road. In S. Banbury and S. Tremblay (Eds.), *A cognitive approach to situation awareness: Theory and application* (pp. 155-175) UK: Ashgate Publishing, Ltd.

Horswill, M., Pachana, N., Wood, J., Marrington, S., McWilliam, J., & McCullough, C. (2009). A comparison of the hazard perception ability of matched groups of healthy drivers aged 35 to 55, 65 to 74, and 75 to 84 years. *Journal of The International Neuropsychological Society*, *15*, 799-802. doi: 10.1017/s1355617709990312

Ledger, S., Bennett, J., Chekaluk, E, & Batchelor, J. (2019). Cognitive functioning and driving: Important for young and old alike. *Transportation Research Part F*, *60*, 262-273. doi: 10.1016/j.trf.2018.10.024

Transport for NSW (2017) *Young driver trauma trends*. Retrieved from http://roadsafety.transport.nsw.gov.au/downloads/trauma-trends-young-drivers.pdf

Road User Hazard Perception Tests: A Systematic Review of Current Methodologies

Caroline Moran[1], Joanne M. Bennett PhD[1], Prasannah Prabhakharan, PhD[2]

[1]School of Psychology, Australian Catholic University, Strathfield, NSW, Australia
[2]Research Centre for Integrated Transport Innovation, School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW, Australia

Abstract

Hazard perception has been linked to crash risk with novice/younger road users poorer at hazard perception than experienced/older road users. Hazard perception testing is included in many licensing systems. This systematic review synthesises studies of hazard perception test methodologies in order to determine best practice. A search resulted in 48 studies that contained a hazard perception test methodology (video, static image, simulator, test-drive) and discriminated between road users (car drivers, motorcyclists, bicyclists, pedestrians) based on age and/or experience. Despite a high degree of heterogeneity, results suggest current driver hazard perception testing could be enhanced, with specific recommendations made for motorcyclists and vulnerable road users.

Background, Method, Results and Conclusions

Background: Driving is a complex task with drivers under 25 years of age over-represented in crash statistics (International Forum, 2018). A driving skill that is most consistently linked with crash risk is hazard perception, which is the ability to anticipate potentially dangerous traffic situations (Horswill & McKenna, 2004). Hazard perception testing is now part of licensing laws in many countries such as Australia (Australian Government, 2018). Hazard perception test methodologies have evolved from rudimentary driving simulators to computer-based tests using a range of stimuli such as live videos, response methods such as touch screen, and scenario types (McKenna & Crick, 1994; Quimby & Watts, 1981). Test validity was based on novice/younger road users having poorer hazard perception ability than experienced/older road users. Theoretical frameworks have guided test development such as Endsley's model of situation awareness (Endsley, 1995). Four key methodologies have evolved over time – video, static image, simulator and real-world test-drive. Hazard perception tests provide temporal (response times) and spatial (accuracy) measures, with the adjunct of eye tracking to capture visual scanning patterns and questionnaires to probe decision-making. To date, there is no consensus as to which methodology is best practice for assessing hazard perception skills.

Method: A search was conducted in April 2018 of published studies in Medline, PsychInfo and Scopus. Studies that included a hazard perception test methodology or comparison of methodologies, in non-clinical populations of road users (car drives, motorcyclists, bicyclists and pedestrians) that were discriminated based on age and/or experience, were included in the review.

Results: 48 studies met the inclusion criteria with all four methodologies – video, static image, simulator and test-drive – able to discriminate between road user groups based on age/or experience, on at least one measure of hazard perception. Video methodology using temporal measures was widely used, however results for spatial measures were inconsistent. Eye tracking measured visual scanning patterns but failed to enhance other temporal and spatial measures such as touch screen. Questionnaires were equally able to discriminate road user groups without a traditional temporal response. There were inconsistencies in categorising participants based on age and experience, limited application of a theoretical framework and post-hoc changes made to tests with the deletion of scenarios that failed to discriminate between road use groups based on age and/or experience.

Conclusion: This systematic review found all four methodologies – video, static image, simulator and test-drive were able to discriminate between road users on at least one measure of hazard perception. Results were largely in the expected direction such that novice/younger road users were poorer at hazard perception than experienced/older road users. Future research is needed to resolve inconsistencies in categorising participants based on age and experience, the limited application of a theoretical framework and the association of scenarios with crash risk including those deleted post-hoc due to a failure to discriminate between road use groups. It is recommended that hazard perception testing be extended to motorcyclists as part of the licensing process, and further research to develop better methodologies to capture hazard perception in pedestrians and bicyclists.

References

Australian Government (2018) Driver's licence application. Retrieved from https://www.australia.gov.au/information-and-services/transport-and-regional/drivers-licence-application

Endsley, M. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors: The Journal of The Human Factors and Ergonomics Society*, *37*(1), 32-64. doi: 10.1518/001872095779049543

Horswill, M.S. & McKenna, F.P. (2004). Drivers' hazard perception ability: Situation awareness on the road. In S. Banbury and S. Tremblay (Eds.), *A cognitive approach to situation awareness: Theory and application* (pp. 155-175) UK: Ashgate Publishing, Ltd.

Horswill, M. (2016). Hazard perception in driving. *Current Directions in Psychological Science*, *25*(6), 425-430. doi: 10.1177/0963721416663186

International Traffic Forum (2018). *Road safety annual report 2018*. Retrieved from https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2018_2.pdf

McKenna, F.P., & Crick, J.L. (1994). *Hazard perception in drivers: A methodology for testing and training* (Contractor Report 313). Retrieved from https://trl.co.uk/sites/default/files/CR313.pdf

Quimby, A.R., & Watts, G.R. (1981). *Human factors and driving performance* (Laboratory report 1004). Retrieved from https://trl.co.uk/sites/default/files/LR1004.pdf

The testing and evaluation of a vision based automatic detection system for illegal phone use by drivers in Australia

John P Wall[a], Saurav Sakar[a], Victor Lewandowski[a], Paul Hayes[b], Steven Legg[a], Greer Banyer[a], Arem Gavin[a], Arnold Jansen[a] , Louise Higgins-Whitton[a], Tam McCaffery[a], John Willoughby[a] and Bernard Carlon[a]

[a] Transport for NSW, [b] Phaseprofessionals

Abstract

Naturalistic driving original studies have shown a range of crash risks associated with hand-held mobile phone use. One study found that mobile phone use during or shortly before a casualty crash increased the risk of the crash occurring by four times. Hand held phone use is illegal in Australia but until now enforcement options have been limited to direct intervention by a police officer observing illegal mobile phone use. In 2018, Transport for NSW (TfNSW) embarked on a project to find a camera technology detection solution for this road safety issue.

Background

Naturalistic driving studies have shown a range of crash risks associated with illegal, hand-held mobile phone use depending on the type of use. Case study research of mobile phone use during or shortly before a crash found the risk of having a casualty crash was four times higher than where a person was not using a phone (McEvoy et al., 2005).

The NSW Government released the Road Safety Plan 2021 in February 2018 which included a commitment to implement legislative changes to enable camera-based technology to enforce mobile phone offences. The Road Transport Legislation Amendment (Road Safety) Act 2018 came into effect from 1 July 2018, making NSW the first jurisdiction to introduce such legislation in Australia.

A Registration of Interest process was announced in April 2018 to identify potential technology for a vision-based system that would automatically detect mobile phone offences on NSW roads. Following a tendering process, three proponents were selected to demonstrate and test their solutions. This process helped identify a preferred provider to support a two-phase non-enforcing pilot which ran between January and June 2019.

Method

A test facility on a bridge over the M4 motorway in Western Sydney was used to validate the claims of the shortlisted three companies. Each was allocated a lane to monitor on the 100 km/h stretch of road.

During the four-week test proponents were expected to meet technical and management requirements including: capturing illegal mobile phone use by drivers passing under the test site and provision of clear photographic evidence within 24 hours of detection. To assist the evaluation, TfNSW deployed a high definition video camera and radar unit to independently validate the data provided by the proponents.

Based on outcomes from the testing, a non-enforcing pilot of the best performing solution provided the opportunity to gain further insights. A thirteen-week phase ran at two fixed locations (M4 and Anzac Parade), covering all lanes in one direction. A shorter six-week phase piloted a transportable version of the system at six locations across Greater Sydney, with the technology being moved from one site to the next every few days.

Results

During the four-week test period 1.7 million vehicles were detected by the TfNSW verification system. Vendors' vehicle detection rates varied from 19% to 103% when compared to the TfNSW system. Proponents provided two offence detection counts: Detection rate identified through artificial intelligence and detection rate following human verification. The proportion of verified offences based on the verification count ranged from 0.02% (lane2) to 1.3% (lane1).

Table 1. Technology Testing Phase – vehicle count accuracy and automatic / verified offence detection, by motorway lane / proponent

	Lane1	Lane2	Lane3
Vendor vehicle count accuracy	**103%**	**61%**	**19%**
Automatically detected possible offences	8,591	419	2,277
Human verified offences	7,571	156	2,155
Vendor detection rate	**88%**	**37%**	**95%**

The non-enforcing pilot generated more extensive data and insights from fixed and transportable deployments of the technology. Over 8.5 million vehicles were detected, almost 104,000 instances of illegal mobile phone use were identified, and non-compliance was found to be 1.2%.

Table 2. Technology Pilot Phases – summary of detection and offence data from both fixed and the transportable technology deployments

	M4	Anzac Parade	Transportable
Vehicle detections	5,603,793	2,462,499	446,367
Automatically detected possible offences	672,601	311,020	119,473
Human verified offences	66,621	28,884	8,438
Mobile phone offence detection rate	**1.19%**	**1.17%**	**1.89%**

Downtime for the fixed solution was 0.8% and 1.2% for the transportable solution (mainly arising from the relocation between sites).

Conclusions

The testing and piloting of new technology to automatically detect illegal phone use by drivers has shown there is a technology solution for this road safety problem. A selected provider has demonstrated a reliable system in all light and whether conditions, and for both fixed and transportable deployment models.

References

McEvoy S P, Stevenson M R, McCartt A T, Woodward M, Haworth C, Palamara P et al. (July 2005). Role of mobile phones in motor vehicle crashes resulting in hospital attendance: a case-crossover study. British Medical Journal doi:10.1136/bmj.38537.397512.55

Underlying factors in the take up of active travel among South Australian young adults

Trevor Bailey[a], Lisa Wundersitz[a], Simon Raftery[a]

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

Abstract

Since at least 2000, declines in young adult driver licensing have been observed in several overseas countries and in some Australian jurisdictions. This study investigates driver licensing trends in South Australia since 2009 for those aged 17-24 years, in comparison to other age groups and equivalent Victorian data. Importantly, the trends are examined in relation to gender, location of residence and socio-economic status. The findings will have implications for future planning around safe active travel, shared vehicle use and public transport initiatives.

Background

Several studies have reported declines in young adult driver licensing in the United States, Canada, United Kingdom and some European countries (e.g. Sivak & Schoettle, 2012; Delbosc & Currie, 2013; Chatterjee et al. 2018). Also, in the UK, young adult licence holders during a 'typical' week, now tend to have reduced self-driven trips and reduced overall distances driven, while increasingly choosing alternative travel modes (Chatterjee et al. 2018). Note also, some young adults have licences but choose not to drive, just as some drive but without a licence (Chatterjee et al. 2018).

Delbosc and Currie (2013), Delbosc (2017) and Chatterjee et al. (2018) all considered that declines in both licensing and private car use among young people are indicative of a wide range of factors such as: living with parents for longer, delays in partnering and parenting, difficulties in securing stable employment, costs of getting a licence and running a car, ubiquitous use of smart communication technologies, declining social status of owning a car, environmental concerns, and the attractiveness of alternative travel modes. Chatterjee et al. (2018) concluded that, not only is each factor in itself intrinsically complex, but collectively the factors are likely to be influential on licensing rates and car ownership in complex combinations rather than in distinct and separate ways.

In Australia, Raimond and Milthorpe (2010) have reported falling driver licensing rates among young adults in Sydney. More recently, Wundersitz, Bailey and Thompson (2017) found decreasing licensing rates since 2001 among those aged 18-24 and living in Victoria. Over a third of Victorians in this age group did *not* hold a driver's licence in 2016. Females and those living in urbanised environments tended to have lower licensing rates. A small scale national survey (Bailey, Wundersitz, Raftery & Baldock, 2015) of young adults who do not drive (*n*=144) found that most said this was because they prefer active travel modes, they dislike driving, or they feel that public transport/being a passenger suits them better.

If fewer young adults are obtaining or delaying a driver's licence and more are taking up or supplementing their driving with active travel modes such as walking or cycling, more of them will be travelling as vulnerable road users. This provides a rationale for not only strengthening the programs and communication activities focusing on safe active travel but also for increased provision of infrastructure that supports safer walking and cycling. Similarly, if young adults, with or without a licence, show a preference for using public transport and/or sharing private vehicles, then making these travel modes more attractive may bring reduced on-road risk in terms of crashes if those young people themselves are then not driving vehicles.

The current study identified trends in South Australian driver licence data since 2009 with the aim of extending the current Australian knowledge base of trends in young adult travel behaviour. Additional understandings of the factors underlying the trends were gained through analyses of the data by age, gender and socio-economic status.

Method

The total numbers of licence holders (full and provisional, but excluding learner's permits) at individual ages (17 to 90+ years) as at 30 June for each year 2009-2018, and broken down by gender and postcode of residence, were obtained from the South Australian Department of Planning, Transport and Infrastructure. The numbers of driver's licences held at each age and in each year were then tabulated against Australian Bureau of Statistics (ABS) population data by postcode and by gender. The percentages of licensed drivers per population were then calculated for each age category and examined to ascertain trends over time in licensing rates, including those *not* holding a licence. These trends will be analysed by gender, residence location, and socio-economic status using ABS geographic rankings of socio-economic advantage and disadvantage.

Results

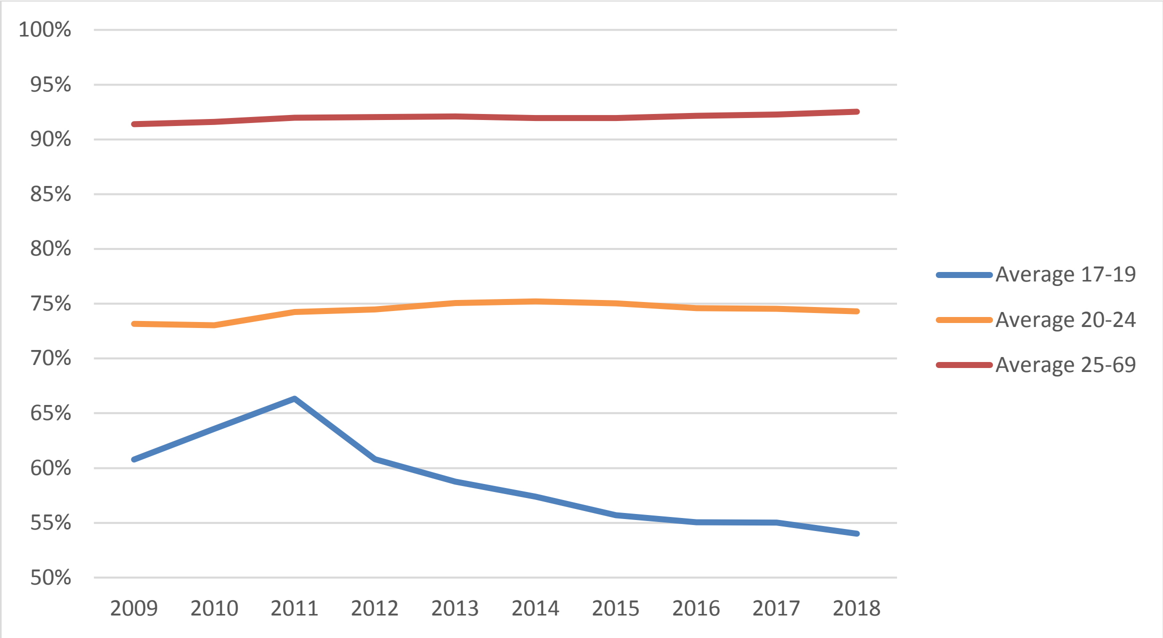
Preliminary analyses indicated that South Australians aged 17-19 and 20-24 during 2009 to 2018 were substantially *less* likely to be licensed to drive than those aged 25-69, as can be seen in Table 1 and Figure 1. Since 2009, over 91% of 25-69 year olds held a licence, but 17-19 year olds experienced lower licensing rates between 54% and 66%, and those aged 20-24 years rates between 73% and 75%.

As can be seen in Table 1 and Figure 1, the licensing rates for 17-19 year olds increased markedly from 2009 to 2011, most likely as the young adults concerned anticipated the introduction of the strengthened Graduated Licensing Scheme provisions introduced in South Australia during 2010, and sought to obtain a licence before the new provisions affected them. However, this increase was only temporary as the licensed driver rates for 17-19 year olds then substantially declined, with the 2018 licence rate of 54% for this group lower than the corresponding 61% rate for 2009. Importantly, approximately 45% of South Australians aged 17-19 did *not* hold a driver's licence between 2015 to 2018.

Table 1. Driver licensing rates per population, South Australia, 2009-2018, by age group

Age group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Age 17-19 years	60.8%	63.6%	66.3%	60.8%	58.8%	57.4%	55.7%	55.1%	55.0%	54.0%
Age 20-24 years	73.2%	73.0%	74.2%	74.5%	75.1%	75.2%	75.0%	74.6%	74.5%	74.3%
Age 25-69 years	91.4%	91.6%	92.0%	92.0%	92.1%	92.0%	91.9%	92.1%	92.3%	92.5%

Figure 1. Driver licensing rates per population, South Australia, 2009-2018, by age group



Conclusion

Compared to drivers aged 25 and over, the lower licensing rates among 17-24 year olds, but particularly among 17-19 year olds, suggest that South Australians in this age group are increasingly choosing alternative travel modes, bringing implications for improved support for safer active travel and encouraging the take up of shared and public forms of transport.

References

Bailey, T., Wundersitz, L., Raftery, S., & Baldock, M. (2015). Young adult licensing trends and travel modes (15/01). Melbourne: Royal Automobile Club of Victoria (RACV).

Chatterjee, K., Goodwin, P., Schwanen, T., Clark, B., Jain, J., Melia, S., Middleton, J., Plyushteva, A., Ricci, M., Santos, G., & Stokes, G. (2018). Young people's travel – What's changed and why? Review and analysis. Project Report. Bristol, UK: Department for Transport.

Delbosc, A. & Currie, G. (2013). Causes of youth licensing decline: a synthesis of evidence. Transportation Review, 33(3), 271–290.

Delbosc, A. (2017). Delay or forgo? A closer look at youth driver licensing trends in the United States and Australia. Transportation, 44, 919-926.

Raimond, T. & Milthorpe, F. (2010). Why are young people driving less? Trends in licence-holding and travel behaviour. In Proceedings of Australasian Transport Research Forum, 29 September – 1 October, Canberra.

Sivak, M., & Schoettle, B. (2012). Recent changes in the age composition of drivers in 15 countries. Traffic Injury Prevention, 13(2), 126-132.

Wundersitz, L., Bailey, T., & Thompson, J. (2017). Young Adult Licensing Trends - 2017 Update (17/02). Melbourne: Royal Automobile Club of Victoria (RACV).

Use of Truck-Mounted Attenuators in Short Term/Mobile Lane Closures: Operator Perspectives in Southeast Queensland

Ross Blackman[a], Ashim Kumar Debnath[b]

[a] Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology,
[b]Deakin University

Abstract

Truck-mounted attenuators (TMAs) are deployed to provide positive protection for roadworkers and reduce the impact of vehicle intrusions into work zones. The aim of this research was to explore operational issues and perceived effectiveness of TMAs from the perspective of TMA operators in Queensland, Australia. Participants perceived TMA deployment procedures as sufficient overall, but concerns were expressed about lack of driver awareness, inappropriate driver behaviour, and consistency of deployment. In the first research focusing directly on driver behaviour and TMAs in Australia, the interviews revealed TMA operators' perspectives on risks and hazards associated with TMA use, as well as the supporting safety measures deemed most effective.

Background

Lane closures on multilane roads require motorists to transition safely from closed to open lanes before entering a roadwork site. While informative traffic controls help to alert drivers to upcoming lane closure, drivers sometimes fail to transition safely, exposing workers and motorists to substantial collision and associated injury risks. Accordingly, TMAs are used to reduce the incidence and severity of work zone intrusions. While international research demonstrates the general effectiveness of TMAs (Ullman & Iragavarapu, 2014), there is a need to optimise their deployment to maximise positive outcomes. With this objective, research examining driver behaviour in relation to TMAs and associated traffic management was undertaken by CARRS-Q in 2018 on behalf of Queensland Transport and Main Roads (TMR). The current content focuses on interviews with TMA operators, while the broader study also included traffic observations at relevant worksites. Prior to this, empirical research on TMA use and effectiveness in Australia was lacking.

Method

Six experienced (minimum 4 years) TMA operators employed by TMR were interviewed in Southeast Queensland using a semi-structured format to discuss their knowledge and perceptions regarding TMA use and related safety issues. Four operators participated in a group interview and two were interviewed individually. Interview duration was approximately 45 minutes. The interviews were structured around four main themes, including TMA Deployment, Risks and hazards, Effectiveness of safety practices, and Improving TMA design and deployment.

Results and Conclusions

Due to the wide range of activities and environments in which TMAs are used, there was said to be no typical or standard deployment procedure. Where traffic control involved external contractors, variation in procedures also related to inconsistent operational approaches and policies. The need to achieve an appropriate balance between rigour, consistency and flexibility can sometimes lead to compromise, particularly if multiple organisations are involved.

Numerous concerns were expressed regarding driver behaviour, including speeding, inattention, fatigue, impairment, phone use and lack of understanding of controls and signals. Wet weather was considered hazardous due to driver failure to adjust for conditions. Reportedly, drivers often do not look far enough ahead and also tend to 'tailgate', increasing the risk of rear-end crashes. These risks and hazards are all consistent with the international literature on TMA safety research and work zone safety generally, as are operators' perceptions that visible police presence at work sites has the most notable positive influence on driver behaviour (Smith et al., 2006; Debnath et al., 2017).

Among the most prominent general concerns expressed by TMA operators was the lack of understanding among drivers about TMAs and associated traffic controls and signals. Participants described being followed by drivers who mistook arrow boards for indicators and stopped behind the TMA, either confused or expecting the TMA to change lanes in front of them. It was also reported that curious drivers sometimes drive too close to the TMA so as to observe the attenuator device. Participants said that such events indicate a need for advertising and education to inform drivers of the purpose of TMAs and appropriate driver behaviour.

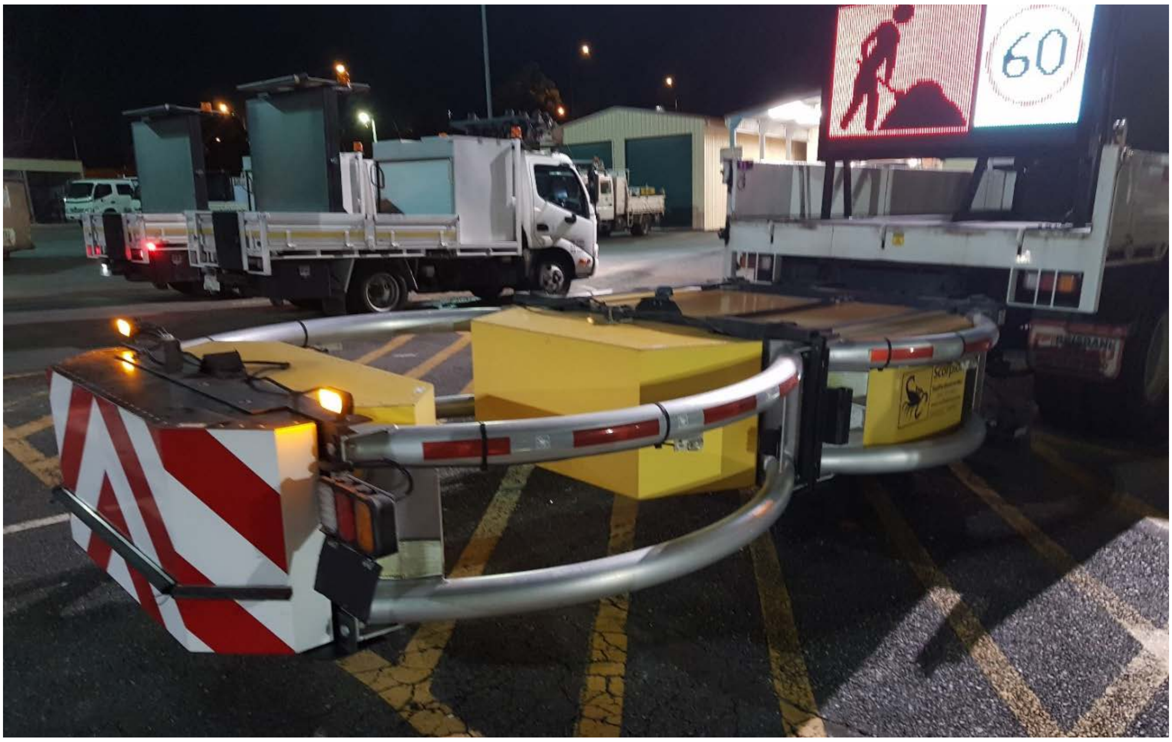


Figure 1. Truck-mounted attenuator (TMA) used in the study area

References

Debnath, A. K., Blackman, R., Sheldrake, M., Haworth, N., King, M., & Biggs, H., 2017. Safety at Road Worksites: Stage 1 Working Papers (AP-R544-17). Sydney, Austroads. https://austroads.com.au/publications/road-safety/ap-r544-17

Smith, J. H., Edwards, R., O'Neill, S., & Goluchowski, M., 2006. Best practice for use and design of truck mounted attenuators (TMA) for New Zealand roads. Wellington, NZTA. https://www.nzta.govt.nz/resources/research/reports/301

Ullman, G. L., & Iragavarapu, V., 2014. Analysis of Expected Crash Reduction Benefits and Costs of Truck-Mounted Attenuator Use in Work Zones. Transportation Research Record, 2458: 74-77.

Understanding Driving Challenges and Engagement Opportunities to Improve Local Driving Knowledge of Newly Arrived International Drivers and Migrants

Pedro Ezcurra[a], Travis Murphy[a], Charles Mountain[a]

[a]Royal Automobile Association

Abstract

There is strong public opinion regarding tourists and international drivers posing a high risk on South Australian (SA) roads. While there is little information and publicly available data about international drivers' involvement in SA crashes, there are experiences, stories and anecdotes that indicate road safety is an issue for them due to their limited local knowledge.

International drivers settling in SA were surveyed to understand their pain points, challenges and interests after driving on the state's roads. The study investigates how they prepared to face the roads in SA, what are their most stressful situations and their recommendations for others.

Background

Overseas migrants about to commence driving in SA often have to drive out of necessity due to limited public transport options and the need to seek and maintain a job (Knight et al 2010). International drivers setting in a new country face a number of challenges. Driving in a new environment is one of these, potentially imposing a risk to other road users.

There is strong public opinion regarding tourists and international drivers being a high risk on SA roads. While there is little information and publicly available data about international drivers and their involvement in SA crashes, there are experiences, stories and anecdotes that indicate road safety is an issue for a number of international drivers due to their limited local knowledge.

As roads are shared by residents and visitors, improving migrants' road safety conditions pose serious implications for the South Australian community.

South Australian population growth is being driven by overseas migrants, with the state having an influx of more than 10,000 overseas net migrants each year.

Method

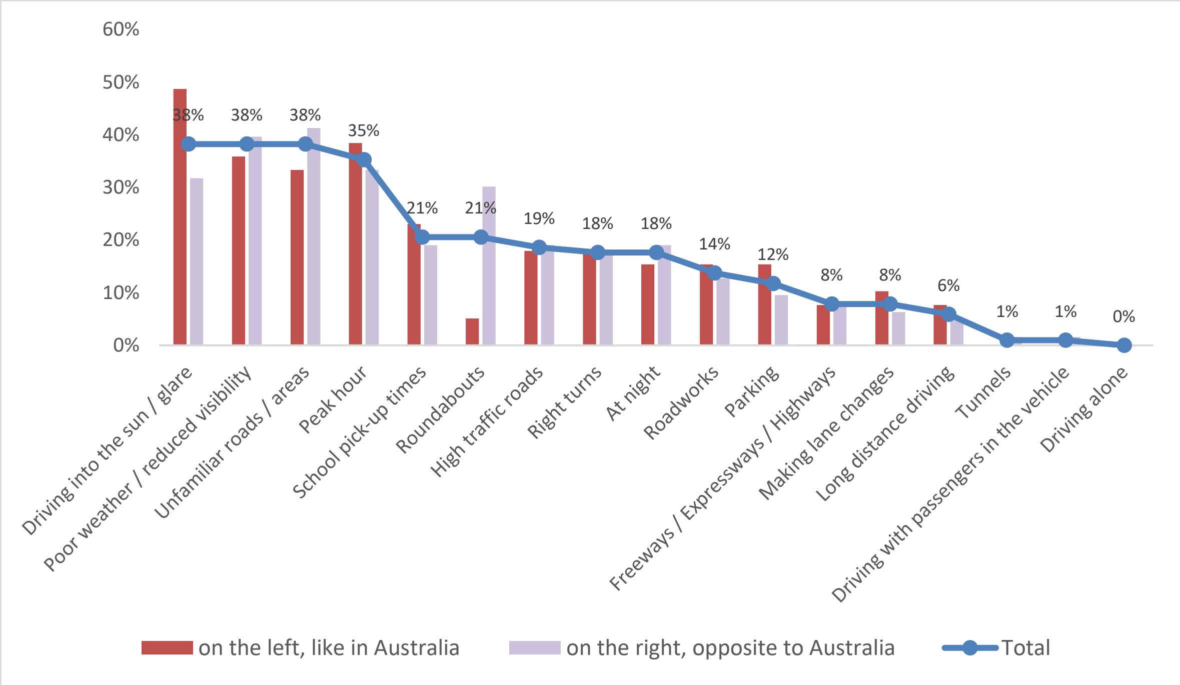
The study gained information by engaging key stakeholders in personal meetings and the design and development of an online survey. The survey was distributed through a number of community organisations that work with international migrants and through personal networks.

The sample included 122 responses which were analysed with Microsoft Excel through various descriptive techniques.

Results

The results highlighted that just over a third of international drivers find difficult or very difficult to understand SA road rules. Further analysis is based on the side in which vehicles travel in respondents' countries of origin showed that a higher proportion of people who come from countries where vehicles travel on the right side of the road presented difficulties understanding SA road rules (40%) compared to those coming from vehicles travelling on the left side of the road (26%). Main challenging situations for international drivers driving in SA included unfamiliar roads (38%), poor weather (38%), driving into the sun or glare (38%), peak hours (35%), and roundabouts (21%). Before driving in the state, most respondents looked for information about licencing (69%) and road rules (65%) while fewer took practical lessons (37%). Despite this, when recommending others about what information to look for during the first two years of driving in the state most of the respondents recommended looking for vehicle insurance (89%) which was followed by looking information on SA road rules (85%) and driver's licence (81%).

Figure 1. Most stressful driving situations



Conclusion

This study reviewed international drivers' interest, experiences, pain points and recommendations that can inform future road safety programs directed to migrants. The study highlights the difficulties faced by those coming from overseas countries especially those who normally drive on the opposite side of the road. It also highlights that more work needs to be done on explaining how SA rules apply and the differences with other countries. The learnings can assist to develop programs targeting international drivers to support their settlement in SA and to achieve better road safety outcomes.

References

Knight E., Harris A., Shannon N., (2010). *Newly arrived migrants – what are the road safety issues?* Paper presented at the Australasian Road Safety Research, Policing and Education Conference, Canberra, Australia.

Review of Post-Licence Motorcycle Rider Training in New South Wales

Ross Blackman, Narelle Haworth, Herbert Biggs[a], Darren Wishart[b]

[a] Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology, [b] Griffith University

Abstract

Fully licensed motorcyclists represented over two thirds of riders killed on New South Wales (NSW) roads from 2010 – 2014. An ongoing need to address crash risks among this cohort is recognised and there is strong support for post-licence rider training (PLRT) among rider advocates and stakeholder groups. This research examined the PLRT environment in NSW to assess the extent to which NSW PLRT courses targeted identified rider skills and competencies. A desktop review of available courses was supplemented by interviews with training providers. A wide range of courses was identified, most of which appeared to potentially support rider risk management.

Background

Motorcyclists remain overrepresented in fatal and serious injury crashes (~17%) on New South Wales (NSW) roads. Rider training and related research has historically focused on novice rider safety (e.g., Ivers et al., 2016), yet fully licensed riders comprised over two thirds of motorcyclist fatalities in NSW from 2010 to 2014. Post-licence motorcycle rider training (PLRT) has strong support from motorcycle stakeholders, but course diversity and limited specific program evaluations leave many questions unanswered. Having identified the need to address crash risks in the *NSW Motorcycle Safety Strategy 2012-2021* (Transport for NSW, 2012), the Centre for Road Safety engaged CARRS-Q to investigate the extent to which NSW PLRT courses targeted identified rider skills and competencies.

Method

The research included a desktop review of available PLRT courses to provide an overview of course content, locations and costs. The review was complemented by interviews with eight training providers for information on course structure, components, delivery, promotion, and trainee characteristics. The information was used to identify courses likely to support riders to manage risks and promote safety improvements. The study framework was informed by identification of six key rider competencies (scanning, buffering, braking, cornering, lane positioning and basic motorcycle handling) drawn from a review of crash types and feedback from motorcycle stakeholders.

Results and Conclusions

The research identified 36 PLRT courses across 10 providers that may variously assist riders to manage potential crash risks. Trainees were reported to have vastly different characteristics, needs and objectives for undertaking training (Table 1); some reportedly required skills development from a low level while some were highly competent. This reflects a need for a diverse range of course offerings, which appears to be largely met across NSW overall, although courses are geographically limited, and some course costs are a potential barrier.

Unlike many pre-licence training courses, many of the PLRT programs contained, and were often structured around, the key competencies identified above, but in most cases there was no standardised curriculum. Providers indicated that prospective PLRT participants sometimes lacked basic skills that could be expected to be acquired through pre-licence training. As such, providers usually set some prerequisites for participation in higher level courses. Importantly, training was often tailored to participants' individual requirements and ability.

Assessment was made of the extent to which each training course would likely support riders to manage on-road risks, based on the inclusion of key competencies in program components, as well as the broadly defined concepts of 'roadcraft' (a combination of practical skills, situational awareness, hazard perception and response, and attitudes and behaviours). Around half (55%) of available courses appeared likely to support riders' risk management, clearly addressing both skills and roadcraft, while 20% appeared only somewhat supportive due to limited skills and roadcraft content. The remaining 25% were higher level track-based courses, with a high degree of uncertainty regarding potential road safety benefits. The absence of direct evidence of safety effects is acknowledged, while any positive effects of PLRT on motorcycle safety overall may be minimal due to low participation rates.

Table 1. Post-licence training participation among interviewed NSW providers*

Provider	Trainee Age range	Male %	Motorcycle types	Returning %	Average skill level	Trainees per year
A	Up to 87	95	Sport	NA	Variable	Up to 900
B	18-60	NA	Touring, Cruiser	20	NA	Up to 40
C	Up to 80	80	NA	20	NA	NA
D	NA	85	Mixed	10-15	Poor	NA
F	20-75	80	NA	NA	Poor	NA
G	NA	84	Sport, Touring, Adventure, Cruiser	25-30	Avge-poor	~320
J	17-60	50	Cruiser, Adventure, Touring	40	Avge-poor	>200

*Insufficient information was obtained from one of the interviewed providers. NA = Not available.

References

Ivers, R. Q., Sakashita, C., Senserrick, T., Elkington, J., Lo, S., Boufous, S., and de Rome, L., 2016. Does an on-road motorcycle coaching program reduce crashes in novice riders? A randomised control trial. Accident Analysis & Prevention, 86, 40-46.

Transport for NSW. (2012). NSW Motorcycle Safety Strategy 2012 – 2021. Sydney, Transport for NSW. https://roadsafety.transport.nsw.gov.au/aboutthecentre/strategies/nswmotorcyclesafetystrategy/index.html

Towards linking driving complexity to crash risk

Hendrik Zurlinden [a], Anita Baruah [a], John Gaffney [a]

[a]VicRoads

Abstract

Complementary to classical road safety approaches aimed at improving infrastructure, there is growing evidence about the relationship between motorway crashes and traffic conditions. Unstable or congested flow can drastically increase cognitive workload for motorists which, combined with reduced freedom to perform needed maneuvers (e.g. lane changes), increases crash risk. While these conditions are usually described by macro factors such as average traffic speed, modern vehicle detection technologies allow analysis of individual vehicle behaviors (micro level). This paper discusses the value of refined detection and analysis methodologies to develop Intelligent Transport System based road safety improvement strategies.

Traffic performance is determined by random interactions between individual vehicles

Improving road traffic safety and efficiency on highly saturated urban motorways and high-volume arterials requires an understanding of the complex traffic phenomena such as unstable or congested traffic flow, including wide moving jams and of the mechanisms that can trigger them. Such phenomena increase crash risk. For example, as motorways approach capacity, there is an increasing number of interactions between individual vehicles that cause traffic to slow down, longitudinal oscillating waves to form, and lane change numbers to rise.

Along with a heterogeneous vehicle fleet comes an even more diverse driver population expressing numerous behaviours which influences interactions between vehicles and ultimately determines the overall traffic performance outcome of a system. Human behaviours include unique personal (instantaneous) choices of:

- Speed;
- Travel lane;
- When and where to change lanes;
- When to enter and/or leave the motorway; and
- Gear changing, mirror glancing, braking and acceleration actions to maintain their position within the traffic stream.

The human element creates complexity, and this creates human error

Drivers can perform certain simple tasks with relative ease with minimal chance of error. Higher speed driving (with lower traffic densities) on motorways does not always result in proportionally more crashes (i.e. higher crash risk) nor necessarily lead to increased congestion. However, as the number of vehicles per kilometre (i.e. density) rises there is an increasing number of inter-vehicle interactions with vehicle movements between different lanes (e.g. lane changes) or vehicles in the same lane performing abrupt braking or other manoeuvres. These interactions compound the driving task which with the reducing road space available (caused by rising volumes as well as numerous individual vehicle manoeuvres) requires considerably more skill and precision by the driver and additional collaboration between drivers to perform seemingly normal and simple tasks such as lane changing to gain advantage in the flow, to fill all motorway lanes to capacity, or to reposition the vehicle into the slow lane for a nearby exit.

As a result, there is growing evidence relating to the relationship between motorway crashes and traffic state (Golob, Recker & Alvarez, 2004; Hovenden, Zurlinden & Gaffney, 2018).

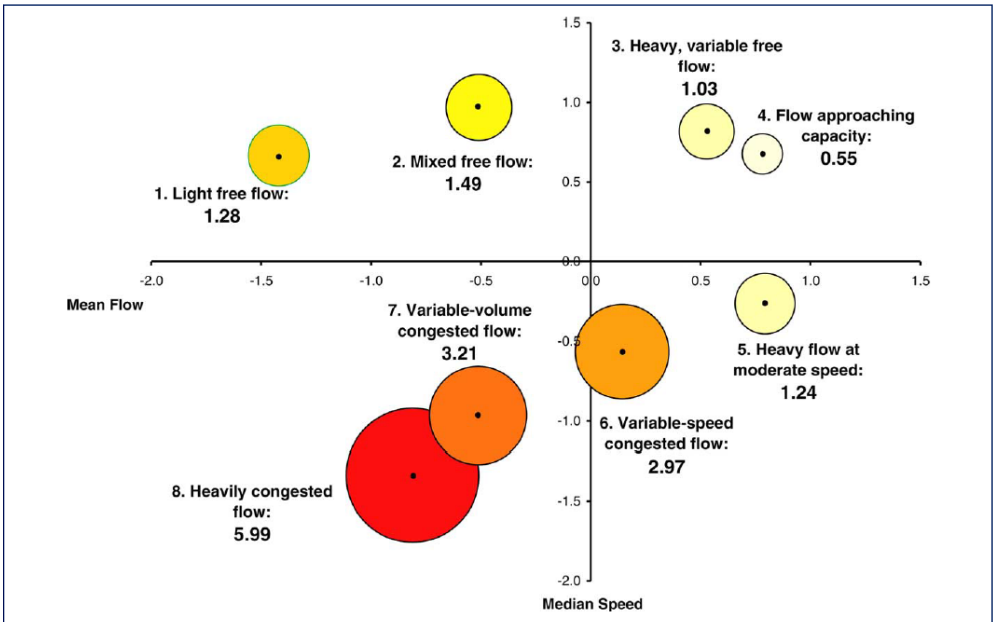


Fig. 6. Estimated total crashes per million vehicle miles of travel for the eight traffic flow regimes during a.m. peak hours, plotted in standardized speed–flow space.

Figure 1. Estimated Crash Rates / Types for Traffic Flow Regimes (Source: Golob et al., 2004)

New insights through new measurement technology

New insights into the mechanisms that cause unstable flow or congestion, including individual vehicle maneuvers, are now possible due to advancements in detection technology (e.g. infrared technologies), which provide richer, finer grained (vehicle events and smaller time periods) and more accurate data sets. This enables real-time control of numerous compounding and complex motorway phenomena and their triggers, e.g. through improved design limiting the number of needed lane changes or an improved Coordinated Ramp Metering Signal system, in turn improving road safety. Measurement and analysis of lateral movement data (i.e. lane changes) is also suitable to explain many of the phenomena linked to merging, diverging and weaving (e.g. reduced capacity).

References

Elvik, R. (2014). *Towards a general theory of the relationship between exposure and risk.* TØI, Oslo.

Gaffney, J. (2018). *The Study of Road Safety on Urban Motorways.* Churchill Trust, Canberra.

Golob, T., Recker, W., Alvarez, V. (2004). Freeway Safety as a Function of Traffic Flow. *Accident Analysis and Prevention*, 36(6), 933-946. https://doi.org/10.1016/j.aap.2003.09.006

Hall, M., Gaffney, J., Penno, K. (2018). *Measuring Lane Changing on Urban Motorways to Improve Efficiency and Safety.* Australian Road Reserach Board, Sydney.

Hovenden, E., Zurlinden, H., Gaffney, J. (2018). *Urban Motorway Safety – Beyond Crash Rates.* Australian Road Reserach Board, Sydney.

Knoop, V. L., Hoogendoorn, S. P., Shiomi, Y., Buisson, C. M. (2012). Quantifying the Number of Lane Changes in Traffic: An Empirical Analysis. *Transportation Research Record*, 2278, 31-41. doi:10.3141/2278-04

The Folly Of Using An Outcome To Predict The Future

Paul Durdin[a], Shane Turner[a], Haris Zia[a]
[a]Abley Limited

Abstract

If we are to reach the Vision Zero goal where no lives are lost on our roads, then a paradigm shift is required in the way we approach many aspects of road safety. This paper examines the predictive robustness of using historic crash to forecast future crash occurrence and compares it to a proactive risk approach. The findings provide compelling evidence that reactive approaches relying on crash history should be a secondary consideration to proactive risk-based approaches in both the identification of high-risk locations and the assessment of interventions.

Background

Crash data continues to be a key input to the way in which high-risk locations are identified and interventions prioritised and funded by many transport authorities. In large part, this is attributable to processes and procedures developed by transport authorities over many decades being slow to adjust to proactive approaches that adopt a more ethical standpoint to road safety; one where people do not need to be injured or killed before safety improvements can be justified. Whilst proactive approaches to measuring safety, such as crash prediction modelling, Star Rating and Infrastructure Risk Rating are becoming more widely accepted by transportation professionals, there remains a reluctance to fully embrace these proactive risk techniques in preference to reactive crash-based approaches.

Analysis

The predictive capability of different risk metrics has been evaluated from a national road safety dataset in New Zealand that covers approximately 100,000km of public roads. Reactive risk metrics in the dataset are based on crashes in the 2013 to 2017 period, and proactive metrics are based on infrastructure, operational and environmental factors contained in various data sources current to 2017. Crash data from 2018 has been analysed to determine the predictive capability and robustness of both reactive and proactive risk metrics.

The risk metrics described in the extended abstract are:

- Collective Risk – a measure of estimated fatal and serious crash density per km, using a severity index adjustment approach based on all injury crashes.
- Personal Risk – a measure of estimated fatal and serious crash density per vehicle km travelled, using a severity index adjustment approach based on all injury crashes.
- Infrastructure Risk Rating – a measure of the underlying level of safety of a road segment based on physical, operational and adjacent land use characteristics.

Each of the numerical risk metrics are classified into a five-tiered risk band.

Results

The proportion of fatal and serious crashes in 2018 occurring in each of the risk bands is shown in Table 1.

Table 1. Proportion of Fatal and Serious Crashes in 2018 by Risk Metric Rating

Risk Rating	Collective Risk	Personal Risk	Infrastructure Risk Rating (IRR)
Low	32%	24%	5%
Low Medium	29%	24%	20%
Medium	20%	38%	51%
Medium High	14%	10%	19%
High	6%	5%	6%

The results show that 61% of all fatal and serious crashes occurred on roads with a Collective Risk rating of Low or Low-Medium. In jurisdictions where crash data is used as the primary determinant of identifying high-risk locations and prioritising and funding safety improvements, these sites would almost certainly not be addressed. In contrast, only 25% of fatal and serious crashes occurred on roads with an IRR of Low or Low-Medium.

Analysis by vehicle km travelled demonstrated a similar predictive capability, as shown in Figure 1.

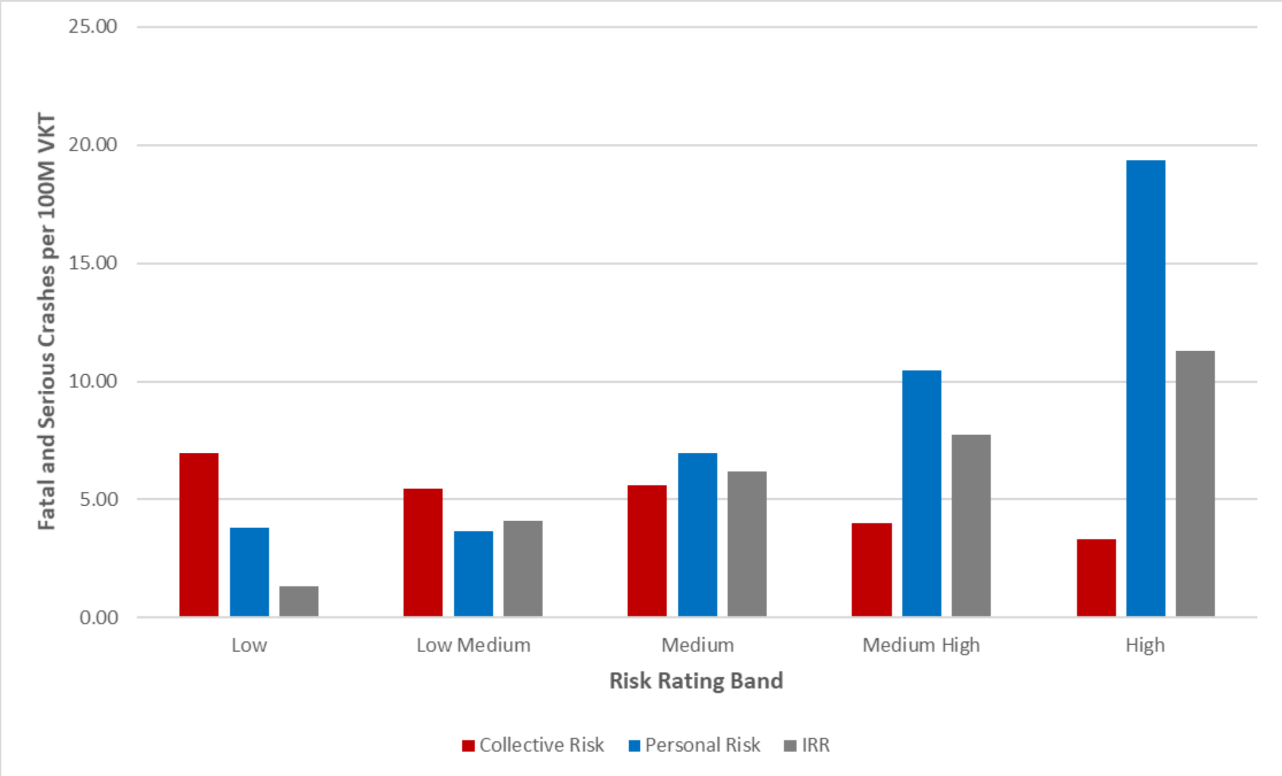


Figure 1. Fatal and Serious Crashes per 100 million vehicle km Travelled by Risk Metric Rating

The results show the actual fatal and serious crash rate in 2018 increased with increasing risk rating band for the Personal Risk and IRR risk metrics, but followed an inverse trend for Collective Risk.

Conclusions

The analysis provides compelling evidence to move away from identifying, prioritising and funding safety improvements solely on the basis of historic crash data. Predictive capability of reactive risk metrics can be enhanced by including a measure of exposure (Personal Risk), but even better predictive capability is achieved through the proactive IRR metric.

Safety on Congested Urban Motorways

Elizabeth Hovenden[a], Hendrik Zurlinden[a], John Gaffney[a]

[a]VicRoads, Australia

Abstract

The metropolitan Melbourne motorway network carries 40 per cent of urban arterial road travel and casualty crash numbers have been increasing despite a decreasing trend on other urban roads. Infrastructure is rarely mentioned in Police crash reports as being involved in the urban motorway crashes, rather mention is made about traffic conditions and vehicle-to-vehicle interactions. Analysis was undertaken to test the hypothesis that the dynamic of the traffic flow, which causes congestion and requires complex driver responses, is a significant component of the casualty crash problem. A relationship between 'traffic state' and crashes was observed.

Background

The metropolitan Melbourne motorway network represents seven per cent of the urban arterial road network yet it carries 40 per cent of the urban arterial road travel in terms of vehicle kilometres travelled and this percentage is growing. The number of casualty crashes on metropolitan Melbourne motorways has increased by 15 per cent over the last 10 years (2008 to 2017) despite an overall decrease of 15 per cent in the total number of urban casualty crashes over the same period.

The majority of urban motorway casualty crashes are vehicle-to-vehicle crashes, with rear-end crashes accounting for 53 per cent of the crashes and lane change or side swipe crashes accounting for 18 per cent of crashes. Run off road crashes only account for 15 per cent of the crashes. The Police reports discuss heavy and/or stop-start traffic and vehicle blind spots as contributing factors to the crash and rarely mention infrastructure.

As urban motorways are generally built to the highest standards, a new way of looking at motorway safety is required. This led to the formulation of a hypothesis that the dynamic of the traffic flow, which causes congestion and requires complex driver responses, is a significant component of casualty crashes on urban motorways.

There is overwhelming evidence that the dynamic of the traffic flow requires significant changes to driver behaviour, contributing to increasing number of crashes. Golob, Recker and Alvarez (2004) identified adverse safety effects of congested motorways and increased crash rate under flow breakdown conditions. Kononov, Bailey and Allery (2008) conclude that although crashes increase moderately with increased traffic on uncongested segments, once a critical density is reached crashes increase at a faster rate.

Method

In-depth analysis was undertaken for the Monash Freeway and Eastern Freeway. Crash data was linked to traffic data including vehicle occupancy (a measure of density), vehicle speed and flow. Vehicle occupancy was used to categorise the 'traffic states' ranging from free-flow to flow breakdown.

Results

A relationship was observed between crash occurrence and 'traffic state'. Nearly half (45%) of the weekday casualty crashes on the Monash Freeway occurred in conditions where flow breakdown (congestion) has occurred (31%) or where flow breakdown is likely or certain to occur (14%), however only eight per cent of the day operates at conditions corresponding to flow breakdown and five per cent of the day operates at conditions where flow breakdown is likely or certain to occur. Considering exposure, only 19 per cent of the total day's traffic occurs in flow breakdown conditions and only 10 per cent of the total day's traffic occurs in conditions where flow breakdown is likely or certain to occur (see figure below).

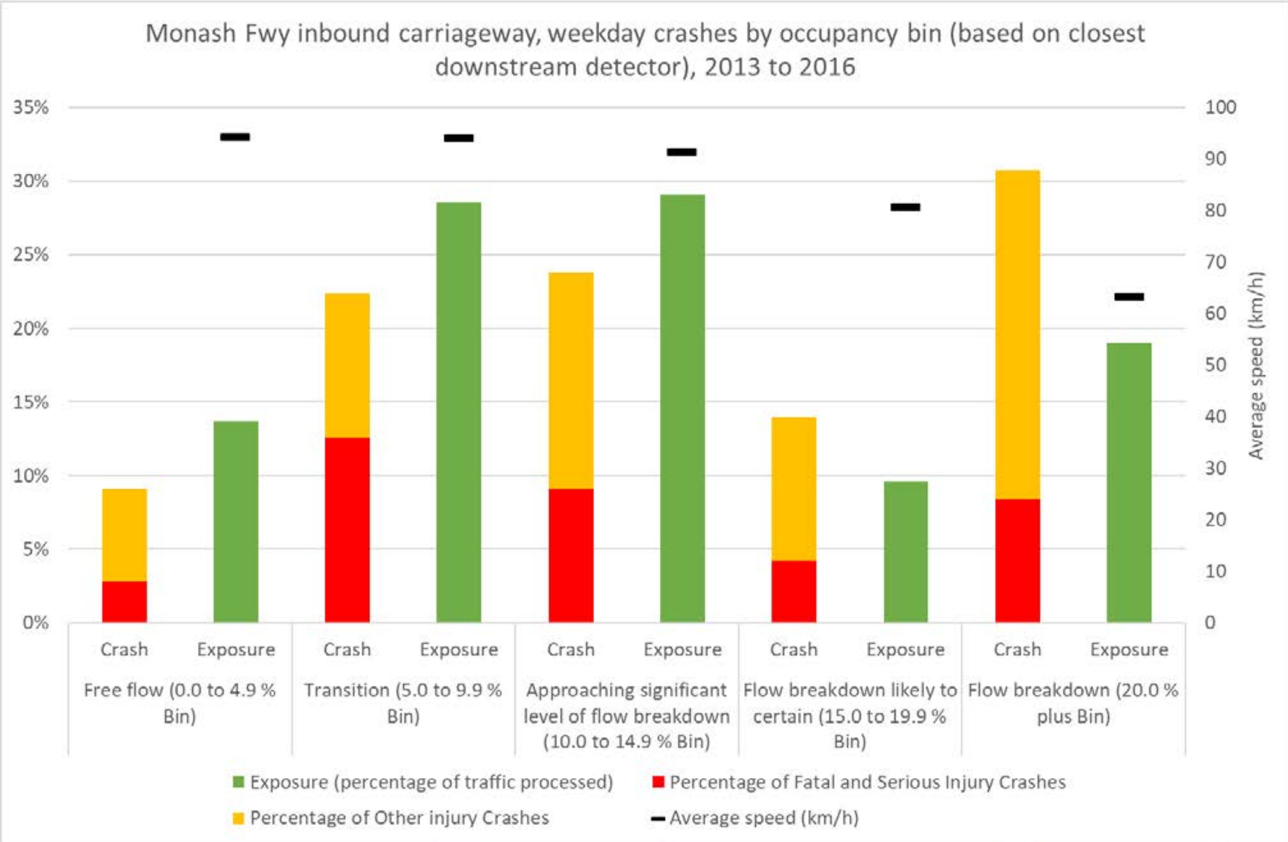


Figure 1. Comparison of Monash Freeway crashes and traffic state

Conclusion

There is a relationship between crash occurrence on urban motorways and the traffic state. The results of this analysis can be used to improve safety on urban motorways through the development of Intelligent Transport System strategies to keep the motorway operating at conditions that minimise flow breakdown risk.

References

Golob, T., Recker, W., Alvarez, V., (2004). Freeway Safety as a Function of Traffic Flow. *Accident Analysis and Prevention, 36(6)*, 933-946. doi:10.1016/j.aap.2003.09.006

Kovonov, J., Bailey, B., Allery, B. K., (2008). Relationships Between Safety and Both Congestion and Number of Lanes on Urban Freeways. *Transportation Research Board Record*, *2083*, 26-39. doi: 10.3141/2083-04

Leading Law Enforcement Towards Zero: NSW Police Force Road Policing Strategy 2021

Senior Sergeant Michael Timms, A/Superintendent Rob Toynton and Assistant Commissioner Michael Corboy APM

Traffic and Highway Patrol Command, NSW Police Force

Abstract

In response to the release of (the NSW Government) Road Safety Plan 2021, New South Wales Police Force (NSWPF) has developed *Road Policing Strategy 2021*.

The plan, devised by NSWPF Traffic and Highway Patrol Command, does not simply rebadge the objectives contained in the Road Safety Plan 2021 with a police logo, but commits NSWPF to an ambitious plan of general road safety deterrence and specific road policing activity.

The Road Policing Strategy 2021 is our roadmap to achieving the objectives of Road Safety Plan 2021 and the integration of Towards Zero/Safe Systems into NSWPF business-as-usual.

Background

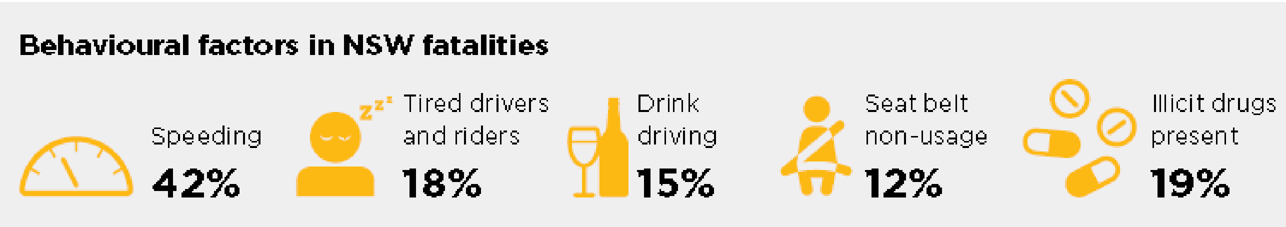
In 2018 Transport for NSW released *Road Safety Plan 2021*. The plan will "reinforce strong partnerships between government, local councils, stakeholders and the community". As a key government stakeholder, NSWPF reviewed Road Safety Plan 2021 and integrated future road policing strategies with the plan's priority areas.

Road Policing Strategy 2021 explains what NSWPF will to do support Road Safety Plan 2021, and how NSWPF can embed Towards Zero as "business as usual".

Road Safety Plan 2021 Priority Areas: NSWPF actions

NSWPF Road Policing Strategy 2021 will focus on priority areas the overarching government plan such as speeding (Road Safety Plan 2021, P8).

Table 1. Behavioural factors in NSW fatalities (Road Safety Plan 2021 P8)



Speeding represents the largest causation factor in NSW fatalities. Highway Patrol vehicles are equipped with three speed measuring instruments and there are 1,400 Highway Patrol officers that detect and stop speeding motorists at the roadside.

There are other behaviours that contribute to road trauma and Highway Patrol are assisted by other members of the 17,000-strong NSWPF such as General Duties officers attached to Police Area Commands and Districts.

Road Policing Strategy 2021 has seen Highway Patrol and Generalist officers' team up and form *Strike Force Puma* to target high-risk offenders such as disqualified drivers who continue to drive.

In its first six months, Puma laid 143 traffic and criminal charges and 720 other legal actions (eg penalty notices). General duties officers who were rotated through Puma can go back to their commands and reinforce that road safety is indeed everyone's business.

Road Policing Strategy 2021 formalises a 70:30 sharing of random breath testing (RBT) and roadside or mobile drug testing (MDT) which is doubling to 200,000 roadside tests by the end of 2020, with Police Area Commands and Districts carrying out 30% of this task.

Figure 1. NSWPF Road Policing Strategy

Towards Zero: NSW Police Actions

Embedding Safe Systems into Government business-as-usual is a recommendation from the *Inquiry into the National Road Safety Strategy 2011-2020*. For road policing, this represents a paradigm shift from the "E's of road safety" for which police were seen as responsbile for the E of enforcement.

Road Policing Strategy 2021 shows how police can impact on all safe systems pillars. Police are role-models for the community and need to make decisions with safety in mind.

For example, Police are provided with the safest possbile vehicles which, when on-sold to the public via auction, increases the safety of the used vehicle fleet. Educating police about safer vehicles influences their decision making so they buy safer family vehicles.

There are other areas where efforts can be re-doubled, such as Local Council Traffic Committees where police can be advocates for safer roads.

Finally, projects to replace 20th century police computer systems should enhance the quality of road policing data and improve tasking and deployment.

Conclusion

The underlying philosophy behind Road Policing Strategy 2021 is that *Road Safety is everyone's responsibility. We must believe that deaths and serious injuries on NSW roads are unacceptable."*

References

Road Safety Plan 2021 (2018), Transport for NSW Centre for Road Safety, Retrieved from towardszero.nsw.gov.au/sites/default/files/2018-02/road-safety-plan.PDF

Woolley, J., Crozier, J., (2018), Inquiry into the National Road Safety Strategy 2011-2020. Retrieved from roadsafety.gov.au/nrss/files/NRSS_Inquiry_Final_Report_September_2018_v2.pdf

New approach to road safety advertising in NSW supporting Towards Zero

Lucy Filardo[a], Ruth Graham[a], Ralston Fernandes[a], Susan Everingham[a], Nicole Douglas[b], Dush Sharma[b]

[a]Centre for Road Safety, Transport for NSW, [b]Customer, Technology and Services, Transport for NSW

Abstract

Road safety advertising, alongside other measures, has helped reduce the NSW road toll over time. To support implementation of the new Road Safety Plan 2021, which includes a vision of zero road trauma by 2056, a new road safety advertising strategy is being developed. NSW's traditional approach of focusing mostly on road users' behaviour will evolve to the use of greater positive appeals that focus on all parts of the 'Safe System'. This will help provide the community an understanding of all factors that reduce road trauma on NSW roads and position road safety as a shared responsibility.

Road Safety Advertising in NSW

NSW has had great success in encouraging safer road user behaviour through public education campaigns. Examples of successful campaigns are the 2006 'Pinkie' campaign 'Speeding. No one thinks big of you', which challenged young male speeding drivers by leveraging the social unacceptability of speeding. And the 2012 'Plan B' campaign, which took a humorous approach to encourage drivers to separate drinking and driving, and think about other ways to get home after drinking out. Along with other initiatives, these campaigns helped push the NSW road toll down to a record low of 307 in 2014.

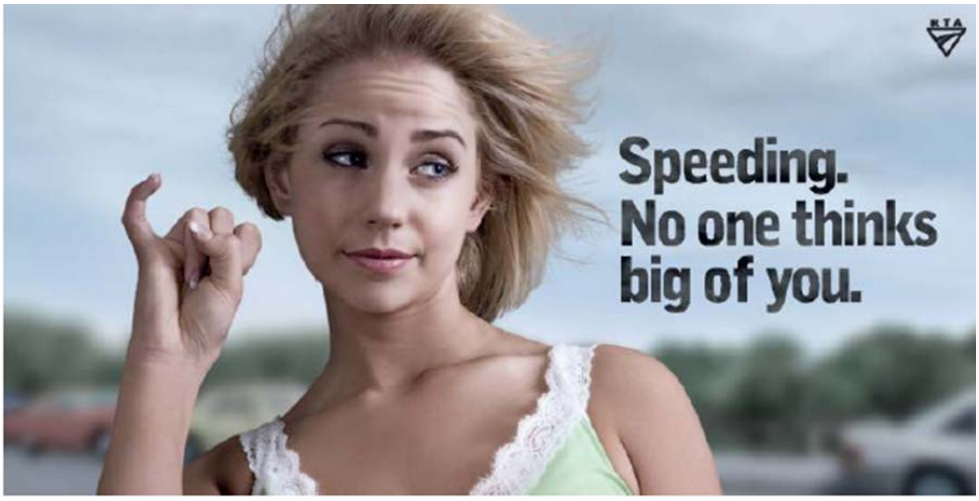


Figure 1. 'Pinkie' campaign 'Speeding. No one thinks big of you' creative

Figure 2. 'Plan B' campaign creative

However, in 2015, there was an increase in the number of lives lost on NSW roads which continued into 2016 and 2017. In 2018, the NSW Government launched the Road Safety Plan 2021 (the Plan) to reset its road safety priorities in line with its Towards Zero vision. Underpinning the Plan is the Safe System approach, which will guide the delivery of countermeasures to reduce death and injury on NSW roads.

Road safety communications in NSW have traditionally focused on behaviour change and education, directed at specific groups of individuals and issues. To support the Plan and the broader range of measures that are used to address road safety in NSW such as road safety infrastructure, safer vehicle technologies and appropriate speed limits, a new approach to road safety advertising is being developed. This approach will seek to educate the community about the Safe System to improve understanding, encourage engagement and advocacy for the range of road safety measures employed, and promote personal responsibility. It also aims to better connect with road users and influence behaviour, through better use of audience data and insights.

Research investigating community understanding of the Safe Systems approach found many do not understand and therefore do not see a safe system in operation, rather the management of road safety is seen as reactive (Senate SHJ, 2018). Conversely, when explained, the reaction to the Safe Systems approach was largely positive, with the concept implying greater alignment and coordination of road safety efforts, as well as creating a narrative that supports a better understanding of the full range of measures that are implemented to address road safety.

The new strategy will shift advertising to an audience segmented approach, where appropriate. This will facilitate more effective targeting and messaging for specific groups, and will underpin a step-change in broader community support for road safety.

Conclusion

A new approach to road safety advertising will demonstrate NSW's holistic approach to reducing road trauma through the proven initiatives under the Safe System and build community confidence in NSW's approach to improving road safety. It will also provide an opportunity to highlight to all road users in NSW the role they play in the Safe System and Towards Zero.

References

Senate SHJ (2018) *Audience Segmentation for Road Safety*. Unpublished report prepared for Transport for NSW

Application of Infrastructure Risk Rating (IRR) to Support Speed Limit Reduction in Western Australia

Richard Amoh-Gyimah[a], Jaqueline Haupt[a], Alex Price[a], Hayley Lajszczak[a]

[a] Main Roads Western Australia

Abstract

The Infrastructure Risk Rating (IRR) methodology developed in New Zealand assesses road safety risk based on infrastructure, roadside hazards and land use elements. The methodology was applied to 110km/h posted speed limit state roads in Western Australia (WA) to support speed limit review. After identifying medium to high-risk road sections based on IRR scores, stakeholders reviewed the results, considering route hierarchy, surrounding network and implementation issues. As a result, a number of road sections were identified as priority sections that warrant speed limit reduction.

Background

The Infrastructure Risk Rating (IRR) was first developed by the New Zealand Transport Agency to assess road safety risk based on infrastructure elements and interactions with surrounding land use (NZ Transport Agency, 2016) and later investigated by Austroads for application by State and Local Governments in Australia (Austroads, 2018). Main Roads WA has taken up the IRR methodology on an exploratory basis, in order to investigate how it may be incorporated into speed limit setting practices by helping to identify high-risk road sections on rural roads.

WA is currently the only State with a default speed limit of 110km/h on rural roads. Currently, 82.2% of state roads are either 110km/h speed limit posted or subject to the state default. These 110km/h roads account for 27.5% of all KSI crashes from 2013 to 2017. This study applies the IRR methodology on all 110km/h posted state roads to identify high-risk road sections that cannot be treated immediately and may warrant speed limit reduction.

Methodology

The first part of the methodology was to develop the IRR risk score and rating/risk bands for the road sections using the IRR equation. The equation requires 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. These data are sourced from a variety of sources and state agencies in WA. Obtaining the most current and reliable data for roadside hazards and land use were particularly challenging.

The second stage of the study was to consider the results from the IRR model from a regional on-road perspective through discussions with stakeholders, that included the consideration of the hierarchy of the road (only non-highway state controlled roads, also known as M-Roads were considered), the presence of edge lines, the homogeneity of the road environment along the entire road, route hierarchy and interaction with the surrounding network. The review determined those road sections suitable for speed reduction and those requiring further analysis and consideration of speed reduction and/or other treatments.

Results

Overall, 3,522 road sections were identified as having 110km/h posted speed limit. The IRR methodology was applied to 2,781 road sections (13,199km), with 741 other sections omitted due to incomplete data. Table 1 presents the resulting IRR risk band (based on the IRR scores) of the assessed sections.

Table 1. Result of IRR analysis on 110km/h posted speed limit state roads

IRR Risk Band	**Road Sections**	**M-Road Sections***
High	6	2
Medium-High	40	19
Medium	689	372
Low-Medium	397	148
Low	1649	423
Total	**2781**	**964**

**M-Roads refers to non-highway state controlled roads*

The 393 M-Road sections identified through the IRR as of ‘High’, ‘Medium- High’ and ‘Medium’ risk make up 34 M-Roads (or 3,316km). Out of those, 37 M-Road sections (from 4 M-Roads), representing 142km, were recommended for a speed reduction from 110km/h to 100km/h; further 215 M-Road sections (making up 984km and 15 M-Roads) were identified for potential speed limit reduction and will be evaluated by regional staff. The remaining 141 M-Road sections that were not recommended for speed limit reduction were prioritised for other road engineering treatments.

Conclusion

Despite some challenges involved in data collection and manipulation for application of the IRR methodology, there are significant opportunities for improving road safety outcomes in WA by implementing speed reduction strategies on roads where crash risk was identified as medium to high. The use of the IRR for this project provides justification not only for speed limit reduction, but also for other safety treatments that will reduce crash risk. Future work will extend the analysis to state roads with speed limit below 110km/h.

References

NZ Transport Agency. (2016). NZ Speed Management Guide, First Edition. New Zealand Government.

Austroads. (2018). Speed Management - A Compendium of Effective Countermeasures and Strategies for Government and the Community (Draft Report). Austroads Ltd, Australia.

From hindrance to help – parental influence in novice-driver education

Andrew Rasch

Keys2drive Research and Development Manager

Abstract

Funded by the Australian Government and sponsored by Australia's motoring clubs, Keys2drive aims to reduce the high crash risk for newly-licensed drivers by providing free one-hour lessons to novice drivers and their parent/supervisor. Inclusion of parents in Keys2drive lessons is compulsory and underscored by research showing that the depth and breadth of parental involvement in novice-driver education is an important factor in its effectiveness (Masten & Chapman, 2003). In 2019, Keys2drive commissioned new research to measure, among other things, parents' confidence, attitudes, skill and readiness to supervise a novice driver. The research highlighted a need for ongoing upskilling of parents to improve safety outcomes.

Context

Parental influence on novice-driver safety manifests itself in various ways, including the example parents set as drivers themselves (McIntyre, 2015), and their depth of involvement as their children progress to solo driving. But, usually, parents cannot tell conclusively if they are doing a good job. They rarely have a way to measure their own performance or benchmark it against best-practice standards, nor regular access to expert advice.

Researchers argue that certain parental teaching behaviour may help develop basic manoeuvring skills, but not higher-order skills that help prevent crashes in non-supervised environments (Simons-Morton & Ouimet, 2006). Like novice drivers, parents are also susceptible to optimism bias, where overestimation of their own skills and preparedness for this complex task becomes problematic.

Although some parents have more suitable temperament and ability as driving supervisors, researchers argue that, to decrease crash rates, better education across the board is usually required (Gregersen et al., 2003).

This is where Keys2drive comes in.

What did the research show?

The 2019 Keys2drive new research comprised several in-depth focus groups, surveys, online forums, and face-to-face interviews. It revealed various noteworthy parental attitudes, perceptions and other observations:

- Most parents felt very confident and rated themselves highly skilled as supervisors
- All felt teaching and demonstrating safe driving behaviour was extremely important
- Parents overwhelmingly valued their role and the need to: teach correctly, lead by example and instill safe driving practices in their children
- Some questioned their ability to consistently teach good habits and compliance with road laws
- Some parents used their own judgement and instincts and some sought further information before becoming supervisors
- Most felt apprehensive about their inability to continue supervising their newly-licensed children
- Most taught through oral instruction, rather than demonstration
- Almost half of learners and pre-learners reported observing poor parental road-safety behaviour, including speeding, drink-driving and smartphone use.

Keys2drive intervention

Mandatory parental involvement is a defining characteristic of Keys2drive. With the aid of specific information from accredited instructors and accessible, take-home guides, Keys2drive helps counteract the common and unhelpful ‘do as I say’ approach, whereby a novice-driver’s brain is on ‘autopilot’ and parents teach what they know: “change lanes”; “slow down”; “do a U-turn here” etc. Keys2drive instead focuses on two-way active learning, which helps parents develop the necessary skills to supervise novice drivers in a more meaningful, cognitive way. Parents learn that, ideally, their supervisory involvement continues, not ends, at the P-plate stage.

Researchers argue that parents and children often find the learning-to-drive experience stressful and full of conflict (Simons-Morton & Ouimet, 2006). This can lead to parental disengagement; Keys2drive addresses this by teaching parents to relinquish more control, which helps learners to self-question, self-assess and self-correct their own performance instead of just responding to instructions.

Keys2drive’s influence on parents

With positive and enduring ways to address them, the Keys2drive curriculum aligns strongly with the research findings. Post-Keys2drive lesson feedback from parents is instructive, often focusing on their receiving greater insight, critical-thinking tools and ways to correct bad habits. Parents also report an increased awareness of novice-driver safety, and a renewed confidence and understanding of their ongoing role and how it can influence behaviour.

References

Masten, S., & Chapman, E. (2003). The Effectiveness of home-study driver education compared to classroom instruction: the impact on student knowledge, skills, and attitudes. Sacramento, California: Department of Motor Vehicles.

Alderman, E. M. & Johnston, B. D. (2018). AAP Committee on Adolescence, AAP Council on Injury, Violence and Poison Prevention. The Teen Driver. Pediatrics; 142(4):e20182163.

McIntyre, A. (2015). The Effectiveness of Driver Training/Education as a Road Safety Measure 2016 Update. Royal Automobile Club of Victoria. Retrieved from https://www.racv.com.au/membership/member-benefits/expert-advice/advocacy-for-members/research-and-reports.html

Simons-Morton, B., & Ouimet, M. C. (2006). Parent involvement in novice teen driving: a review of the literature. Injury Prevention, 12 (Suppl 1), i30–i37. http://doi.org/10.1136/ip.2006.011569

Gregersen, N. P., Nyberg, A., & Berg, H.-Y. (2003). Accident involvement among learner drivers: an analysis of the consequences of supervised practice. Accident Analysis and Prevention, 35(5): 725–730. https://doi.org/10.1016/S0001-4575(02)00051-9

Speeding and restraint use in crashes: fresh insights from event data recorders (EDRs)

Martin Elsegood[a], Sam Doecke[a], Giulio Ponte[a]

[a]The Centre for Automotive Safety Research

Abstract

Event data recorders (EDRs) are installed in many modern vehicles and, in the event of a crash, record driving data such as travel/impact speed, Delta-V and restraint usage. EDR data was collected from 312 crashed vehicles in South Australia during 2017 and 2018, and 238 of these could be matched to police reports. An analysis on speeding and seatbelt usage showed that 27% of free-speed vehicles were speeding and indicated that seatbelt wearing rates in crashes is close to 97%. EDR data provides a more accurate indication of levels of speeding in crashes than available from police reports alone.

Background and Aim

Speed is known to be a key factor in the incidence and severity of crashes (Kloeden, McLean, Moore & Ponte, 1997; Elvik, 2013) but traditional reconstruction methods to calculate vehicle speed in a crash are resource intensive and vary in reliability, therefore, imposing limitations.

Increasingly, modern vehicles are being equipped with event data recorders (EDRs) that document crash and pre-crash driving data including travel speed and seat-belt usage.

The aim of this study is to gain fresh insights into speeding rates and seatbelt use in crashes using EDR data.

Method

EDR data from crash-involved vehicles were collected during 2017 and 2018, matching the vehicles to police crash reports where possible to provide crash details. The vehicle data included in this study was obtained from crashed vehicles held at Pickles Auctions Pty Ltd (an organisation that auctions crashed vehicles). EDR data from fatal crashes obtained from the SAPOL Major Crash Investigation Section (MCIS) were also included in the study but were analysed separately due to the different sampling techniques. Further details on the data collection can be found in Doecke (2018).

Speeding was assessed for vehicles that were defined as free-speed vehicles if they met the following criteria.

- had right of way and was travelling through the intersection,
- was the striking vehicle in a rear-end crash,
- was either vehicle involved in a head-on crash,
- was a single vehicle crash, except on a sharp bend,
- was not making a significant manoeuvre or negotiating a roundabout.

Seatbelt use was assessed for any vehicle whose EDR recorded seatbelt use.

Results

A total of 312 EDR downloads were obtained, with 238 matched to a police report; 224 from Pickles, and 14 from MCIS.

Comparing data on all police reported crashes in South Australia in 2017 (Complete 2018 data was not yet available) from the Traffic Accident Reporting System (TARS), the EDR sample from Pickles was found to be representative in terms of injury severity, and broadly representative of speed zones, although 100 km/h zones were under-represented, which suggests an under-representation of rural crashes.

Figure 1 shows an example of an EDR readout and the locations of the crashes. The majority occurred in suburban Adelaide, but several occurred in the far corners of the South Australia.

Pre-Crash Data, -5 to 0 seconds (Most Recent Frontal/Rear Event, TRG 1)

Time (sec)	-4.9	-3.9	-2.9	-1.9	-0.9	0 (TRG)
Vehicle Speed (MPH [km/h])	53.4 [86]	53.4 [86]	51 [82]	42.3 [68]	26.1 [42]	11.2 [18]
Brake Switch	OFF	OFF	ON	ON	ON	ON
Accelerator Rate	Middle	OFF	OFF	OFF	OFF	OFF
Engine RPM (RPM)	1,600	2,000	1,200	1,200	800	400
Pre-Crash Data Status *	OFF	OFF	OFF	OFF	OFF	OFF

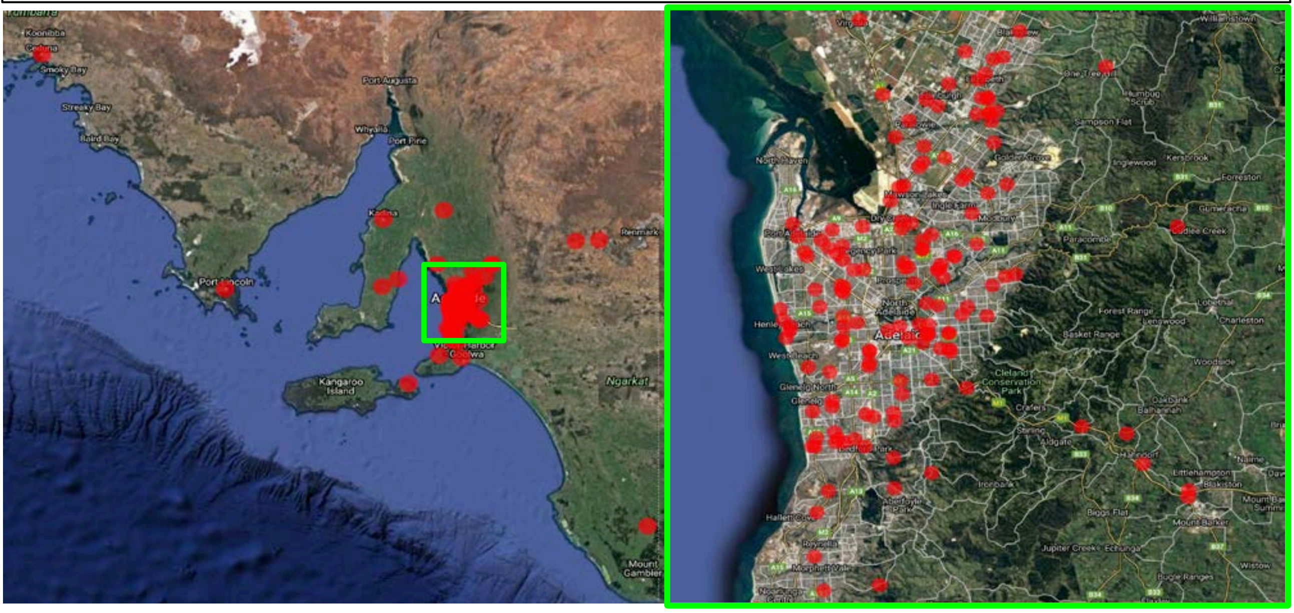


Figure 1. Example of EDR data obtained and locations of crashes for EDR vehicles downloaded at Pickles in South Australia and Adelaide suburban areas.

Due to the evolution of the EDR, each vehicle model and build year displayed varying data. Of the 224 matched cases from Pickles, 187 (83%) contained travel/impact speeds, 115 (51%) contained driver restraint usage data, and 58 (26%) contained front passenger restraint usage data. Of the 187 vehicles with a known travel speed, 126 were classified as free-speed vehicles, while 11 of the cases from MCIS were classified as being from a free-speed vehicle.

The number of free-speed vehicles speeding from the different EDR data sources are shown in Table 1, along with the number of crashes where police reported the main error as being excessive speed in TARS.

Table 1. Excessive speed as a crash error in TARS and free-speed vehicles speeding in EDR data.

Speeding	**TARS 2017 data**		**Free-speed vehicles from Pickles**		**Free-speed vehicles from MCIS**	
	Number	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*
Not Speeding	13238	100.0%	92	73.0%	6	54.5%
Speeding	0	0.0%	34	27.0%	5	45.5%
Speeding by 5 km/h+	-	-	24	19.0%	4	36.4%
Speeding by 10 km/h+	-	-	17	13.5%	4	36.4%
Total	13238	100.0%	126	100.0%	11	100%

EDR data from the Pickles' cases exposed three vehicle drivers (3%) being unrestrained, while no passengers were recorded unrestrained. EDR data from the MCIS cases showed two drivers (7%) were unrestrained, both resulting in fatalities.

Limitations

The sample size of the EDR data is small and so the result for percentage speeding is only considered preliminary. Rural cases may have been under-represented, and speeding is more prevalent on rural roads (Kloeden & Woolley, 2017); therefore, the percentage found to be speeding could be an under-estimate.

Conclusions

EDR data can provide objective data on speeding and seatbelt use and provides a more accurate indication of levels of speeding in crashes than available from police reports alone. Speeding in crashes was found to be common (27%), especially in the serious crashes investigated by MCIS (46%). Non-use of seatbelts in crashes was found to be a small number in all crashes (3%), but a concern (7%) in fatality crashes.

References

Doecke, S. (2018) *Using event data recorders and data matching to understand crashes: A pilot study*. Expert Symposium on Accident Research, Hannover, Germany, 19-20 May 2018.

Elvik, R. (2013). A re-parameterisation of the Power Model of the relationship between the speed of traffic and the number of accidents and accident victims. *Accident Analysis & Prevention*, 50, 854-860.

Kloeden, C. N., McLean, A. J., Moore, V. M., & Ponte, G. (1997). Travelling speed and the risk of crash involvement. Volumes 1 and 2 (CR172). Canberra: Federal Office of Road Safety, Transport and Communications.

Kloeden, C. N., & Woolley, J. E. (2017). *Vehicle speeds in South Australia 2016* (CASR144). Adelaide: Centre for Automotive Safety Research.

Child restraint misuse and injury outcomes observed in at-scene in-depth crash investigations in South Australia

Sam Doecke[a], Jeffrey K Dutschke[a]

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

Abstract

Twenty-three children aged 0-7 who were legally required to be in a child restraint were involved in accidents investigated as part of CASR's at-scene in-depth crash investigations between late 2014 and 2018. Correctness of child restraint use, injury outcomes and crash severity (Delta-V) were determined. Thirteen (57%) of these children were confirmed to be in an age appropriate restraint that had the top tether attached (if required). Three (13%) were in age inappropriate restraints. Six (26%) were in restraints without the top tether attached to the anchor. In a high Delta-V crash, the injuries were much more severe for a child in an untethered restraint compared to a tethered restraint.

Background

Child restraints have been shown to be highly effective in reducing injuries to child passengers in crashes (Henderson, 1994), but previous studies have found that incorrect use of child restraints is common in Australia (Koppel and Charlton, 2009; Brown and Bilston, 2007; Brown, Hatfield, Du, Finch & Bilston, 2010). An appropriate child restraint is one that is suitable for the size of the child. An appropriate child seat is defined by the age of the child in current South Australian law, but the sitting shoulder height of the child determines if the particular child seat is the appropriate for the child. Even with an appropriate child seat, both securing and installation errors are possible (Brown *et al.* 2010). Securing errors relate to the attachment of the child to the child seat. Installation errors relate to the attachment of the seat to the vehicle. Non-attachment of a top tether is one such installation error, and this error has been previously been observed in 1.5 to 7% of child restraints in vehicles (Brown *et al.* 2010; Koppel and Charlton, 2009).

The Centre for Automotive Safety Research's (CASR's) at-scene in-depth crash investigators immediately attend vehicle crashes that occur on public roads within 100 km of Adelaide, and for which an ambulance has transported at least one person. This paper describes the observations that could be made of child restraint appropriateness and fitment for children travelling in motor vehicles included in the in-depth investigations performed between late 2014 and the end of 2018.

Method

During CASR's routine in-depth crash investigations, if a child was known to be involved, or a child seat is observed, its type and fitment is recorded and photographed. Child 'securing' errors are not able to be observed with this methodology as children have usually been removed from the seat prior to CASR's arrival. In cases where the child restraint was removed prior to the arrival of CASR's investigators, non-attachment of the top tether could be deduced if an anchor was not fitted. Information on observed fitment is also obtained from emergency services and witnesses where possible. Age of the child was obtained from police reports, hospital notes and/or interviews. Hospital and ambulance notes provided injury information. The change in velocity was determined through computer aided simulation and/or downloading from event data recorders (Doecke, 2017).

Results

A total of 23 children aged under 8 years old were passengers in vehicles involved in crashes investigated between late 2014 and the end of 2018. The restraint use, injury data and crash details of these are shown in Table 1. One (4%) was not using any form of child restraint. Only 13 (57%)

of these children were confirmed to be in an age appropriate restraint that had the top tether attached (if required), three (13%) were in age inappropriate restraints, six (26%) were in restraints without the top tether attached to the anchor, and the age appropriateness and anchor status was unknown in one case. There were no cases where the child was in an age inappropriate and untethered child restraint. The proportion of children in untethered child seats in this dataset is much higher than the proportions observed in other studies (Brown *et al.* 2010; Koppel and Charlton, 2009).

Figure 1 shows the change in velocity (Delta-V) and the injury outcome, in terms of Maximum Abbreviated Injury Score (MAIS) is shown for the nine children involved in frontal crashes in this dataset. We observed one high delta V crash (86 km/h) where one child in a tethered child seat had a much lower MAIS than the child in the untethered child seat.

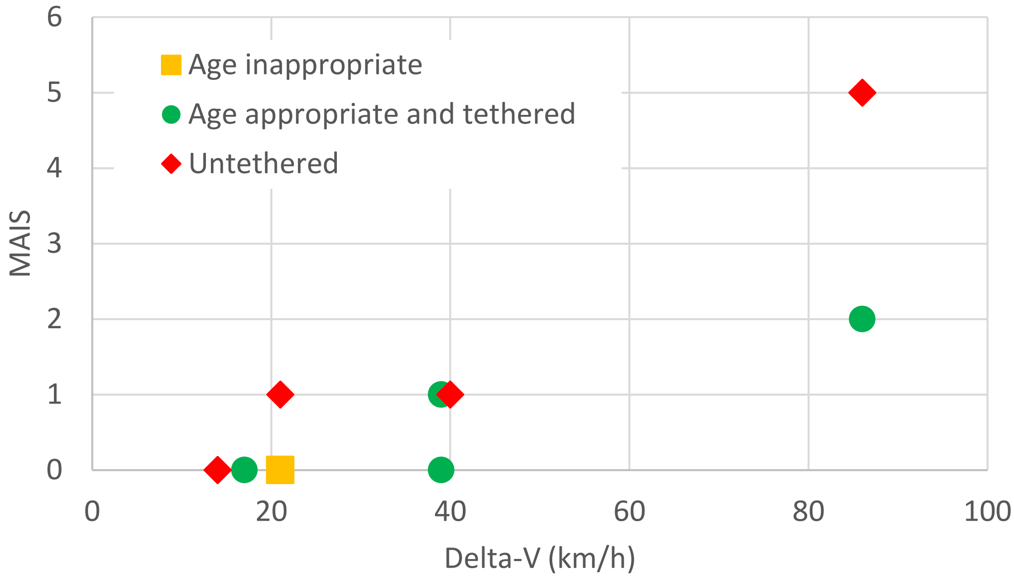


Figure 1. Change in velocity (Delta-V) and injury severity (MAIS) in frontal crashes with child passengers under eight-years-old, by child restraint (mis)use

Conclusion

Data on child restraint use in South Australia from CASR's at-scene in-depth crash investigations suggest that it is common for the top tether to not be attached to the anchor, and in a crash with a high Delta-V the injury outcome was much more severe for a child in an untethered restraint than for a child in a tethered restraint. Using an inappropriate restraint for the child's age was also observed in a number of cases.

References

Bilston, L., Du, W., Brown, J., 2011. Factors predicting incorrect use of restraints by children travelling in cars: A cluster randomised observational study. Injury Prevention 17, 91-96.

Brown, J., Hatfield, J., Du, W., Finch, C., Bilston, L., 2010. The characteristics of incorrect restraint use among children traveling in cars in New South Wales, Australia. Traffic Injury Prevention 11 391 — 398.

Doecke, S, 2017. Event Data Recorders (EDRs) in Australia: A New Source of Pre-Crash Speed and other Crash Data. Proceedings of the 2017 Australasian Road Safety Conference, 10-12 October, Perth, Australia. Extended Abstract only.

Henderson, M. 1994. An in-depth study of car crashes in which child occupants were injured. Child Accident Prevention Foundation of Australia.

Sjaanie Koppel & Judith L. Charlton (2009) Child Restraint System Misuse and/or Inappropriate Use in Australia, Traffic Injury Prevention, 10:3, 302-307.

Table 1. Restraint and injury details for children included in the study

Seat type	Age	Age appropriate?	Position	Tethered	Delta-V (km/h)	Impact direction	Injury severity	MAIS	Injury description
Rear facing CRS	0	Yes	RR	Yes	UK	Multiple	Hospital Admission	UK	Skull fracture with bleeding on brain
Rear facing CRS	0	Yes	CR	Yes	54	Side	Non-injury	0	NA
Rear facing CRS	1	Yes	LR	Yes	34	Rollover	Hospital Treated	1	Abrasion to foot
Forward facing CRS	0	No	CR	Yes	21	Front	Non-injury	0	NA
Forward facing CRS	1	Yes	CR	Anchor	86	Front	Hospital Admission	2	Fractured arm
Forward facing CRS	2	UK	LR	Yes	13	Rear	Non-injury	0	NA
Forward facing CRS	2	Yes	CR	Yes	20	Side	Hospital Treated	UK	UK
Forward facing CRS	3	Yes	LR	Yes	17	Front	Non-injury	0	NA
Forward facing CRS	3	Yes	LR	Ad-hoc	40	Front	Hospital Treated	1	Contusions
Forward facing CRS	3	Yes	LR	Yes	39	Front	Hospital Treated	0	NA
Forward facing CRS	3	Yes	LR	Yes	1	Pedestrian	Non-injury	0	NA
Forward facing CRS	3	Yes	LR	No	8	Side	Hospital Treated	1	Small laceration to lip
Forward facing CRS	4	Yes	RR	Yes	39	Front	Hospital Admission	1	Laceration above right eye
Forward facing CRS	4	Yes	LR	No anchor	86	Front	Hospital Admission	5	Spinal injury resulting in quadriplegia
Forward facing CRS	4	Yes	LR	UK	UK	Multiple	Hospital Treated	1	Seatbelt bruising
Forward facing CRS	UK	UK	LR	No	14	Front	Non-injury	0	NA
Forward facing CRS	UK	UK	RR	No	14	Front	Non-injury	0	NA
Forward facing CRS	UK	UK	LR	Yes	UK	Front	Hospital Treated	1	Contusions
Booster seat	2	No	RR	Unknown	UK	Front	Hospital Treated	1	UK
Booster seat	4	Yes	LR	No	21	Front	Hospital Treated	1	UK
Booster seat	UK	UK	LR	Yes	16	Side	Non-injury	0	NA
None	6	No	RR	NA	UK	Rear	Non-injury	0	NA
UK	1	UK	LR	UK	UK	Side	Hospital Treated	0	NA

UK = Unknown, NA = Not applicable

Dynamic Speed Management in a Managed Motorway Environment

Jimmy Liakos[a], Elizabeth Waller[b]

[a] Transurban [b]Transurban

Abstract

Transurban operates managed motorways, including Melbourne's CityLink which connects to public motorways in the north, south and west of the city. Managed motorways offer many benefits by optimising the network, enabling safe and reliable journeys for road users. Transurban implemented the Dynamic Speed Management Trial in 2018, increasing the default speed limit from 80 km/h to 100 km/h in off peak periods when deemed safe to do so. Baseline data including crashes, incidents and speed compliance were captured prior to the trial and continually measured during the trial. This extended abstract and presentation will report on the trial findings and learnings.

Background

In May 2015, VicRoads and Transurban announced that speed limits on sections of the Tullamarine Freeway would remain at 80km/h following the completion of the CityLink Tulla Widening (CTW) project. In order to add new lanes within the existing road corridor as part of the project, lane widths were slightly narrowed, which meant sight lines were reduced in the event of emergency braking so 80 km/h was the design speed limit.

As part of our ongoing customer focus and understanding that drivers wanted to enjoy the new lanes while travelling at the pre-upgrade speed of 100km/h, Transurban saw an opportunity to utilise the new technology installed as part of the project to dynamically and safely increase speeds during the off-peak.

Trial Description

After successful planning and collaboration with VicRoads, a six-month trial began in March 2018 to dynamically increase speeds from 80km/h to 100km/h on a 12.5km section of upgraded road between Bulla Road and the Bolte Bridge during the off-peak when safe to do so.

To ensure the trial was operating safely, the speeds were only increased to 100km/h when certain on-road conditions were met, including:

- Lower traffic volumes equal to, or less than, approximately 790 vehicles per hour, per lane, which typically occurs from 9pm to 6am. This figure was used having regard for traffic density levels (Level Of Service (LOS) B as defined in the Highway Capacity manual) to ensure vehicles have the ability to freely merge and change lanes as required.
- Dry weather such as no rain and no fog to ensure the safest conditions for braking and optimal visibility.
- No hazards on the road, including any planned roadworks or incidents.

Prior to the trial commencing, rates of crashes, incidents and speed compliance were captured as a baseline and were then measured throughout the trial. A comparison of the data before andduring the trial, showed no change with respect to crashes and incidents, whilst speed complaince increased from 60% to 92%.

An average of 182,747 minutes (3,045 hours) of travel time has been saved per month between Mar 2018 and Mar 2019. And customer feedback has been overwhelmingly positive with a highly favourabe net promoter score attached to the trial and positive feedback relating to safety.

Following the completion of the trial in September, and having consideration for the positive results and feedback, Transurban decided to continue the ongoing dynamic management of speeds on this section of CityLink, resulting in an efficient, reliable and safe journey for road users.

Conclusion

This paper will provide an overview of the motivation for, and the methodology and findings from the Dynamic Speed Management trial on CityLink, including a focus on speed compliance and the drive to challenge existing standards/guidelines.

About Transurban

Transurban builds and operates roads in Australia, the USA and Canada. Our vision is to strengthen communities through transport and our road safety strategic framework is underpinned by the safe system approach. Transurban reports on its road safety KPIs, including the rate of injury crashes, and commissions independent research and analysis to inform our operations provide a safe environment for people using our network.

How do we prevent and mitigate crashes? Evidence from Australian at-scene in-depth crash investigations

Sam Doecke[a], James Thompson[a], Chris Stokes[a]

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

Abstract

The Centre for Automotive Safety Research's conducts at-scene in-depth crash investigations in South Australia that allow detailed analysis of the crash in order to determine contributing factors to crashes and the interventions that could prevent or mitigate them. This initial analysis of such a dataset (n=116) showed that the most common contributing factors are human errors, but the interventions to prevent or mitigate the crashes are most commonly infrastructure treatments or vehicle technologies that eliminate the human error and/or reduce the vehicle's speed prior to impact in the event of a human error.

Method

The Centre for Automotive Safety Research's (CASR's) at-scene in-depth crash investigators attend and investigate vehicle crashes (Figure 1) that occur on public roads within 100 km of Adelaide, and for which an ambulance has transported at least one person. All attended crashes are thoroughly investigated including photographs and video of the vehicle and scene; data collection on the characteristics of the vehicle, environment and people; injury information from treating hospitals; a survey of the crash scene; a reconstruction of the crash; and interviews with the crash participants. A more detailed description of the methodology can be found in Doecke, Baldock & Woolley (2016). This method of data collection results in a highly detailed and accurate database of injury crashes that compliments the larger, but far less detailed, datasets based on routine police reports.

Figure 1. CASR crash investigation being conducted at a crash scene

All cases are then reviewed by CASR's multidisciplinary team of experts to determine the factors that contributed to the crash occurring. In the current series of crash investigations, beginning in late 2014, interventions (or treatments) that could have prevented the crash or mitigated its severity are also nominated by the case review panel along with a confidence level (high, medium, low) that the intervention would have prevented or mitigated the crash. Future interventions, such as autonomous vehicles, were not considered. This paper details and discusses the contributing factors and interventions from the first 116 crashes occurring between 2014 and 2017 reviewed in this manner.

Results

A brief summary of these 116 crashes is as follows:

- 5% Fatal, 36% Admitted to hospital, 58% Treated at hospital, 1% Unknown.
- 41% Rural, 59% Metropolitan
- 57% Speed zone 25-60 km/h, 19% Speed zone 70-90 km/h, 24% Speed zone 100-110 km/h
- 56% Mid-block, 44% Intersection
- 34% Single vehicle, 8% Pedestrian, 58% Multiple vehicles

The top ten contributing factors and interventions for prevention and mitigation with a medium or high confidence rating found from CASR's in-depth crash investigations are shown in Table 1. Most of the crashes involved at least one human factor (92%), and aalmost all the crashes (96%) were found to have applicable interventions.

Table 1. Top ten contributing factors, prevention interventions, and mitigation interventions found from CASR's at-scene in-depth crash investigations

Contributing factors	**Number**	**Percentage**
Human: fail to give way	43	37.1%
Human: speed too high for conditions	20	17.2%
Road: visibility	19	16.4%
Road: junction layout	14	12.1%
Vehicle: conspicuity	12	10.3%
Road: unsealed	12	10.3%
Human: recognition failure	12	10.3%
Human: exceed speed limit	12	10.3%
Human: Alcohol	10	8.6%
Human: Drugs	10	8.6%
Prevention interventions		
Roundabout	34	29.3%
Prevent right turn	29	25.0%
Traffic lights	23	19.8%
Electronic Stability Control (ESC)	20	17.2%
Apprehension for drink/drug driving offence	15	12.9%
Grade separated junction	15	12.9%
Autonomous Emergency Braking (AEB)	14	12.1%
Speed limit reduction	14	12.1%
Lane Keep Assist	12	10.3%
Controlled right turn at signalised intersection	8	6.9%
Mitigation interventions		
Speed limit reduction	21	18.1%
Autonomous Emergency Braking (AEB)	13	11.2%
Centre barrier	13	11.2%
Vertical deflection	10	8.6%
Side barrier	10	8.6%
Clear zone to guidelines	7	6.0%
Emergency Braking Assist (EBA)	5	4.3%
Intelligent Speed Assist - Limiting	5	4.3%
Total cases reviewed	**116**	**100%**

Note: Only 9 mitigation interventions are listed as several tied for 10th place

Limitations

The number of crashes investigated and reviewed is relatively low compared to the total number of injury crashes that occur in South Australia (≈4,000 per year) and so the results should be treated with some caution. CASR's in-depth crash investigation activity is ongoing; therefore, this sample size will grow in time and this analysis can be updated with a larger sample.

It should be noted that only limited consideration was given to the cost or practicality of a given intervention and potential negative safety effects on other crash types.

Conclusions

In-depth crash investigations allow detailed analysis of the contributing factors to crashes and the interventions that could prevent or mitigate them. This initial analysis of such a dataset showed that the most common contributing factors are human errors, but the interventions to prevent or mitigate the crashes are most commonly infrastructure treatments or vehicle technologies that are aimed at eliminating the human error and/or reducing the speed prior to impact in the event of a human error. Almost all the crashes could have been prevented or mitigated with currently available interventions.

References

Doecke, S. D., Baldock, M. R. J., & Woolley, J. E. (2016). *In-depth crash investigation in South Australia and its use in roadside safety research*. Expert Symposium on Accident Research, Hannover, Germany, 9-10 June 2016.

Process evaluation of the NSW Mandatory Alcohol Interlock Program

Rae Fry[a], Fiona Christian[b], Wendy Hodge[b], David Wakelin[b], Kerry Hart[b], Rebecca Wilkinson[a], Louise Higgins-Whitton[a], Anna Beck[a]

[a]Centre for Road Safety, Transport for NSW, [b]ARTD Consultants

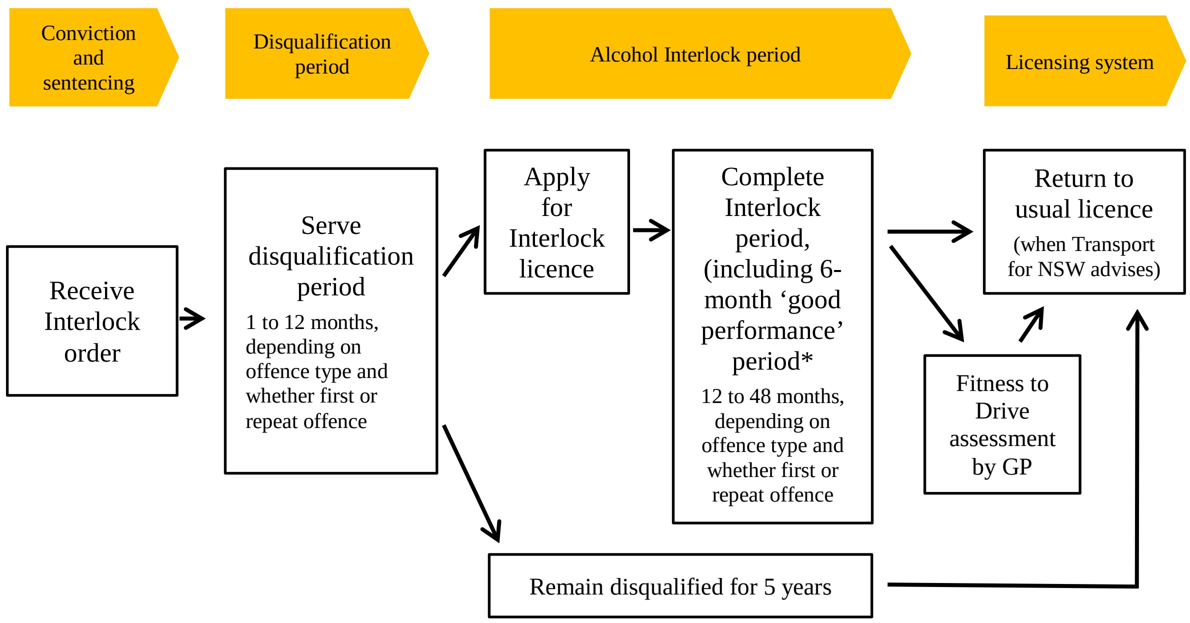
Abstract

A process evaluation of the NSW Mandatory Alcohol Interlock Program aimed to assess program implementation, improve program delivery and refine policy settings. The evaluation found the roll-out was an overall success and sentencing patterns reflected the intent of the legislation. Non-compliance offences were very low (<1%). The participant survey showed 82% of respondents approved of the program, though the take-up rate for the Interlock licence (54%) could be improved. Participants said that the Interlock licence helped them separate drinking from driving and maintain work and family commitments. However, the cost of the device was a common concern.

Background

The NSW Mandatory Alcohol Interlock Program (MAIP) is a court-ordered penalty for all drivers convicted of serious or repeat drink-driving offences. It involves a licence disqualification period followed by an Interlock period. During the Interlock period, a driver must only drive a vehicle installed with an alcohol Interlock device. If the driver takes up the Interlock licence, they may regain their usual licence at the end of the Interlock period. If the driver does not take up the Interlock licence, they remain disqualified for five years. MAIP includes strategies to encourage participants to seek medical help for alcohol problems.

The process evaluation covered the period from program commencement (February 2015) until September 2017.



* Performance is monitored during the Interlock period using data from the Interlock device. If drink drive attempts occur, the participant may receive a warning letter and referral for treatment for alcohol dependency.

Figure 1. Licensing flow chart for the NSW Mandatory Alcohol Interlock Program

Methods

Methods included analysis of de-identified administrative data (n=8500), surveys (n=341) and semi-structured interviews (n=21) with program participants, surveys with service agents (typically auto-electricians) who install and service Interlock devices (n=33), and semi-structured interviews with 30 stakeholders, including companies providing Interlock devices, general practitioners and solicitors.

Results

The evaluation found the roll-out of MAIP was an overall success. Court orders and sentencing patterns reflected the intent of the legislation — more than 70% of orders were for two years, which correlated with the most common offence, driving with a high-range concentration of alcohol. Charges for non-compliance with an Interlock order were very low at 0.8% of MAIP participants.

The participation rate could be improved. As at June 2017, 3,474 people had obtained their Interlock licence, 54% of the 6,376 people who were eligible to apply for the Interlock licence because they had finished their disqualification period (though some of those eligible may have gone on to obtain their licence after June 2017). There were no significant differences in participation by age group, gender or location. There was a trend for lower participation among Aboriginal people, but the difference was not statistically significant. The reasons behind the relatively low overall participation rates are not well understood as it proved difficult to contact those who had not taken up their Interlock licence.

Data from participants was limited to self-reported information from the 25% who responded to the surveys. Among these respondents, 82% approved or strongly approved of the program. Participants reported that MAIP was helping to separate drinking from driving, and this continued (at least in the short term) for the small number who had completed their Interlock licence at the time of the survey. Participants said the Interlock licence helped them maintain work responsibilities (64%) and family commitments (60%). Negatives included social embarrassment: just 18% of participants said the Interlock licence improved their social life compared to being disqualified from driving, while 34% said it was unchanged. There were also limitations for those who drive for work, such as being unable to drive multiple work vehicles. The cost of the Interlock device was a common concern, despite discounts for concession cardholders and extra subsidies for those experiencing severe financial hardship: 80% of respondents disagreed or tended to disagree that installing and maintaining the device was affordable.

Medical referral letters are sent to participants if they repeatedly attempt to use the car when they have alcohol in their system. Among survey participants who visited a doctor after receiving a letter, approximately one-third were referred to specialist alcohol treatment services for further assistance. A low total proportion of participants (3% to 7%) reported receiving specialist alcohol rehabilitation services as a result of medical referral.

The evaluation identified some areas where delivery could be improved. Better communication was needed about pricing structures for Interlock devices and how to obtain an Interlock licence. Simpler and clearer processes for accessing affordability provisions were also required. It was found that better functionality of IT systems would improve data availability for program monitoring. There were some gaps in availability of Interlock service agents in some areas of NSW.

Conclusion

The process evaluation provided valuable information as program implementation progressed. It confirmed that delivery was on track, that Interlock orders had been issued by the Courts as planned, and that Interlock devices were being supplied to participants and working effectively. Identification of some delivery issues led to improved business processes and more user-friendly materials for participants, including information about affordability provisions. IT system changes are underway. MAIP has now been expanded to include mid-range drink-driving first offences, and the expansion is likely to help fill geographic gaps in Interlock servicing. An outcomes evaluation is planned.

References

ARTD Consultants. (2018). Evaluation of the Mandatory Alcohol Interlock Program: Phase 1 Process Evaluation. Report for the NSW Centre for Road Safety, Transport for NSW, Sydney.

Exploring the prevalence of in-vehicle distraction in moving traffic: A pilot study

Giulio Ponte[a] and Lisa Wundersitz[a]

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

Abstract

Video from four locations around Adelaide was examined to code distracted behaviours of drivers moving in traffic. A total of 920 drivers were observed of whom 8.9% were engaged in one of 16 in-vehicle behaviors that were classified as a distraction. The more significant driver distractions included using mobile phones (2.5%), holding an object (1.8%) and eating or drinking (1.5%) while driving. This pilot study demonstrates that there is camera technology suitable for observing distracted driving behaviour among drivers in moving traffic on public roads in South Australia, which could potentially be deployed for a larger, more representative study.

Background

Observation of drivers while moving in traffic can provide objective information about the prevalence of specific distractions within the vehicle. Distracted behaviours include phone use, interaction with vehicle systems (e.g. navigation systems) or passengers and other behaviours such as eating, drinking and smoking. Recording video of drivers in traffic is a more covert means of obtaining data on driver distractions and allows observations of a larger number of vehicles compared to naturalistic studies, which generally use small numbers of instrumented vehicles. Given the risks associated with driver distraction and the potential increase in technology-related distractions, the development of a methodology to monitor driver distraction over time is important for identifying trends (and potential solutions) for such behaviours.

Method

Four elevated locations were selected for the video camera observations. Elevated locations were used so that drivers could be observed (i) on their approach, from afar (ii) zoomed in to the driver's compartment directly from above and (iii) zoomed in from an angled perspective to capture the driver from an alternate view that might reveal the driver's distracted behaviours not captured in the other two views, or to confirm a behaviour captured from an alternate view.

The video recording of traffic, and a majority of the coding was undertaken by One Task Behaviour Analytics, who specialise in this field of work. Around 90 minutes of video footage was recorded at each location. For each period of recorded video footage, a 30-minute observation period of video was selected and used in the analysis of distracted behaviours.

Results

In the two-hour sample period across the four sites, there were 920 drivers observed, of whom 8.9% (n=82) were engaged in distracted behaviours. Table 1 below shows the number of observed distractions at each location. Twenty-three drivers (2.5%) were observed engaging in mobile phone use while driving.

Table 1. Driver distractions coded at each location

Distraction	1	2	3	4	Total	Per cent
1. Mobile phone - Talking (phone to ear)	-	-	-	1	1	0.1%
2. Mobile phone - Active touching (texting etc)	-	-	1	1	2	0.2%
3. Mobile phone - Hands-free (touching in cradle)	-	1	4	-	5	0.5%
4. Mobile phone - Holding	1	-	6	-	7	0.8%
5. Mobile phone – On lap (passive)	1	3	2	2	8	0.9%
6. Touching navigation system /other tech	-	-	-	-	-	0.0%
7. Adjusting controls	1	1	-	1	3	0.3%
8. Wearing headphones	1	-	3	4	8	0.9%
9. Eating/drinking	1	3	6	4	14	1.5%
10. Smoking	-	2	1	3	6	0.7%
11. Searching for (or holding) object	3	6	5	3	17	1.8%
12. Reading	-	-	-	-	-	0.0%
13. Grooming (& looking away)	-	-	-	1	1	0.1%
14. Attending to/touching passengers or animals	1	2	-	-	3	0.3%
15. Likely/possible distraction (nature unknown)	1	-	3	1	5	0.5%
16. Other	1	1	-	-	2	0.2%
No Distraction	123	320	294	101	838	91.1%
Total	134	339	325	122	920	100.0%

The most frequently observed distracted behavior, aside from mobile phone use, was searching for, or holding an object (1.8%); eating/drinking (1.5%) and wearing headphones (0.9%). Five drivers (0.5%) were assessed as being distracted from driving but the nature of the distraction could not be ascertained.

Of the 82 drivers who were observed as being distracted, 61 (74.4%) were male, 18 (22.0%) were female and in three observations the gender could not be determined. Examples of driver distractions extracted from the video footage are shown in Figure 1.

Figure 1. Examples of driver distractions. The top three images show 'Mobile phone – holding' for the same driver as seen in the three different camera views. The bottom three images show various examples of 'Eating/drinking' and 'Smoking'.

Conclusion

This pilot study has demonstrated that there is technology that is suitable for observing distracted driving behaviour among drivers in moving traffic on public roads. The method used provides a reasonably objective snapshot of distracted behaviour, although some judgement is required when viewing the footage. The observation and coding processes are quite labour intensive but it is anticipated that this will decrease as the technology progresses through automated detection, machine learning and artificial intelligence. A larger study will need to be undertaken to achieve a more representative snap-shot of in-vehicle distractive behaviours.

Use of the Safe System Assessment Framework as a Safety Key Performance Indicator

Brayden Capper[a], Ben Matters[b], Lisa Steinmetz[a], Blair Turner[a]

[a]Australian Road Research Board, [b]Major Road Projects Victoria

Abstract

As part of the Northern and South-Eastern Suburban Roads Upgrade packages Major Road Projects Victoria has sought to incorporate road safety metrics into the design review process. The Australian Road Research Board employed the Safe System Assessment Framework to meet this need. Thirteen road project reference designs were assessed to provide baselines scores. Once received, respondents' concept designs will be likewise assessed to provide a comparative metric of road safety performance. This work provided an extension in use of the Safe System Assessment Framework as well as insights into current gaps in road safety design practice.

Background

Major Road Projects Victoria (MRPV) engaged the Australian Road Research Board (ARRB) to undertake Safe System Assessments (SSA) of reference designs for 13 projects as part of the Northern and South-Eastern Suburban Roads Upgrade packages.

The Safe System Assessment Framework is a practitioner assessment tool to assist in the methodical consideration of Safe System objectives in road infrastructure projects. The tool was developed by ARRB for Austroads (2016).

For this package of projects, SSA were undertaken for each reference design to ascertain a baseline level of safety. This will enable a quantitative safety assessment to be undertaken of concept designs received by MRPV (for each of the 13 projects) against the reference designs.

Methodology

The assessments that were undertaken for this project were an extended rapid SSA that was conducted in accordance with the VicRoads Safe System Assessment template (VicRoads 2018) and Austroads Safe System Assessment Framework (Austroads 2016). The assessments focused on the reference designs in order to provide a baseline assessment for which submitted designs will be compared. These assessments did not reference existing conditions as the project intent was to provide insights into safety aspects of the baseline reference designs rather than the existing conditions. This approach of risk identification presents the opportunity to focus efforts on areas where the greatest safety improvements, for subsequent concept designs, are able to be gained.

In undertaking the SSA, various design elements within each project were grouped into midblock and intersection stereotypes. The SSA scores were aggregated to provide an overall baseline score for each project to allow direct comparison between respondents' concept designs and baseline reference designs.

Outcomes

Although the project's focus was to produce metrics to enable comparison of the road safety of concept designs to baseline reference designs, another useful outcome was the large amount of knowledge produced on the Safe System conformance of road design elements. This provides valuable insight into current road design standards conformance with Safe System principles and where – despite safety improvements overall – gaps still lie. In particular:

- Midblock design typically performed very well, particularly designs featuring elements such as high levels of access control, medians and flexible road safety barrier, which help manage vehicle conflicts and kinetic energy in the event of a crash.
- Intersection designs were typically assessed to be of higher-risk (which is common given the higher prevalence of crashes at conflict points), particularly high-speed, multi-lane cross- and T-intersections which expose road users to high-speed and right-angle type crashes.
- Vulnerable road users were often at higher risk, owing largely to their low biomechanical tolerance in the event of a crash.

Conclusions

The incorporation of SSA of designs into the tendering process brings consideration of road safety outcomes to the forefront of road infrastructure projects in a new and forward-thinking way that will ultimately result in improved visibility and consideration of the Safe System in future projects.

References

Austroads 2016 Safe System Assessment framework, AP-R509-16, Austroads, Sydney, NSW

VicRoads 2018, Full Safe System Assessment report template, VicRoads, Kew, VIC

Anatomy of a wire rope safety barrier impact

David B. Logan[a], Nimmi Candappa[a], Eliza Houghton[b]

[a]Monash University Accident Research Centre (MUARC), [b]Transport Accident Commission (TAC)

Abstract

Carriageway departure crashes make up a significant proportion of fatalities and serious injuries in regional Victoria. Wire rope safety barrier (WRSB) is a proven countermeasure, eliminating 80-90% of serious trauma when fully installed. To demonstrate its life-saving benefits, the TAC staged a ‘typical’ fatigue-related crash on a public road under controlled conditions, driving a passenger vehicle into a WRSB at 87km/h at a 7-degree angle, while filming and making measurements. The vehicle was effectively contained by the WRSB, disengaging at 46km/h with decelerations well within tolerable levels. The test demonstrated the effectiveness of WRSB and will be used to validate future simulations aimed at improving WRSB design.

Background

From 2012-2016, an average of 78 vehicle occupants were killed and 520 hospitalised annually in run-off-road and head-on crashes in regional Victoria, equating to half of road fatalities and one-quarter of serious injuries in country areas. Wire rope safety barrier (WRSB) is a proven Safe System solution to this issue (Candappa, Corben, D’Elia and Newstead, 2011), eliminating 80-90% of fatalities and serious injuries when installed on both sides and centre of the road.

Under Victoria’s *Towards Zero Strategy and Action Plan 2016-2020*, a large-scale rollout of WRSB was planned for Victoria’s most high-speed, high-risk roads. To demonstrate its life-saving benefits, the TAC recreated a ‘typical’ fatigue-related carriageway departure crash with a car being filmed driving into WRSB under controlled conditions for a public education campaign.

Method

A 2012 Ford Territory was driven along a centerline barrier-equipped section of the Midland Highway near Shepparton. The four-wire section (2m post spacing) was 760m long, with impact 200m from the west end. The driver directed the vehicle into the barrier at 90km/h and 7-degree impact angle, representing typical rural fatigue crash conditions from MUARC real-world studies. Upon impact, the driver took his foot off the accelerator and allowed the vehicle to run for 2s before braking to rest.

Three load cells were fitted on the top, second and fourth wires to measure wire tension during the impact. Triaxial accelerometers were mounted at the centre-of-mass of the vehicle and on the driver’s helmet.

The event was captured with seven cameras at 100-800 fps (4-32x actual speed).

Results

Initial barrier contact occurred at 24.2ms^{-1} (87.2km/h). The vehicle collapsed 17 posts before disengaging at a speed of 12.8ms^{-1} (46.1km/h), 36m and 2.25s later (Figure 1). Mean deceleration for the event was 5.1ms^{-2}, peaking at 8.5ms^{-2}.

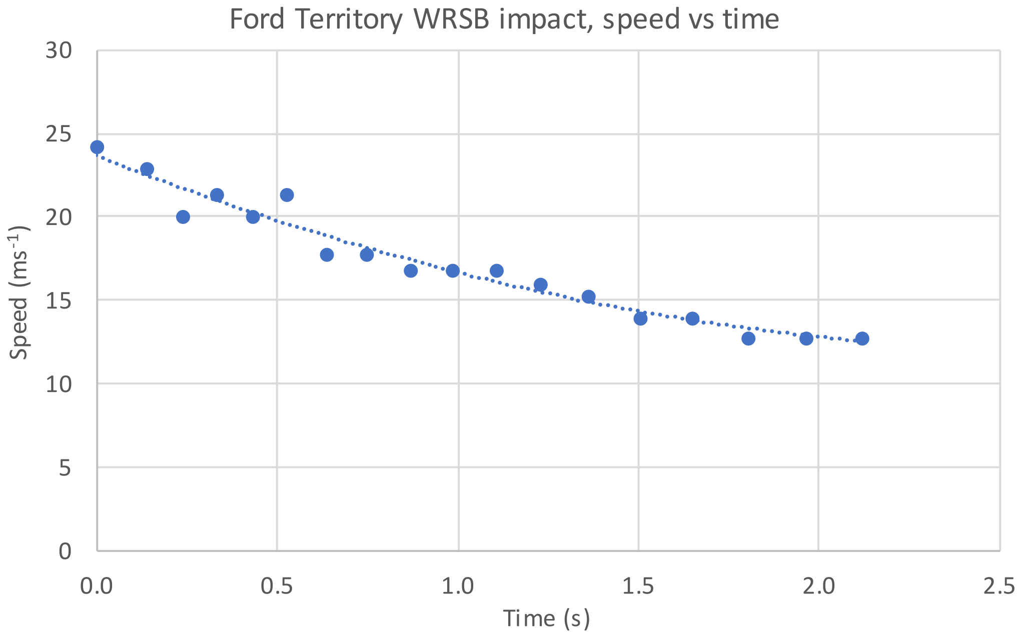


Figure 1. Vehicle speed vs time from barrier contact to separation

The barrier successfully captured the vehicle, with only 600mm lateral excursion. The centre brake light was seen to activate throughout, indicating stability control intervention, with the braking forces applied by the ESC likely increasing the overall deceleration rate. Against instructions the driver had steered gently into the barrier for visual effect. The camera showed a quarter-turn of steering from 0.29s until 1.16s. He stopped 1.5m laterally off the barrier. Vehicle damage was largely superficial, with a fluid leak and the engine not able to be restarted after the test. The passive safety systems were undeployed.

The barrier wires were tensioned to around 25kN pre-test as recommended by the Ingal representative. During the event, bottom wire tension peaked at +6.7kN (at 0.12s). The corresponding figures for the middle and top wires were 4.2kN (0.16s) and 3.6kN (at 0.26s).

The acceleration time series collected from the vehicle and driver had some anomalies that are still to be investigated.

Conclusion

This test clearly demonstrated that WRSB was highly effective in containing a modern vehicle of typical mass and ride height at a speed and impact angle commensurate with a fatigue-related carriageway departure crash. An associated PhD project will use this experiment as a validation sample for a model being developed to facilitate the simulation of a wider range of barrier impacts and provide guidance for improving WRSB design.

References

Candappa N., D'Elia A., Corben B. and Newstead S., 2011. Wire Rope Barrier Effectiveness on Victorian Roads. *Proceedings of the Australasian Road Safety Research, Policing and Education Conference*. 1-2 September, Melbourne.

Effectiveness of the Rural Junction Activated Warning System (RJAWS): Case Study-South Australia

Amit Dua [a] & Bojeen Brifkani [b]

Road Safety Directorate, Department of Planning, Transport and Infrastructure, South Australia

Abstract

In 2018, the Department of Planning, Transport and Infrastructure completed the trial project of installing rural junction activated warning system (RJAWS) at four rural intersection locations in SA. The RJAWS is an innovative road safety treatment designed to reduce the speed of traffic on the main road by the presence of side road traffic to provide advanced warning to reduce the likelihood and severity of a crash at an intersection. The speed decrease has been chosen in consideration of the Safe Systems approach. The selected locations were identified as high risk locations and these locations would normally require significant and costly work to treat the locations otherwise. Before and after speed study indicates that the system is effective in reducing the speed limit on the intersection approaches although more data analysis is required to confirm that which is currently underway.

Background

Rural Junction Activated Warning System (RJAWS) originates from Sweden and has been more recently trialed with success in reducing likelihood and severity of crashes in New Zealand (Hamish et al., 2017 & Nygårdhs & Helmers, 2007). Building safer roads and intersections by applying safe systems is a strategic priority under the South Australia's Road Safety Strategy 2020. It has been found that 31% of fatal and serious injury crashes (based on 2013-17 crash data) in South Australia occurs at rural intersections (DPTI, road crash data) and the main causes are the improper judgement of gaps when exiting from a side road onto a major road.

The RJAWS is a trial project which involved installing Variable Speed Limit Signs (VSLS) at intersection approaches to reduce the speed limit (from 100 to 70km/h and 80 to 50km/h) on the major rural road for a short section by several hundred meters which are triggered by the presence of side road traffic to provide advanced warning to drivers on the main road. The reduction in speed increases the gap time between the vehicle turning right onto the major rural road (or crossing the major rural road) and the oncoming traffic.

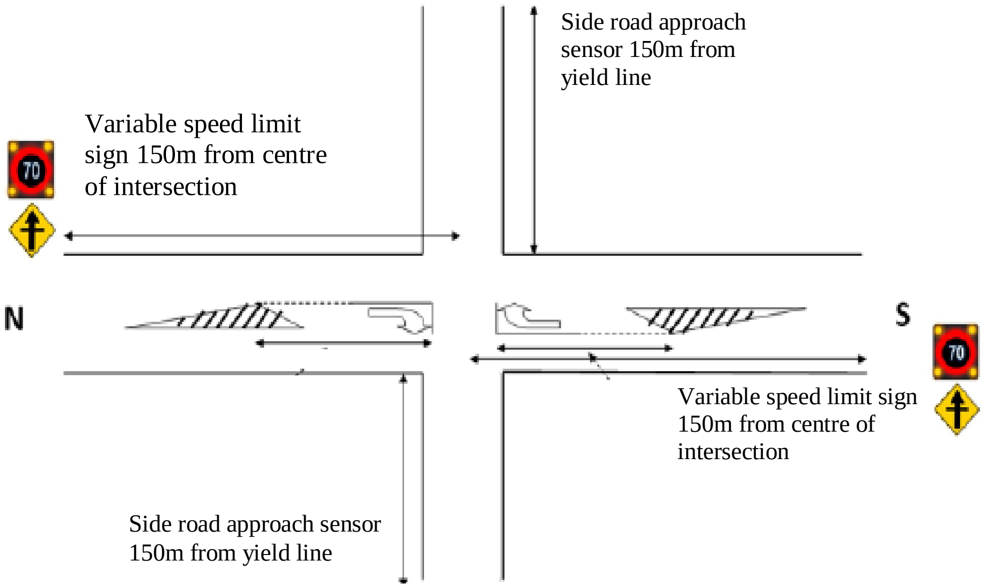


Figure 1: General Set-up of the Rural Junction Active Warning System.

The speed decrease has been chosen in consideration of the Safe Systems approach. The speed limit drop was significant to achieve the safe intersection sight distance (SiSD) at the intersection approaches. The decrease of 30km/h is also likely to reduce the severity of crashes at the junctions. Once the radar trigger the VSLS sign with the presence of a vehicle on the side road, the signs will then be triggered again by a sensor at the junction when the vehicle has moved across the junction and the VSLS will turn off following a time period of 10 seconds (nominal), refer to Figure 1.

The locations that required this type of treatments were carefully investigated and chosen by a number of factors such as restricted sight distance, crash history, speed limit and high cost of realignment. The four rural intersection locations identified for the trial were:

- Cudlee Creek Road / Fox Creek Road
- Bull Creek Road / Paris Creek Road
- McLaren Flat Road / Baker Gully Road
- Horrocks Highway / Stradbrooke Road

Prior to this trial, the intersection of Cudlee Creek Road and Fox Creek Road with a history of serious injury crashes was treated with another innovative treatment in 2017 which was ineffective to improve the safety at the location. McLaren Flat Road and Baker Gully Road intersection also has insufficient sight lines and had a fatal crash in 2015.

The system was installed on all four locations and activated by January 2019.

Before and after speed limit surveys were conducted at the four intersections locations to evaluate the effectiveness of the treatment. Preliminary data investigation for Bull Creek Road and Paris Creek Road intersections has shown that the mean speed on the approaches of the intersection is dropped by approximately 5km/h and 7km/h for the southbound and northbound traffic lanes, respectively, and the percentage of vehicles exceeding the original speed limit on the main road has decreased from 3% to 1.4%.

The Speed Frequency Histograms of the post-installation survey have also shown a new peak at approximately 45-55km/h, as shown in Figure 3 below, which represents that motorist are slowing down when the Variable Speed Limit Sign has been activated. Figure 2 below shows the Speed frequency Histogram of the data collected prior to the installation of VSLS. The analysis of the speed limit data collected for other locations are currently underway and would be presented in the conference.

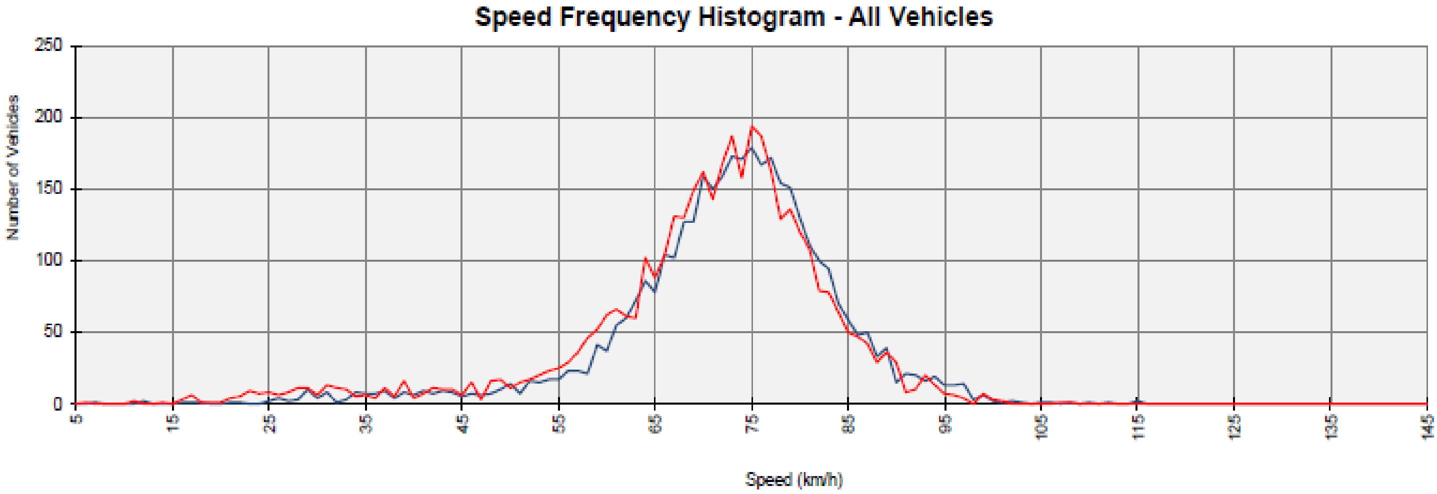


Figure 2: Speed limit survey conducted prior to the installation of VSLS.

]

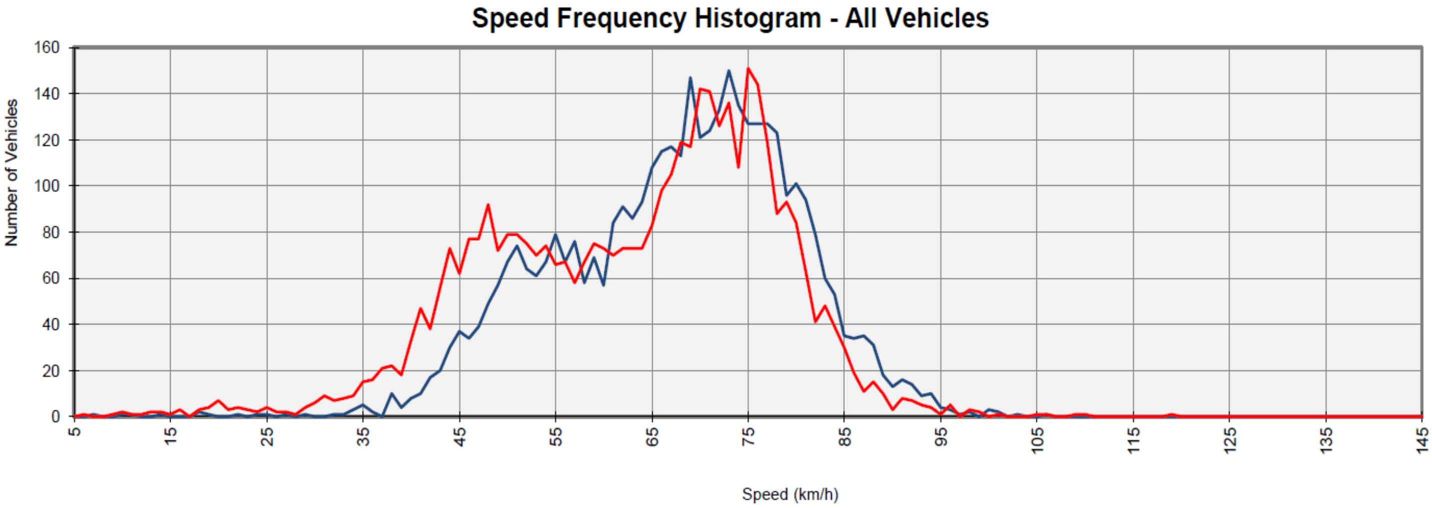


Figure 3: Speed limit survey conducted after the installation of VSLS.

References

Nygårdhs, S., & Helmers, G. (2007). VMS–Variable Message Signs: A literature review. Retrieved from Linköping, Sweden:

Mackie, Hamish & Brodie, Colin & Scott, Richard & Hirsch, Lily & Tate, Fergus & Russell, Murray & Holst, Ken. (2017). The signs they are a-changin': Development and evaluation of New Zealand's rural intersection active warning system. Journal of the Australian College of Road Safety. 28. 11-21.

Use of Spatial Analysis Techniques to Identify Statistically Significant Crash Hots Spots in Metropolitan Melbourne

Elizabeth Hovenden[a], Gang-Jun Liu[b]

[a]Department of Transport, Melbourne, Australia, [b]RMIT University, Melbourne, Australia

Abstract

Traditional statistical techniques have limitations in analysing crashes as these techniques assume spatial independence and stationarity. Crashes break these assumptions as they tend to cluster at specific locations (spatial dependency) and vary from one location to another (non-stationarity). Several spatial statistical methods were used to examine crash clustering in metropolitan Melbourne, including the Getis-Ord Gi* method which identified statistically significant crash clusters. Using this method, the degree, location and extent of clustering were found to vary for different crash categories, with fatal crashes exhibiting the lowest level of clustering and bicycle crashes exhibiting the highest level of clustering.

Background

Understanding where, when, what type and why crashes are occurring can help in determining the most appropriate initiatives to reduce road trauma. As crashes are influenced by spatial factors (Loo & Yao, 2012), spatial statistical analysis techniques are better suited to analysing crashes than traditional statistical techniques (Gudes, Varhol, Sun & Meuleners, 2017). Traditional statistical techniques assume spatial independence and stationarity, however crashes exhibit spatial autocorrelation (spatial dependence) clustering at specific locations such as on vertical and horizontal curves (Mohaymany, Shahri & Mirbagheri, 2013) and they exhibit non-stationarity, varying from one location to another. Failure to account for spatial autocorrelation can lead to interpretation errors (Getis & Ord, 1992).

Method

Several spatial statistical tools from the Esri ArcGIS 10.3.1 for Desktop software package were used to examine crash clustering in metropolitan Melbourne, including the Spatial Autocorrelation (Morans I) tool to explore clustering of crashes globally (for the entire study area), Kernel Density Estimation (KDE) to identify areas with a high density of crashes and the Getis-Ord Gi* hot spot analysis method to identify statistically significant casualty crash hot spots. Police-reported casualty crash data for the 2012 to 2016 period were used in the analysis. The crash data was segmented by year, time-period, crash severity, crash type and vehicle type and the Global Moran's I method was used to investigate global clustering and the Getis-Ord Gi* method was used to identify statistically significant casualty crash hot spots for the different categories. The output from the Getis-Ord Gi* analysis was overlaid with land use and road classification data.

Results

The Global Moran's I statistic identified statistically significant global clustering for 2012-2016 metropolitan Melbourne casualty crashes and for each of the crash categories with the exception of fatal crashes and crashes involving certain vehicle type (light commercial vehicles, buses and trams), indicating a random global pattern for each of these four crash categories. This method, however, was unable to identify if there was clustering at a local level, nor where the clustering occurred.

Although the Kernel Density Estimation method identified areas with a higher density of crashes, it was unable to identify whether the clusters were statistically significant. This method was therefore not used for the analysis of the individual crash categories.

The Getis-Ord Gi* method was able to identify local crash clustering and indicate whether the clustering was statistically significant or not. This method identified that only 15.7 per cent of casualty crash locations in metropolitan Melbourne had statistically significant hot spots at the 95% confidence level. It also found that the degree of clustering, as well as the location and extent, varied for the different crash categories, with fatal crashes exhibiting the lowest level of clustering (1.8%) and bicycle crashes exhibiting the highest level of clustering (22.5%). For example, locations with hot spots clusters include the Melbourne Central Business District (CBD) and its surrounds, and high activity areas such as Dandenong and Footscray. Bicycle crash hot spot clusters were mainly located along popular bicycle routes, including the CBD. Heavy vehicle crash hot spot clusters, on the other hand, were mainly located around industrial areas. Investigation of temporal factors has shown that some crash clusters are persistent from year to year, some only occur in one year and not in other years, others decline over time whilst others emerge over time.

Overlaying the results with other spatial data such as land use and road classification found that hot spot clusters were located in areas with a higher proportion of commercial land use and a higher proportion of arterial and sub-arterial roads compared to the total metropolitan Melbourne area.

Conclusion

Spatial analysis techniques can help with understanding where, when, what and why crashes are occurring. This understanding is important for developing initiatives to target road trauma and ensuring that the right interventions are applied in the right locations. The use of spatial statistical analysis techniques can lead to more effective remedial treatments as they enable statistically significant crash clusters to be distinguished from random crash locations. An understanding of how hot spot locations have changed over time is important for efficient allocation of resources by ensuring effort is put into persistent and emerging clusters rather than declining clusters. Knowing which clusters are emerging can allow early intervention and prevent further injuries and fatalities.

References

Getis, A. & Ord, J.K. (1992). The Analysis of Spatial Association by Use of Distance Statistic. Geographical Analysis, 24(3), 189–206. doi: 10.1111/j.1538-4632.1992.tb00261.x

Gudes, O., Varhol, R., Sun, Q.C. & Meuleners, L. (2017). Investigating articulated heavy-vehicle crashes in Western Australia using a spatial approach. *Accident Analysis and Prevention, 106,* 243-253. doi: 10.1016/j.aap.2017.05.026

Loo, B.P.Y. & Yao, S. (2012). Geographical information systems. In G. Li & S.P. Baker (Eds), *Injury Research: Theories, Methods, and Approaches*. (pp. 447-463). New York: Springer.

Mohaymany, A.S., Shahri, M. & Mirbagheri, B. (2013). GIS-based method for detecting high-crash-risk road segments using network kernel density estimation. *Geo-spatial Information Science, 16 (2),* 113-119. doi: 10.1080/10095020.2013.766396

A case study on raised intersection platform on urban arterial un-signalised intersection, South Australia

Jiban Sapkota and Amit Dua
Safety Strategy Section, Road and Marine Services
Department of Planning, Transport and Infrastructure, South Australia

Abstract

With growing safety concerns for cyclists and pedestrians at metropolitan intersections the Department of Planning, Transport and Infrastructure, South Australia, has committed to trial raised intersection platform as a part of a demonstration project. The objective was to reduce the chance of occurrence of vehicles side impacting (right angle and right turn crashes) cyclists or pedestrians at intersections and also to reduce the severity outcomes in the event of crashes occurring. Raised platform force motorists to slow down when approaching and exiting the intersection. The trial was implemented at only location is the first of its kind on an arterial road in South Australia at the un-signalised intersection of The Parade West and Rundle Street in Kent Town.

This study involved before and after comparison of data collected such as speed, traffic, and casualty crashes at treated sites after the platform was installed. There was not much time lapse after treatment, therefore casualty crash rates and crash types by road users group were compared to quantify the safety benefit. This study also involved an observation survey at the site and analysing complaints registered in the department after treatment to see if any unusual events are occurring or likely to occur in future.

Speed data analysis shows that the trial was successful in decreasing the speed of the traffic approaching intersection. On average, mean speed decreased from 37.2 km/h to 26.6 km/h and the 85th percentile speed decreased from 47.9 km/h to 34.0 km/h. Likewise, no serious injury crashes between vehicle-cyclist were reported since its installation as compared to two crashes during before period.

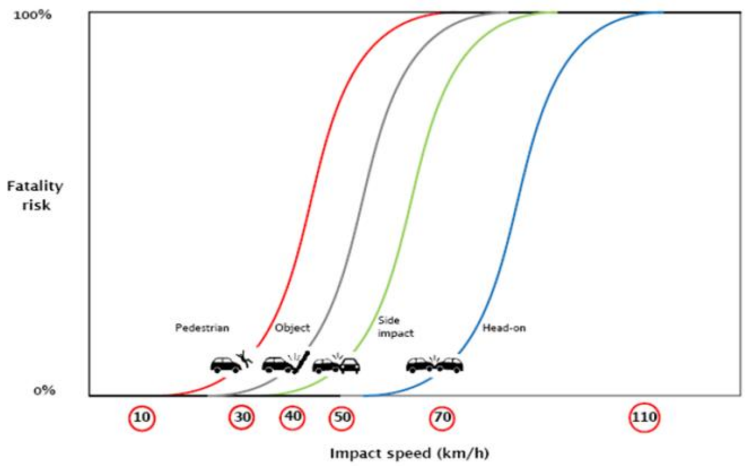
The project was successful to reduce the approaching speed limit on the intersection close to the survivable speed of 30km/h; outcomes of this study could be replicated at intersections where cyclist or pedestrian movements are high and their safety is critical.

Introduction

Almost half of all serious casualty crashes in metropolitan area occurred at intersections. Side impact collisions are a common occurrence at intersections and typically result from Right Angle and Right Turn type crashes. These crash types are proven to be the most predominant type resulting in serious injury crashes at intersections.

The Safe System approach recognised that in the event of a crash, the impact forces are within the boundaries of human tolerance. Figure 1 illustrates the estimated crash impact speeds based on the safest vehicles, where the forces are likely to exceed the tolerance of a human body and where chances of survival decrease rapidly beyond this impact speed. Safe System speed thresholds for car/pedestrian or cyclist crashes and car/car (side impact) crashes are 30 km/h and 50 km/h respectively.

Figure 1: Safe System speed threshold for crash types



IMPACT SPEEDS ABOVE WHICH CHANCES OF SURVIVAL DECREASE RAPIDLY		
Crash Type	Impact Speed	Example
Car/Pedestrian or Cyclist Car/motorcyclist	30 km/h	Where there is a mix of vulnerable road users and motor vehicle traffic..
Car/Pole or Tree	40 km/h	Where unprotected road hazards exist within defined clear zone.
Car/Car (Side impact)	50 km/h	Where there is a likelihood of side impact crashes (eg, intersections or access points).
Car/Car (Head-on)	70 km/h	Where there is no separation between opposing traffic streams

Source: Fact Sheet, RTA, NSW, 2011

There are many effective innovative treatments to reduce speed at intersections to achieve a safe environment for all road users. However, after considering and analysing the situation the Department of Planning, Transport and Infrastructure (DPTI) planned to install and evaluate the effectiveness of the raised intersection platform at an urban un-signalised intersection as a demonstration project.

Raised intersection platforms are similar to speed humps, with the key difference being that the elevation of the entire intersection is raised. Raised platforms are also effective in highlighting the presence of intersections and lowering vehicle speeds through the intersection. Reducing speeds closer to 30 km/h at intersections increases the chances of survivability of most vulnerable road users' (i.e. pedestrians and cyclists) in the event of crash.

This treatment has already been used in Europe and Australia. Studies have shown that the installation of intersection platforms has the potential to reduce the number of crashes by 20-60% and the number of casualties by 25% - 80%.

Background

The project was proposed at the un-signalised intersection of The Parade West and Rundle Street in Kent Town. The Parade West meets Rundle Street forming a T-intersection. The posted speed limit for both roads is 50 km/h. Before and after plan view of the treated site is shown in Figure 2. Rundle Street is a key route for cyclists to and from the Adelaide CBD.

Figure 2: Plan view of intersection before and after platform was installed

This project is a result of one of the actions listed in South Australia's Road Safety Action Plan 2013-16 to install and demonstrate infrastructure treatments that support lower travel speeds and improve the safety of pedestrians and cyclists. The main objective of the project was to reduce the speed of traffic approaching the intersection thereby creating a safe speed environment (as close as possible to 30 km/h as defined in the Safe System speed threshold) for pedestrians and cyclists.

Method

Effectiveness of the raised intersection platform at this location was evaluated by considering various parameters into account such as speed and crashes before and after treatment, plus a site observation survey and analysis of any complaints registered within the department after construction.

Speed and traffic survey

Speed survey meters were placed at 50m and 100m from the centre of the intersection on both approaches of Rundle Street (bar of T-intersection) to compare speed profile before and after the platform was installed. In addition, traffic entering and leaving the intersection was also counted to see if drivers preferred to take an alternative route after construction. Figure 3 shows the locations of the speed meters installed on Rundle Street approaches.

Figure 3: Speed data collected locations on Rundle Street approaches

Speed information collected before and after installation were analysed and are presented in Table 1a and 1b. Table 1a consists of mean and 85th percentile speeds at 50m and 100m from the centre of the intersection on both Rundle Street approaches. On the western approach of Rundle Street at 50m, mean speed decreases from 35.4 km/h to 27.9 km/h, and 85th percentile decreases from 47 km/h to 35.2 km/h. Likewise, on the eastern approach of Rundle Street at 50m mean speed decreases from 39 km/h to 25.2 km/h, and 85th percentile speed decreases from 48.7 km/h to 32.7 km/h.

The average mean and 85th percentile (Table 1b) speed decrease on both approaches of Rundle Street at 50m are 10.7 km/h and 13.9 km/h respectively. Likewise, average decreases in mean and 85th percentile speeds at 100m are 2.9km/h and 2.8km/h respectively. Speed decreasing effects keep diminishing as vehicles move away from the platform ramp.

Table 1a: Before and after speed analysis

Site description		Before		After		Difference wrt Before case	
Approach	Survey locations	Mean Speed (Km/h)	85th Percentile (Km/h)	Mean Speed (Km/h)	85th Percentile (Km/h)	Mean Speed	85th Percentile
Western	50m west of The Parade West	35.4	47	27.9	35.2	-7.5	-11.8
	100m west of The Parade West	43.7	51.1	41.7	49.4	-2	-1.7
Eastern	50m east of The Parade West	39	48.7	25.2	32.7	-13.8	-16
	100m east of The Parade West	41.1	49.7	37.3	45.9	-3.8	-3.8

'-' sign indicates reduction

The mean and 85th percentile speed of all vehicles passing through the intersection (at 50m offset from intersection) are 26.6 km/h and 34.0 km/h respectively.

Table 1b: Before and after speed of all vehicles through intersection

	Avg. drop in speed			Avg. speed after treatment	
	Mean Speed	85th Percentile		Mean Speed	85th Percentile
At 50m from The Parade West	-10.7	-13.9		26.6	34.0
At 100m from The Parade West	-2.9	-2.8		39.5	47.7

'-' sign indicates reduction

In addition, total vehicles travelling equal and 5km/h over the posted speed limit (50 km/h) were also compared. On average 109 veh/day travelling 5 km/h over the posted limit during the before period dropped to 4 veh/day in the after period. It is evident that speed compliance through the intersection is greater in the period after treatment.

Total vehicles entering and exiting the intersection were also surveyed and analysed. Data shows that vehicles passing through the intersection decreased by 5%; in contrast the total number of cyclists passing through the intersection increased by 12% after treatment. These variations could have occurred by chance and it could be validated by using control sites. However, it was not considered in this study.

Crash data analysis

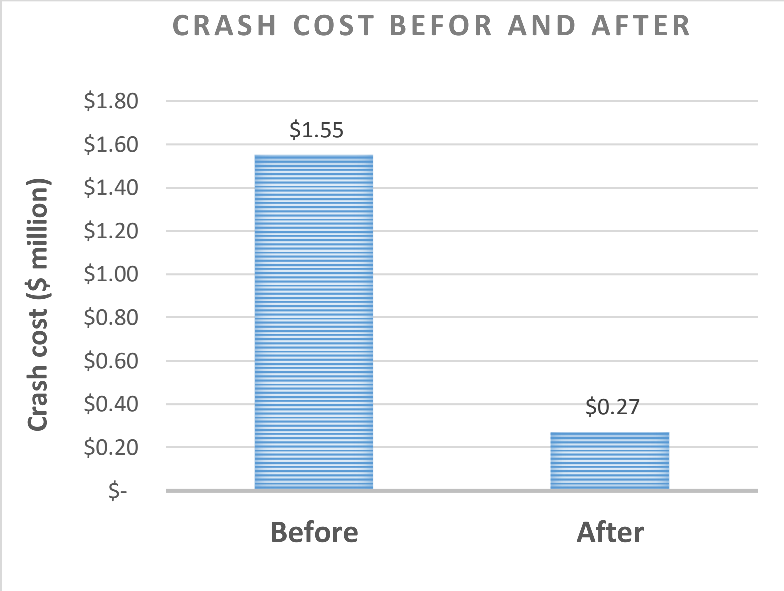
The raised platform project was completed in May 2015 and any crash that occurred during this month was discarded in quantifying the benefit of the treatment. In order to quantify crash savings, five year before and three and eight month (the longest possible time) after period crash rates were compared. Table 2 shows the casualty crashes by crash type before and after. There were 2.4 casualty crashes per year during the 'before' period and this increases to 2.7 casualty crashes per year in the 'after' period. However, no serious injury crashes were recorded in the after period compared to two crashes in the before period. There is an increase in the number of total casualty crashes, however crashes resulted in lower severity outcomes. This is demonstrated in Table 3 by comparing total casualty crash cost before and after. Total crash cost of $1.55 million during the before period decreased to $0.27 million in the after period with total savings of $1.28 million so far.

Table 2: Before and after casualty crashes by crash type

Crash type	5 year before				3 year 8month			
	Fatal	Serious injury	Minor	Total	Fatal	Serious injury	Minor	Total
Right Turn		1	5	6			5	5
Right Angle		1		1			1	1
Rear end			4	4			2	2
Side swipe			1	1			1	1
Roll over				0			1	1
Total	**0**	**2**	**10**	**12**	**0**	**0**	**10**	**10**
Per year	**0**	**0.4**	**2**	**2.4**	**0**	**0**	**2.7**	**2.7**
			% reduction		**-**	**-100%**	**37%**	**14%**

*- sign indicates reduction in number

Table 3: Crash cost before and after



Before and after crash data were also analysed by road user group. Table 4 shows that vehicle with cyclist type of crashes are still occurring in the same ratio but are minor injury in nature.

There was only one crash recorded involving cyclist during the after period. The cyclist fell off a bike and the reason behind it was unknown. Since this crash had happened immediately after the project was completed, it is apparent that the cyclist was surprised with the new treatment installed.

Table 4: Before and after crashes by road user types

	Before		After	
Crash between road user group	**5 year**	**per year**	**3year 8months**	**per year**
Vehicle + cyclist	8	1.6	7	1.9
Vehicle + Vehicle	4	0.8	2	0.5
Cyclist alone	0	0	1	0.3
Total	**12**	**2.4**	**10**	**2.7**

Observation survey

The proposed intersection is on an arterial route providing bus services. Initially, the ramp of the raised platform was designed on 1:20 (75mm in 1.5m) slopes as suggested by the Austroads guideline. However, after construction it was observed that drivers were not able to see/feel the difference. Thus, the effectiveness of the raised platform could not be observed. The ramp slope was then revised to 1:12 (100mm in 1.2m) causing vehicles to slow down on all approaches.

Complaints registered

As a part of the study the authors also followed up if the department had received any formal complaints after construction to analyse responses received from members of the public regarding this demonstration project. It was noted that not a single complaint was registered.

Discussion

Unlike local roads, site identification for demonstration project on arterial roads was difficult. Parameters considered for its identification are very crucial to make the project successful. The following factors were considered while identifying the project site:

- Pedestrian or cyclist movement
- Crash history of vehicle to cyclist/pedestrian crashes
- Consulting with key stakeholders that are most likely to be impacted by the project such as public transport providers and emergency services
- Drainage issues
- Street lighting facilities
- Road function and hierarchy

Raised intersection platforms have been trialled at various locations throughout Europe and Australia at local road intersections in order to reduce speed to provide a safe environment for the most vulnerable road users. The key objective of these platforms is to reduce the speed to a level at which an impact is likely to be survivable, i.e 30 km/h speed for car/pedestrian or cyclist.

Speed data collected for this demonstration project confirms that the mean speed on the raised platform, which is a key conflict area between vehicle and cyclist, is less than 30 km/h; whereas the 85^{th} percentile speed is 34 km/h (Table 1b). Hence, the demonstration project is successful in decreasing the mean speed limit below the targeted level, however the 85^{th} percentile speed is 4 km/h more than expected. In contrast, the project is successful in dropping the 85^{th} percentile speed by 13.9 km/h (Table 1b) compared to the before case. In addition, the number of vehicles compliant within the posted limit is more after treatment.

Crash analysis indicates that the crash rate has increased during the after period compared to the before period, however there are no serious injury crashes (FSI) recorded in the after period compared to two FSI in the before period. This indicates that crash numbers might go up, however crashes are resulting in lower severity outcomes. The department will continue to review the situation to see the long term trend related to crashes.

Many researchers have shown that raised platforms cause traffic to rat race due to lower speeds and discomfort caused by the humps. This study shows a decrease in total traffic by 5% and an increase in cyclist numbers by 12% after one year of construction. However, this study was unable to consider control sites to see if this traffic fluctuation was by chance.

Initially, the platform ramp was constructed at design slope of 1:20 (75mm in 1.5m) because of bus routes. However, immediately after construction its effectiveness could not be observed, as motorists were travelling at their own speed without hindrance. Therefore, the ramp slope was then revised to 1:12 (100mm in 1.2m) causing vehicles to slow down on all approaches. The project was again reviewed one year after construction and it was seen that while some low clearance cars such as Corvette, Celica and Alfa Romeo etc. were scraping at the entry ramp even though they were travelling at very slow speed no formal complaints were registered in the department. However, this issue could be addressed by choosing a gentler slope than 1:12. Interestingly, it was also observed that cyclists do not slow down as much as vehicles do at the intersection.

Conclusion and Recommendation

In conclusion, the main purpose of this project was to reduce the speed of through traffic to safer speeds for cyclists or pedestrians and the project was successful in reducing operational speeds as close as possible to the survivable speed of 30km/h. It is evident that the raised platform discouraged drivers from speeding through the intersection and the outcomes of this study could be replicated at other urban intersections where cyclist or pedestrian movements are high.

References

Pratt, Kate, McGarrigle, Steve and Turner, Blair, 2015. *The Hurdles of introducing innovative road Safety infrastructure solutions-a case study on raised safety platforms,* ARRB Group, 2015 Australasian Road Safety Conference, Gold Coast, Australia.

Harms, Hilke and Turner, Blair, 2011. *Innovative Intersection Treatments for Department for Planning, Transport and Infrastructure*, ARRB Group, Victoria, Australia.

Roads and Traffic Authority, NSW, 2011. *Speeding-Did you know?,* Fact Sheet 6 of 6, New South Wales, Australia

Delivery of Victoria's Audio Tactile Program

Henry Lim

Safe System Road Infrastructure Program (SSRIP), VicRoads

Abstract

Road safety projects in Victoria have traditionally installed Audio Tactile Edge Lines (ATEL) on high and medium volume rural roads with wide sealed shoulders. A new program is now systematically treating high speed rural road across Victoria, utilising several initiatives to more effectively develop and deliver audio tactile. This methodology has led to the application of Audio Tactile Centre Lines (ATCL) and the development of a technical Road Design Note.

Background

The Victorian Government is investing $70 million into the mass action treatment of high speed rural roads with audio tactile. The program represents a systemic approach to reducing the risk of run off and head-on crashes on Victoria's high collective risk road network. It is expected that 13,000km of undivided roads will be treated, equivalent to 65% of the Victoria's declared undivided road network.

While previous projects have targeted medium/high volume rural roads with the application of ATEL, the current program differs through the application of ATCL on all undivided rural roads that meet the criteria.

ATCL involves a continuous installation of black audio tactile ribs placed along the centreline of an undivided road. ATCL provides sound and vibration to alert drivers who have crossed the centreline and aims to prevent head-on crashes and run-off road crashes to the right[1].

Program Development

Roads applicable for audio tactile were identified based on the pavement width and traffic volumes. Consideration was given to routes with high volumes of cyclist/motorcyclist and the noise impact by audio tactile (Figure 1). Future reseal and rehabilitation sites within the next two years were avoided to ensure that the benefits from tactile is realised over the expected treatment life. It is intended that these sections will be treated as part of the future reseal program. These considerations are outlined in a technical road design note which will be utilised for all future applications on high speed rural roads.

Benefits Realisation

The Fatal and Serious Injury (FSI) savings from audio tactile is typically based on crash history; however, given the mass action treatment and proactive nature of this program, the ANRAM risk rating and subsequently, the SSRIP Planning Tool was used to understand the collective risk and predict the FSI savings. The current delivery of audio tactile across 3,600km of roads in South West Victoria has a predicted seven FSI crash savings per year over the five-year treatment life.

Delivery Strategy

The program is delivered centrally by the Safe System Road Infrastructure Program (SSRIP) team. This delivery model has increased efficiency through: economies of scale; standardising procurement processes; and, greater industry collaboration with the linemarking industry. A phased approach has been taken to allow the market to compete and provide capacity. Further work is being undertaken to align the program with the periodic line marking maintenance program.

[1] "Road Design Note 03-10 – Audio Tactile Line Marking (ATLM)" – VicRoads 2019

Figure 1. ATCL on a High Speed Rural Road

Asset Preservation and Renewal

Audio tactile is now a ‘default’ treatment on high speed rural roads across Victoria. Tools and methodologies are currently being developed to help preserve audio tactile and provide a base for a future renewal program. The development of a data mapping system will provide the location and installation date which will help in providing a condition report and guide renewal programs.

Conclusion

The audio tactile program in Victoria has utilised ATCL and ATEL to systematically treat run-off and head-on crashes on high speed rural roads. Covering approximately 65% of the undivided declared road network, several initiatives have been utilised to provide support in the development, delivery and preservation of audio tactile.

NSW Young Drivers Telematics Trial – methodology, results and potential implications for road safety

Sam Xu[a], Joanne Baker[b], Hassan Raisianzadeh[b] Shveta Gupta[c], Alexander Byrganov[c]

[a]NSW State Insurance Regulatory Authority, [b]NSW Centre for Road Safety, [c]NSW Data Analytics Centre

Abstract

The NSW Young Drivers Telematics Trial is a randomised control trial which aims to explore whether, and the extent to which, telematics devices reduce risky driving behaviours among young drivers. Participants are randomly allocated into control and treatment groups, with the latter receiving feedback about their driving behaviour via a LED dashboard display and a mobile phone app. Preliminary results show that the treatment group have lower rates of harsh braking, turning and acceleration compared with the control group. The treatment group also have a lower average speed and are spending a lower proportion of their driving time exceeding the posted speed limit. These preliminary results suggest that the use of telematics to provide feedback to drivers can have a positive effect on driving behaviours.

Background

Young drivers (under 25 years old) are over-represented in road casualty statistics. According to the NSW Centre for Road Safety, NSW young drivers are up to 4.5 times more likely than other age groups to be involved in a motor vehicle crash (NSW Centre for Road Safety 2018). In light of these statistics, the NSW government is exploring whether telematics, which measures vehicle braking, acceleration, turning and speed, can assist in improving road safety outcomes for young drivers by correcting risky driving behaviours through the use of real time and post hoc driver feedback.

Method

Sampling

The sample consists of n=721 drivers under 25 years of age, primarily from Western Sydney, Regional NSW and Outer Sydney. Participants were made aware of the trial through Facebook banner ads and directed to complete an online application. To be selected for the trial, drivers had to own or have access to, an OBDII compliant vehicle. n=2398 applied to be part of the trial, with n=1600 deemed eligible. Of the n=1600 eligible, n=998 were provided with telematics devices, with n=721 activating their devices and logging kilometres.

Design

Participants were randomly assigned to receive either a feedback system – providing real time and retrospective feedback on driving behaviours (treatment group) – or a ‘dummy’ system – providing only general vehicle usage information such as fuel economy, distance and emissions (control group).

The treatment group system consists of:

- A LED dashboard display unit, which changes colour in real-time in response to behaviours such as harsh braking, rapid acceleration and hard turning (harsh manoeuvres) or speeding.
- A mobile phone app which provides post trip information about the user's driving including driver scores, performance rankings and route maps highlighting locations where drivers may have been speeding, or performing a harsh manoeuvre.

The control group system consists of:

- A LED dashboard display, which does **not** change colour in response to driving behaviours
- A mobile phone app which provides general vehicle usage, but no specific feedback about speeding or harsh manoeuvring.

An overview of the telematics system is at **Appendix 1**.

A random selection of 100 control group participants were reassigned into the treatment group and began to receive driving feedback after 3 months of participation.

Outcome measures

Treatment and control groups will be compared against the following safety surrogate measures, which were selected following an extensive literature review:

<u>Speed (when travelling at free speed)</u>

- Time spent speeding at <10km/h over the limit, 11km/h – <20km/h and ≥20km/h as a proportion of driving time (Ellison et al., 2015a, Ellison et al., 2015b; and Wall et al., 2009) where speed limit is 40km/h or more
- Average positive delta speed i.e. the speed difference to the posted speed limit when above the speed limit (Jun et al., 2011; Jun 2006; Aarts 2006).
- Average speed when travelling at free speed (Elvik 2004, 2009; Wall et al., 2010)

<u>Braking</u>

- Number of x-axis g-force events ≤-0.3g, ≤-0.45g, ≤-0.5g, and ≤0.75g per 1000km driven (Klauer et al 2009; Simons-Morton et al., 2012; Dingus et al., 2006; Perez et al., 2017)

<u>Acceleration</u>

- Number of x-axis g-force events ≥0.35g and ≥0.58g per 1000km driven (Simons-Morton et al., 2012; Perez et al., 2017)

<u>Turning</u>

- The number of y-axis g-force events ≥ |0.5|g per 1000 km driven (Simons-Morton et al., 2012)

Preliminary results

Based on the recorded driving data of n=318 treatment group participants (361,476 km and 7714 driving hours) and n=306 control group participants (381,363 km and 8280 driving hours)[1], the treatment group is performing better than the control group in terms of the above mentioned measures.

[1] Results as of 15 October 2018. Not all participants had activated their telematics at this time.

Discussion

Preliminary results suggest that drivers who receive feedback about their driving behaviour perform better than those who do not, as measured by surrogate safety measures found in the broader literature. However, the results are based on data at a point in time where 90 percent of participants had completed less than 3 months of the trial. The trial will conclude in March 2019 and full results and analysis will be made available at the conference.

References

Aarts., L & van Schagen, I. 2006. Driving speed and the risk of road crashes: a review. Accident Analysis & Prevention. vol. 38, 215-224.

Dingus, T.A., Klauer, S.G., Neale, V.L., Petersen, A., Lee, S.E., Sudweeks, J., Perez, M.A., Hankey, J., Ramsey, D., Gupta, S., Bucher, C., Doerzaph, Z.R., Jermeland., J. & Knipling, R.R. 2006. The 100-Car Naturalistic Driving Study, Phase II – Results of the 100-Car Field Experiment. National Highway Traffic Safety Administration, Washington, DC.

Ellison, A.B., Greaves, S.P. & Bliemer, M.C.J 2015a. Driver behaviour profiles for road safety analysis. Accident Analysis & Prevention. vol. 76, pp. 118-132.

Ellison, A.B., Bliemer, M.C.J., & Greaves, S.P. 2015b. Evaluating changes in driver behaviour: A risk profiling approach. Accident Analysis & Prevention. vol. 75, pp. 298-309

Elvik, R. 2009. The Power Model of the relationship between speed and road safety: Update and new analyses. Institute of Transport Economics, Oslo, Norway.

Elvik, R., Christensen, P. & Amundsen, A.H. 2004, Speed and road accidents: An evaluation of the Power Model. Institute of Transport Economics, Oslo, Norway.

Jun, J. 2006, Potential crash exposure measures based on GPS-observed driving behavior activity metrics. PhD thesis, Georgia Institute of Technology, Atlanta, GA.

Jun, J., Guensler, R. & Ogle, J. 2011. Differences in observed speed patterns between crash-involved and crash-not-involved drivers: Application of in-vehicle monitoring technology. Transportation Research Part C: Emerging Technologies, vol. 19, no. 4, pp. 569-578.

Klauer, S.G., Dingus, T.A., Neale, V.L., Sudweeks, J.D. & Ramsey, D.J. 2009. Comparing real-world behaviors of drivers with high versus low rates of crashes and near-crashes. Virginia Tech Transportation Institute, Blacksburg, VA.

New South Wales Centre for Road Safety (2018). .Relativity rankings for motor vehicle controllers involved in casualty crashes, NSW, 2014 to 2016. Unpublished.

Perez, M.A., Sudweeks, J.D., Sears, E., Antin, J., Lee, S., Hankey, J.M. & Dingus, T.A. 2017. Performance of basic kinematic thresholds in the identification of crash and near-crash events within naturalistic driving data. Accident Analysis & Prevention, vol. 103, pp. 10-19.

Simons-Morton, B.G., Zhang, Z., Jackson, J.C. & Albert, P.S. 2012. Do elevated gravitational-force events while driving predict crashes and near crashes? American Journal of Epidemiology. vol. 175, no. 10, pp. 1075-1079.

Wall, J.P., Soames Job, R.F., Boland, P., Cuenca, V., Creef, K., Beck, J. & Saffron, D. 2009. Results of the NSW intelligent speed adaptation trial: Effects on road safety attitudes, behaviours and speeding. Intelligent speed adaptation conference, 2009, Sydney, New South Wales, NSW Centre for Road Safety, NSW, pp. 7-9.

Appendix 1 -

Figure 1 – telematics system overview

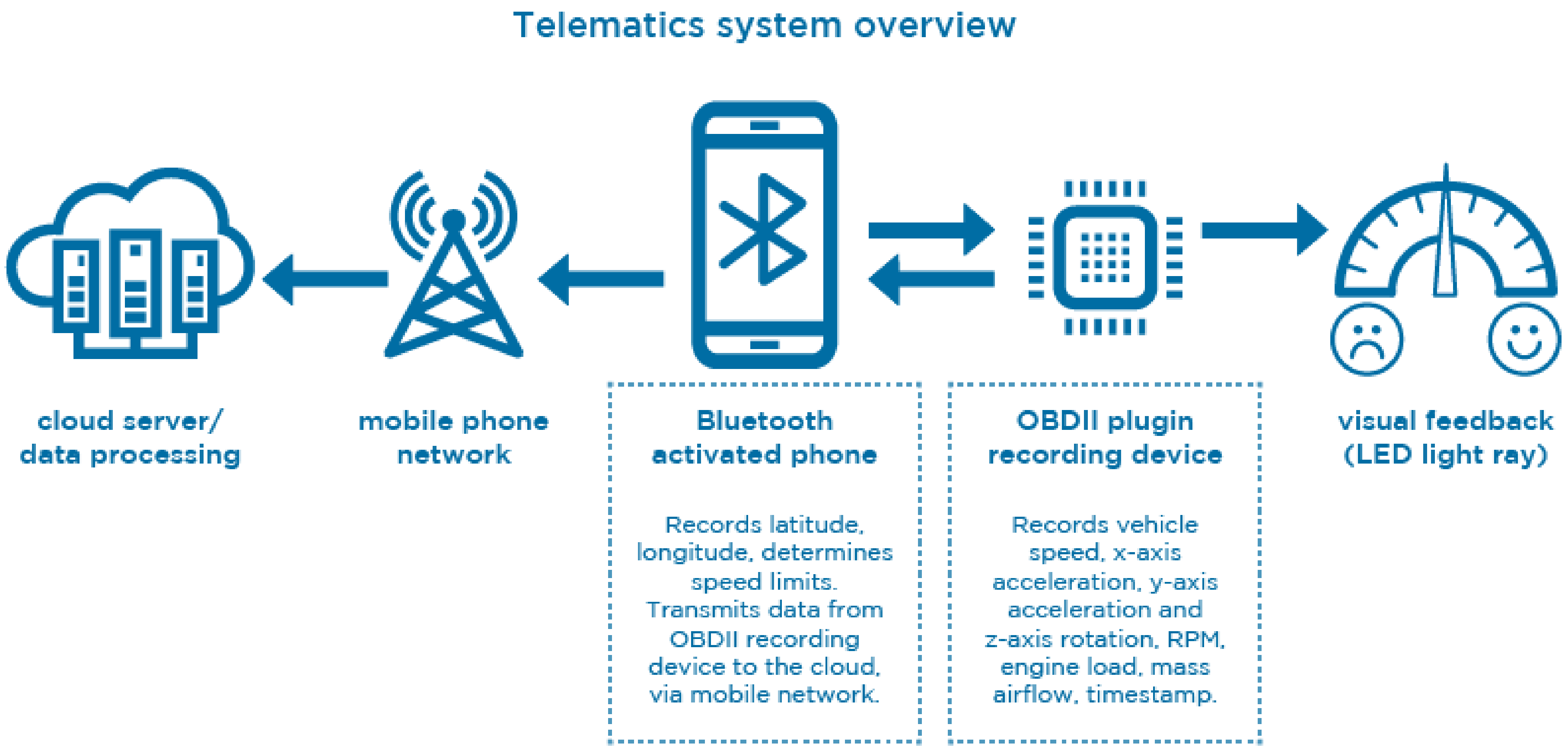


Figure 2 – overview of real time feedback system

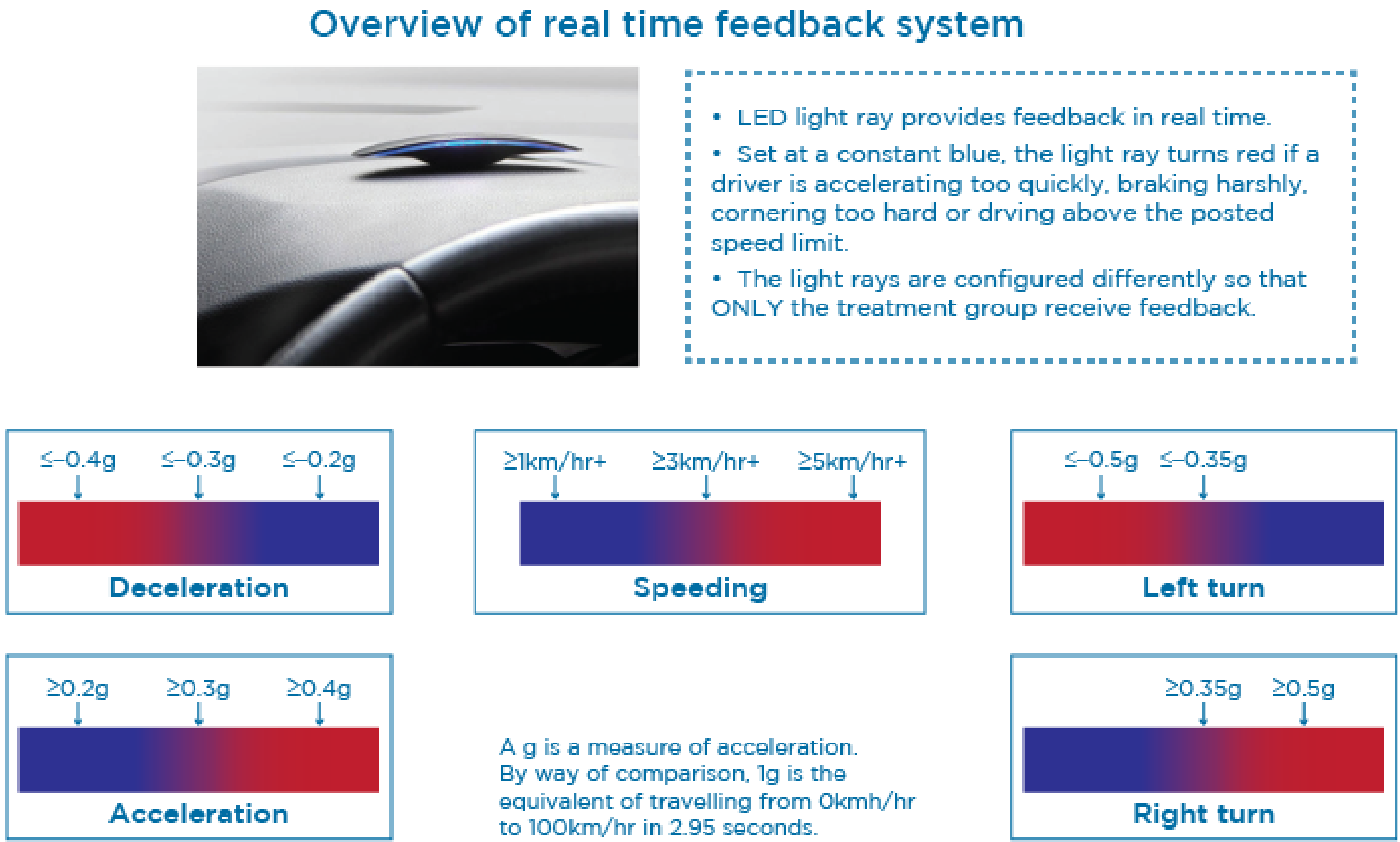
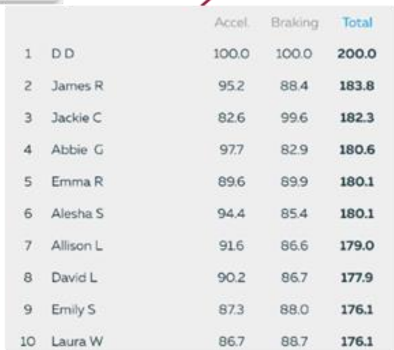
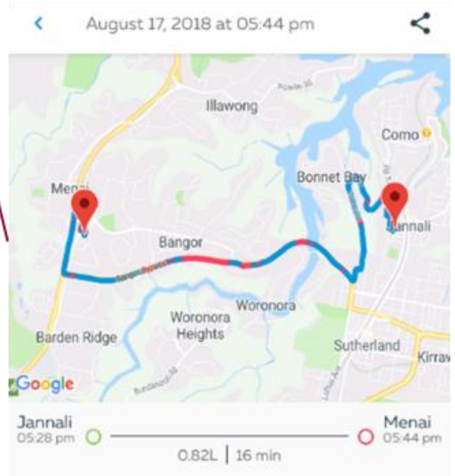


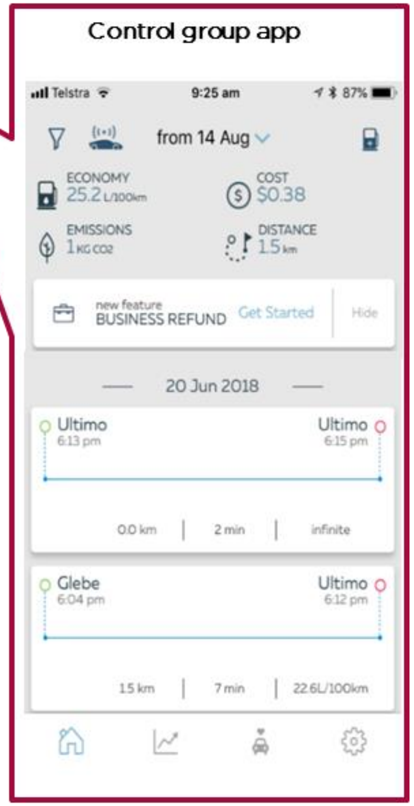
Figure 3 – overview of treatment group system vs control group system



		Accel.	Braking	Total
1	D D	100.0	100.0	200.0
2	James R	95.2	88.4	183.8
3	Jackie C	82.6	99.6	182.3
4	Abbie G	97.7	82.9	180.6
5	Emma R	89.6	89.9	180.1
6	Alesha S	94.4	85.4	180.1
7	Allison L	91.6	86.6	179.0
8	David L	90.2	86.7	177.9
9	Emily S	87.3	88.0	176.1
10	Laura W	86.7	88.7	176.1

	Treatment group	Control group
Recording device	✓	✓
Realtime feedback	✓	✗
Driverscores	✓	✗
Leaderboard	✓	✗
Trip summaries	✓	✗





E-Scooters: Are they a road safety issue?

Narelle Haworth[a], and Amy Schramm[a]

[a]Centre for Accident Research and Road Safety-Queensland (CARRS-Q), Queensland University of Technology

Abstract

Electric scooters (e-scooters) have suddenly arrived on roads and footpaths in many cities across the world. There has been huge media coverage and jurisdictions have scrambled to respond to the regulatory challenges they pose. Our observational study in central Brisbane found more than 90% compliance with the requirement to ride on the footpath, although helmet use was low for shared, but not private, e-scooters. These observations suggest that e-scooters are technically not a significant road safety issue according to current road crash definitions and regulations for riding in Queensland and confirm concerns about the injury risks associated with their use.

Background

Lime e-scooters received an operating permit from Brisbane City Council in November 2018 and more than 500,000 trips occurred in the first three months (Stone, 2019). Queensland road rules (https://www.qld.gov.au/transport/safety/rules/wheeled-devices/personal-mobility-devices) specify the maximum dimensions, riding speed (not maximum achievable speed) and weight of rideables. Riders must be over 12 (supervised if under 16), wear a bicycle helmet and riding on specific types of roads is forbidden (including speed limit greater than 50 km/h, centre line or median strip, or 1-way road with more than 1 marked lane). Giving way to pedestrians on footpaths and shared paths, and bicycles on a bike path, is also required. While helmets were initially provided with Lime scooters, newspaper reports claimed that many had no helmets attached in January and February 2019.

Australian jurisdictions generally require that a road crash occurs within a road-related area and involves a moving vehicle. In Queensland at least, e-scooters are classed as pedestrians, not vehicles. Thus, the extent to which e-scooters are technically a road safety issue likely depends on how often they are used on the road (risking collisions with motor vehicles) and how often they could collide with bicycles (on the footpath or on the road). The extent of injury in these potential crashes is likely to be greater if e-scooter riders are not wearing helmets. This study sought to collect information on these aspects of e-scooter use in central Brisbane.

Method

An observational study at six sites in central Brisbane in February 2018 counted private and shared e-scooters and bicycles and recorded user characteristics (gender, age group, helmet use), locations of riding (footpath, road), and interactions with pedestrians and motor vehicles. A comparison with observations from the same locations in 2017 assessed whether e-scooters were substituting for private and shared bicycle use.

Results

E-scooters comprised 21.9% of observations, with most (18.6%) being Lime e-scooters. Not wearing a helmet (or wearing an unfastened helmet) was more common among riders of Lime e-scooters than private e-scooters (39.1% versus 4.6%) while smaller differences were found in rates of riding on the road (6.9% and 4.6%) and carrying a passenger (2.0% and 0.0%).

In October 2019, 2960 bicycles were observed (2691 private and 269 shared), compared to 3032 (2716 private and 316 shared) in 2019.

Conclusions

The high rate of compliance with the requirement to ride e-scooters on the footpath suggests that e-scooters are technically not a significant road safety issue according to current road crash definitions and regulations for riding in Queensland. However, if other jurisdictions allowed their use on roads (in order to reduce risks to pedestrians) then this could be different. The low helmet use for shared (but not private) e-scooters confirms concerns about the injury risks associated with their use (e.g. RACS and AIPN, 2019). While seasonal and weather factors prevent a strict comparison, there does not seem to be any strong evidence that the introduction of e-scooters has led to fewer bicycle trips in central Brisbane.

References

Royal Australasian College of Surgeons and Australian Injury Prevention Network. (2019). Joint response between RACS and the AIPN to the National Transport Commission Issues Paper: Barriers to the safe-use of innovative vehicles and mobility devices. https://www.surgeons.org/media/college-advocacy/joint-response-to-the-national-transport-commission-issues-paper-barriers-to-the-safe-use-of-innovative-vehicles-and-mobility-devices/ (accessed Mar 2019)

Stone, L. (2019). Lime scooters' Brisbane permit extended to middle of the year. The Brisbane Times; 19 Feb. https://www.brisbanetimes.com.au/national/queensland/lime-scooters-brisbane-permit-extended-to-middle-of-the-year-201902219-p50ytz.html (accessed Feb 2019)

Putting child restraints at the heart of a safety culture in remote Aboriginal communities: a (modified) human-centred design approach

Margaret Howard, Jade Wilson

Department of Planning, Transport and Infrastructure (SA)

Abstract

Child safety restraints undoubtedly are protective of babies and children travelling in cars. For a broad range of reasons their use in remote Aboriginal communities in South Australia is not ubiquitous. On the Right Track Remote has been working with 'The Story Catchers' to capture stories on film from community members and other service providers to understand the complexity of the issue and help to increase the effectiveness of our current child restraints program. The methodological approach has provided us with invaluable learning, insights and inspiration.

The Project

A wholistic approach has been taken that considers:

- The current policy environment, including road rules surrounding restraints
- The environment – community, institutions, structures in place that either hinder or support the use of restraints
- Existing community actions and programs
- Personal skills and behaviours, noting this is only one element considering behaviour change indicators such as favourable attitude, intention to adopt a behaviour, perceived action efficacy, perceived approval, perceived social norms etc.
- The existing body of literature about cultural understandings of childrearing
- Understanding the effectiveness of the current program.

An interview guide was created so that we could learn from people, capture their stories on film and seek to understand their perspectives, their worries and concerns, what they love and care for and how we can respond most appropriately to create the difference that they want.

This has been a powerful body of work that has substantially changed the way we deliver our child restraints program in ways we could not have conceived without the involvement of communities at each step of the design process. Importantly the communities have also been involved in determining the evaluation criteria and measures of success.

Safer School Precincts - The Power of Partnerships in Creating Change

Sue McMillan, Matthew Mayes

Living Neibourhoods and Travel Behaviour Section, Road Safety Directorate, Department of Planning Transport and Infrastructure South Australia

Abstract

It's not always safe or easy for kids to walk, cycle, and scoot to school in Australian urban and regional environments. Parents make decisions about primary school age children's travel modes based significantly on their perception of their child's safety (personal and traffic related).

The South Australian Government's ***Way2Go*** program's partnership model works with 261 schools and 43 local councils to develop context specific, community led School Travel Plans with identified actions to create and sustain safe school precincts.

The presenters will outline the process involved and share evaluation tools, related research, key learnings and examples.

Overview

Aggregated ***Way2Go*** data (2014 – 2018) from the program's primary schools indicates that 52% of children live within two kilometres of their school. In Australia the rates of children walking and riding to primary school have declined from 70% in the 1970's to a current rate of 30%. During the same period broader social trends have included higher car ownership, increased workplace participation by parents and increased parental concerns about safety.

Traffic congestion and aberrant driver behaviour for the 30 minutes at the start and end of the school day is the bane of most school principals and council traffic engineers lives! If even 20% of the students who live within 1 kilometre of their school rode, scooted or walked to school a noticeable safety benefit would occur. ***Way2Go*** commissioned research findings indicate that families who drive to school perceive the school precinct to be more risky than those who actually walk, ride or scoot with their children. [1]

Parental concerns about road safety is another important barrier that can be addressed through a combination of built environment modifications, public education and programs. There is strong evidence that parental attitudes are a primary determinant of their children's participation in this form of physical activity. (Duggan et al, 2018) [2]

Walking and cycling accompanied by an adult or older sibling for all or part of the way to school facilitates the transition from dependent to independent travel and is key to the development of children's safe traffic behaviours. What can governments and communities do to support families and children to use active travel modes for school journeys?

The ***Way2Go*** multifaceted model has the overarching goal of creating and sustaining a community culture of active travel. Components include school surveys (parents, students, staff), GIS maps of student residential locations, site traffic observations and infrastructure inspections, a practical on-road cycling program for 9 – 13 year olds, training and curriculum resources for teachers, signage and crossing monitor support, bike and scooter storage, resources and initiatives that target families as well as small scale infrastructure improvements in partnership with local councils. Medium term School Travel Plans identify staged actions over time with school communities owning and leading the process.

The presenters will describe the holistic ***Way2Go*** Lead School model (initiated in 20 new schools each year) and the key role that relationships, connections and community leadership play in planning and sustaining incremental change. Descriptions of lessons learned and successes will include the key role that targeted research and the collection of systematic feedback play along with strategies for working effectively with the complex and focused everyday world of school communities.

References

[1] Garrard J May 2017 Prepared for the South Australian Department of Planning, Transport and Infrastructure: Walking, riding or driving to school: what influences parents' decision making?

[2] Duggan, M, Fetherston, H, Harris, B, Lindberg, R, Parisella, A, Shilton, T, Greenland, R & Hickman, D 2018, Active School Travel: Pathways to a Healthy Future, Australian Health Policy Collaboration, Victoria University, Melbourne. ISBN: 978-0-6482621-9-0

Assessment of rural road line markings for suitability with Lane Departure Warning

Jamie Mackenzie[a], Jeffrey Dutschke[a], Andrew van den Berg[a], Martin Elsegood[a], Mario Mongiardini[a], Lynn Meuleners[bc]

[a]Centre for Automotive Safety Research – University of Adelaide, [b]The University of Western Australia, [c]Curtin-Monash Accident Research Centre

Abstract

An assessment of line markings in rural WA was performed using vehicles equipped with lane departure warning (LDW) systems. Crossing events were performed by drifting slowly towards the line of interest. A video system was used to record whether a warning was triggered in response. Overall, 189 crossing events were measured with 154 (81%) triggering an accurate warning and 35 (19%) failures. Warning failures were attributed to a range of factors, such as low travel speed or faded line markings. However, in general, LDW systems were deemed capable of providing appropriate warnings in rural road environments where there are suitable line markings.

Introduction

A significant proportion of fatal and serious injuries occur in rural and remote areas (BITRE, 2017). Many of these casualties are the result of run-off-road type crashes (BITRE, 2017). A suggested solution to these types of crash is the use of Lane Departure Warning (LDW) systems, which alert the driver when there is an unintentional lane departure. However, to operate successfully these systems rely on line markings, which may be less than optimal in rural locations. This study describes an assessment of rural road line markings in WA using commercially available LDW systems.

Method

Two vehicles (anonymised in this study), equipped with commercially available, in-built, video-based LDW systems were used to collect data during three days of on-road trials, in daylight conditions, that assessed various line markings and road edges on rural roads in WA. Data was collected at five planned sites along the Great Southern Highway, approximately 155 km South-East of Perth, in the Wheat-Belt region of WA. The five sites were selected to provide a variety of line marking types for assessment. Additionally, data was also collected at a further four ad-hoc sites, in the same general area as the planned sites, where interesting line markings or LDW system behaviour were observed.

Details on relevant factors were collected from each site, such as line marking types, lane widths, and retro-reflectivity (a measure of line ‘brightness’) of line markings. Then, a number of line crossing events were performed with each trial vehicle by initially travelling in the centre of the lane and then instigating a drift to the left or right. A video system with two cameras, one viewing the left/right wheel of interest and one viewing the vehicle’s dashboard, was used to record whether a warning was triggered for each crossing event. Other pertinent details regarding each crossing event were also recorded, such as the daylight brightness, temperature, and the presence of sun glare.

Results

Overall, 189 crossing events were recorded. Of these, 154 (81%) gave an accurate warning, with 35 (19%) failures. Accuracy was high at the planned locations (96%) where the line markings had been recently remarked, but lower at the ad-hoc sites (61%) that were deliberately chosen as locations where warning failures might occur. The results were generally similar for both of the vehicles used in the study.

Discussion

The findings of this study show that LDW systems are capable of providing appropriate warnings in rural road environments where there are suitable line markings. In most cases the situations leading to warning failures were noted as limitations in the LDW system user manuals.

While it was not possible to determine a quantitative definition of a suitable line marking, there were some indications of what may be important. The level of retro-reflectivity, combined with the level of available daylight brightness, did appear to indicate (though not with any kind of statistical power) where LDW systems may have difficulty in detecting a line marking. It was also considered that line marking visual contrast may be an important factor to consider.

References

Bureau of Infrastructure, Transport and Regional Economics (BITRE). (2017). Road trauma Australia 2016 statistical summary. Canberra ACT.

Painting a different picture of managing speed: the effectiveness of street murals

Courtney Bartosak, Claire Lohmeyer

Living Neighbourhoods and Travel behaviour Section, Road Safety Directorate, Department of Planning Transport and Infrastructure South Australia

Abstract

The Roopena Street, Ingle Farm South Australia road murals were developed in partnership with community, Salisbury Council and the Department of Planning, Transport and Infrastructure as a 'Living Neighbourhoods' project, in response to speeding issues identified on the local street. Road murals are intended to modify driver behaviour by creating visual cues that alert the driver they are entering a different precinct. A longitudinal study has considered skid resistance, lessons learned, findings and recommendations. This alternative approach to managing speed was found to reduce both the speeds travelled and the number of vehicles exceeding the speed limit on Roopena Street.

Background

Excessive speeds are a major concern in residential streets. They negatively impact on safety and amenity and therefore liveability[1]. Reducing vehicle speeds is acknowledged as having a beneficial effect for all road users, reducing the likelihood of crashes occurring and their severity when they do occur[2].

Roopena Street in Ingle Farm was identified as the type of street that could benefit from a creative community project[3] that sought to improve the local environment and deliver traffic speed reduction to make the street safer and more people-friendly. Roopena Street has a speed limit of 50kph and a 7-day average of between 3,000 and 3,200 vehicles per day.

The Roopena Street road murals were developed in partnership with residents and businesses, through numerous engagements and with the assistance of a local artist, to capture ideas, designs and refine concepts. Over 40 community members participated in the painting of five road murals.

Method

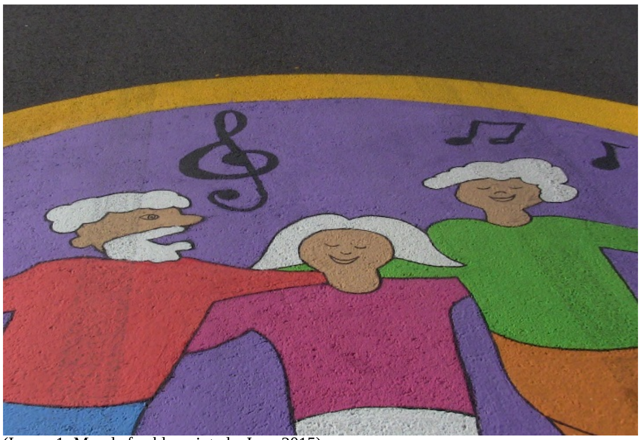
The City of Salisbury conducted traffic surveys in three locations along Roopena Street before the road mural installations, immediately after, and three years after installation. The degree of wear field assessment of AS 404934-2006 was used to assess the degree of wear of the road murals.

Results and conclusions

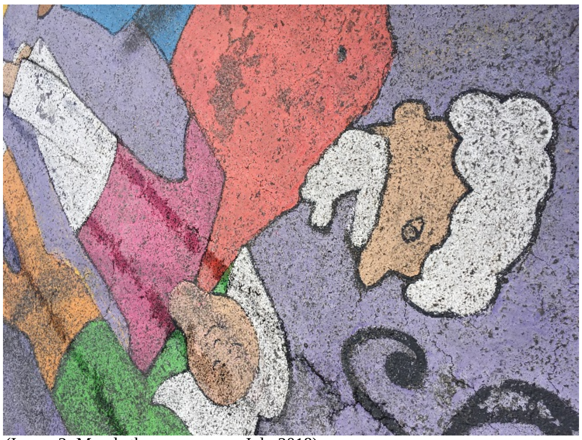
The data shows that immediately after the installation, in two of the three sites the 85th percentile speeds dropped by between 1.4 km/h and 2.6 km/h in the location of the murals, and the percentage of vehicles speeding reduced by 3.2% and 6.7%.

Three years on, and the 85th percentile speeds of vehicles within the mural area remain lower when compared to pre-installation speeds. The 85th percentile speed reduced further, to 50.4 km/h (from 52.2km/h pre installation) and the percentage of vehicles speeding also reduced from 24.8% (pre installation) to 16.6%, recorded at Site 2 which is outside of the influence of the roundabout and Montague Road intersection.

Three years after the installation the condition of the Roopena Street murals has deteriorated (refer to images 1 and 2). The skid resistance was also tested with two small areas not meeting the requirement but identified as low risk.



(Image 1: Murals freshly painted - June 2015)



(Image 2: Murals three years on – July 2018)

The findings of the longitudinal evaluation indicate that the road murals do reduce vehicle speeds by creating a visual cue, to a level typical of the lower impact type of physical traffic calming measures[4]. Given the continued reduction in speed, the murals have been effective as a traffic calming device, notwithstanding the issues of familiarity and wear on the paint surface.

Since the installation of the road murals the Department of Planning, Transport and Infrastructure (DPTI) has produced the Technical Note 'Artwork on Roads' (July 2016), and in April 2017 updated The Code to refer to the technical note and to provide some additional requirements. Following the longitudinal evaluation, a number of suggestions have been made to further update the technical requirements.

References

1. Major Cities Unit, Infrastructure Australia. (2012) *State of Australian Cities 2012*. Canberra; ACT: Department of Infrastructure and Transport

2. Johnston, I. (2004). Reducing injury from speed related road crashes. Victoria: Monash University Accident Research Centre online at https://injuryprevention.bmj.com/content/10/5/257

3. Intermethod. (2015). *Roopena St Murals Project Report*. Adelaide, SA: Department of Planning, Transport and Infrastructure.

4. Tonkin Consulting. (2018). *Roopena St Road Murals Evaluation Report*. Adelaide, SA: Department of Planning, Transport and Infrastructure.

Single-bicycle crashes behind increases in serious injury rates in cyclists

Ben Beck[a,b], Monica Perkins[a], Peter Cameron[a,c], Belinda Gabbe[a,d]

[a]School of Public Health and Preventive Medicine, Monash University, Australia, [b]Faculty of Medicine, Laval University, Quebec City, Quebec, Canada, [c]Emergency and Trauma Centre, The Alfred, Victoria, Australia, [d] Health Data Research UK, Swansea University Medical School, Swansea University, UK

Abstract

Increases in rates of single-bicycle fatalities have been reported in Australia and the Netherlands. However, little is known about whether crash counterparts in cyclist crashes are changing over time. This study aimed to investigate temporal trends in serious injury rates in cyclists, with a focus on crash counterparts. Data were extracted from the Victorian State Trauma Registry (VSTR) over the period of 1 July 2006 to 30 June 2018. Increases were observed in the incidence of single-bicycle crashes and collisions with other pedal cyclists. An increased emphasis on these crash types is required to reduce cycling injury rates.

Background

Cyclist injury rates are on the rise (Beck et al., 2017), however, little is known about the causes of these crashes and how these characteristics are changing over time. Increases in rates of single-bicycle fatalities have been reported in Australia and the Netherlands (Boufous & Olivier, 2016; Schepers, Stipdonk, Methorst, & Olivier, 2017). However, little is known about rates of non-fatal single-bicycle crashes. Therefore, this study aimed to investigate temporal trends in serious injury rates in cyclists, with a focus on understanding changes in crash counterparts.

Methods

We performed a retrospective review of data from the Victorian State Trauma Registry (VSTR) on hospitalised pedal cyclist major trauma patients injured in on-road traffic-related events over the period of 1 July 2006 to 30 June 2018. Crash counterparts were characterised using International Classification of Diseases 10th Revision – Australian Modification (ICD-10-AM) codes. Population-based incidence rates and 95% confidence intervals (CIs) were calculated for each financial year, based on the total population at June 30 of each financial year. Individual Poisson regression models determined whether the incidence rates increased or decreased over the 12-year period.

Results

Over the study period, there were 1,389 hospitalised pedal cyclist major trauma patients. The overall crude incidence rate increased 5% per year (incidence rate ratio (IRR) = 1.05; 95% CI: 1.03, 1.06) with the number of patients increasing from 68 in 2006/07 to 158 in 2017/18.

Crashes predominantly occurred as single-bicycle crashes (44%), collisions with a car, pick-up truck or van (35%) or collisions with other pedal cyclists (9%). The incidence rate of collisions with a car, pick-up truck or van did not change over the study period (IRR = 1.02; 95% CI: 0.99, 1.05). However, there was an 8% per year increase in the incidence of single-bicycle crashes (IRR = 1.08; 95% CI: 1.05, 1.10) and a 9% per year increase in the incidence of collisions with other pedal cyclists (IRR = 1.09; 95% CI: 1.04, 1.15).

Conclusions

Substantial increases were observed in the incidence of hospitalised pedal cyclist major trauma. This increase was largely explained by increases in single-bicycle crashes and collisions with other pedal cyclists. An increased understanding of the crash characteristics and increased emphasis on single-bicycle crashes and crashes with other pedal cyclists is required to reduce cycling injury rates.

References

Beck, B., Cameron, P., Fitzgerald, M. C., Judson, R., Teague, W. J., Lyons, R. A., & Gabbe, B. (2017). Road safety: serious injuries remain a major unsolved problem. *Medical Journal of Australia*, *207*(6), 244-249. doi:10.5694/mja17.00015

Boufous, S., & Olivier, J. (2016). Recent trends in cyclist fatalities in Australia. *Injury Prevention, 22*(4), 284-287.

Schepers, P., Stipdonk, H., Methorst, R., & Olivier, J. (2017). Bicycle Fatalities: Trends in Crashes with and Without Motor Vehicles in the Netherlands. *Transportation research part F: traffic psychology and behaviour, 46*.

The prevalence of alcohol and other drugs in fatal road crashes in Victoria, Australia

Ben Beck[a,b], Monica Perkins[a], Paul Dietze[c], Dhanya Nambiar[a], Peter Cameron[a,d], Jennifer Pilgrim[e]

[a]School of Public Health and Preventive Medicine, Monash University, Victoria, Australia, [b]Faculty of Medicine, Laval University, Quebec City, Quebec, Canada, [c]Burnet Institute, Victoria, Australia [d]Emergency and Trauma Centre, The Alfred, Victoria, Australia, [e]Victorian Institute of Forensic Medicine, Victoria, Australia

Abstract

Alcohol and other drugs are known risk factors for road traffic crashes. We performed a population-based review of road trauma deaths in Victoria between 01 July 2006 and 30 June 2016 using data from the Victorian State Trauma Registry and the Victorian Institute of Forensic Medicine. While road traffic fatalities declined in motor vehicle drivers, motorcyclists and pedestrians, we observed increases in the prevalence of opioids, amphetamines and ketamine in motorcyclists. These data provide important insights that can be used to inform testing regimes and targeted interventions to reduce alcohol and other drug use in all road users.

Background

Being under the influence of alcohol or other drugs is a well-established risk factor for road traffic crashes, injuries and deaths. The prevalence of alcohol and other drugs in fatal road crashes has been studied in other international settings (Brady & Li, 2014; Elliott, Woolacott, & Braithwaite, 2009; Poulsen, Moar, & Troncoso, 2012). However, there is a paucity of current data on the prevalence of alcohol and other drugs, including prescription medication, in fatal road traffic crashes in Victoria, Australia. This study aimed to address this knowledge gap and explore how the presence of alcohol and other drugs has changed over time.

Methods

We performed a population-based review of out-of-hospital and in-hospital road trauma deaths over the period of 01 July 2006 to 30 June 2016 in Victoria, Australia, using data from the National Coronial Information System and the Victorian State Trauma Registry (VSTR). Passengers and occupants out of the vehicle were excluded from this study. Toxicology data were linked from the Victorian Institute of Forensic Medicine. Nine drug classifications were used: alcohol, cocaine, amphetamine, ketamine, opioids, Delta-9-tetrahydrocannabinol (THC), benzodiazepines, antidepressants and antipsychotics. Individual Poisson regression models were used to determine whether the incidence rate increased or decreased over the study period for each road user group and for each drug type. The incidence rate ratio (IRR) and 95% confidence intervals (CI) were calculated.

Results

Over the study period, there were 2,410 road traffic fatalities, excluding passengers and occupants out of the vehicle. These constituted 1,399 (58%) motor vehicle drivers, 511 (21%) pedestrians, 417 (17%) motorcyclists and 83 (3%) pedal cyclists. Road traffic fatalities declined in motor vehicle drivers (IRR=0.95; 95% CI: 0.94, 0.97), motorcyclists (IRR=0.95; 95% CI: 0.92, 0.99) and pedestrians (IRR=0.94; 95% CI: 0.91, 0.97) but there was no change in pedal cyclists (IRR=0.98; 95% CI: 0.91, 1.06).

A blood alcohol concentration ≥0.05 g/100mL was present in 18% of all road traffic fatalities. The prevalence of alcohol declined 7% per year in motor vehicle drivers (IRR=0.93, 95% CI: 0.90, 0.97) and 7% per year in pedestrians (IRR=0.93; 95% CI: 0.87, 0.99), but did not change in motorcyclists or pedal cyclists.

For all road traffic fatalities, opioids were detected in 16% of cases, THC in 13% of cases, antidepressants in 9% of cases, benzodiazepines in 8% of cases, amphetamines in 7% of cases, ketamine in 3% of cases, antipsychotics in 1% of cases and cocaine in 0.2% of cases. The prevalence of opioids increased 12% per year in motorcyclists (IRR=1.12, 95% CI: 1.02, 1.24) but not in other road user groups. The prevalence of amphetamines increased in motorcyclists (IRR=1.18; 95% CI: 1.06, 1.33) but not in other road user groups. The prevalence of ketamine increased in motor vehicle drivers (IRR=1.38, 95% CI: 1.22, 1.57), motorcyclists (1.80, 95% CI: 1.07, 3.03) and pedestrians (IRR=1.29; 95% CI: 1.07, 1.55), but not in pedal cyclists. There were no changes over time in the prevalence of THC, benzodiazepines, antidepressants or antipsychotics.

Conclusions

These data provide important insights into changes over time in the prevalence of alcohol and other drugs in road traffic crashes. These findings can be used to inform testing regimes and to develop targeted interventions to reduce alcohol and other drug use in all road users.

References

Brady, J. E., & Li, G. (2014). Trends in Alcohol and Other Drugs Detected in Fatally Injured Drivers in the United States, 1999–2010. *American Journal of Epidemiology, 179*(6), 692-699.

Elliott, S., Woolacott, H., & Braithwaite, R. (2009). The prevalence of drugs and alcohol found in road traffic fatalities: a comparative study of victims. *Science and Justice, 49*(1), 19-23.

Poulsen, H., Moar, R., & Troncoso, C. (2012). The incidence of alcohol and other drugs in drivers killed in New Zealand road crashes 2004–2009. *Forensic Science International, 223*(1-3), 364-370.

Using maths and science curriculum to increase understanding of how and why correct, age-appropriate child car seat use improves safety

Louise Cosgrove[a]

[a]*Kids and Traffic*, Macquarie University,

Abstract

Kids and Traffic, part of Transport for NSW's (TfNSW) Road Safety Education Program, seeks to prevent child road trauma. *Kids and Traffic* collaborates with educators to develop integrated road safety curriculum, including maths and science, to improve child and adult understanding of how and why child car seats protect children. Findings from the Buckle up Safely Program (Keay et al., 2012) and observational evidence suggest that this approach can improve safety outcomes for children through increasing correct use of age-appropriate restraints. Evaluation now underway will inform professional development and resources to be made available to all NSW early learning centres.

Background

Transport related injuries remain a leading cause of death in children under 16 years of age in Australia. As part of TfNSW's longstanding Road Safety Education Program, *Kids and Traffic* partners with early childhood organisations and other stakeholders to improve safety outcomes for children, families and communities. The shared goal is to move Towards Zero road trauma.

In 2017, over half the children, 0-16 years, killed or seriously injured in road traffic crashes in NSW were motor vehicle passengers. (Centre for Road Safety, Transport for NSW, 2018). For optimal crash protection children need to be restrained in age-appropriate, correctly fitted and correctly used child car seats. However, only a minority of children are optimally restrained. Optimal protection occurs when a child car seat is securely coupled to the vehicle and the child is tightly secured within the seat. Seatbelts need to cross their bones, the strongest part of the child's body, for crash forces to be best withstood (Brown & Bilston, 2012).

Kids and Traffic professional development workshops for educators and resources for children and families explain how and why children need to be optimally restrained. Maths and science based teaching and learning successfully increases child and adult knowledge and understanding related to correct use of age-appropriate child car seats.

Implementation

Kids and Traffic collaborates with educators to develop child-centred, cross-curriculum, play-based road safety education. An integrated early childhood curriculum, including maths and science, supports road safety learning through concepts such as data, measurement, speed, force, physiology and anatomy.

As part of ongoing road safety education children engage in learning about the human body and how the strong skeleton protects the vital organs from injury. Human body texts, puzzles, posters and online resources provide provocation for enquiry and investigation for project-based learning. Discussion on the types of child car seats children use and where seatbelts should cross their bodies is supplemented by tangible resources such as x-rays, models and graphics for exploration.

Measuring children's height and comparing their sizes and types of child car seats used are successful teaching tools to demonstrate that, for optimal protection, the type of restraint used must match the size of each child's body.

Families are ultimately responsible for children's safety. Educators who document and share children's engagement and learning via photos, videos and text help families understand how and why age-appropriate, correct car seat use is necessary and thus contribute to improving safety outcomes for child passengers.

Conclusion

Kids and Traffic collaborates with early childhood educators to design and implement cross-curriculum road safety education to increase knowledge and understanding of age-appropriate and correct child car seat use. Maths and science concepts are used successfully to achieve this outcome.

Formal evaluation of this approach with preschool aged children has now begun at two early learning centres in Sydney. Results will inform development of an additional *Kids and Traffic* professional development workshop and related resources to be made available to all NSW early learning centres.

References

Brown, J. & Bilston, L.E. (2012). Child occupant protection in Australia. *Journal of the Australasian College of Road Safety, 23(2)*, 37-45.

Centre for Road Safety, Transport for NSW. (2018). Road traffic casualty crashes in NSW. Statistical statement for the year ended 31 December 2017. State of NSW through Transport for NSW.

Keay, L., Hunter, K., Brown, J., Simpson, J.M., Bilston, L.E., Elliott, M., Stevenson, M. & Ivers, R.Q. (2012). Evaluation of an Education, Restraint Distribution, and Fitting Program to Promote Correct Use of Age-Appropriate Child Restraints for Children Aged 3 to 5 Years: A Cluster Randomized Trial. *American Journal of Public Health, 102(12)*, 96-102.

Evaluation of the ACT Government's Safer Cycling Reforms: Minimum Passing Distance and Allowance to Ride Across Pedestrian Crossings

Mario Mongiardini, Simon J Raftery, Giulio Ponte, and Jeremy E Woolley

Centre for Automotive Safety Research (CASR) – University of Adelaide

Abstract

Two major components of the ACT Government's safer cycling reforms trial were evaluated: (i) minimum passing distance (MPD) rule and (ii) allowance for cyclists to ride across pedestrian crossings. The evaluation involved analysis of crash and enforcement data during the pre-trial and trial periods as well as pre-trial and post-trial community surveys, correspondence from community members and comments from a cyclist organisation. The MPD rule has likely improved cyclist safety in the ACT, and overall public awareness and perception of potential cycling safety benefits increased. However, crashes between motor vehicles and cyclists riding across pedestrian crossings also increased.

Background

Previous studies (Schramm, Haworth, Heesch, Watson & Debnath, 2016; Transport for New South Wales, 2018) indicated that minimum passing distance (MPD) improved cycling safety in Queensland and New South Wales. In 2015 the ACT Government commenced a two-year "Safer Cycling Reforms" trial, which introduced a MPD rule (minimum 1 metre passing distance on roads zoned 60 km/h and less and 1.5 metres on roads zoned above 60 km/h) as well allowance for cyclists to ride across pedestrian crossings without dismounting (ACT Government, 2018). This study aimed to evaluate the effects of the ACT trial on cyclist safety as well as the public perceptions of the trial rules.

Method

The evaluation involved the analysis of (i) crash data as well as (ii) enforcement data during the pre-trial (Nov. 1, 2013 – Oct 31, 2015) and trial periods (Nov. 1, 2015 – Oct. 31, 2017) and (iii) pre-trial and post-trial community surveys, correspondence from community members and comments from a cyclist organisation.

Results

Crash and enforcement data

A summary of the analysis of crash and infringement data is shown in Table 1. Results were not statistically significant, likely due to the small amount of data available.

Table 1. Summary of crash and infringement data related to MPD and allowance to ride across pedestrian crossings (pre-trial and trial periods)

MPD-RELATED CRASHES BETWEEN CYCLISTS AND MOTOR VEHICLES					
	Pre-Trial		**Trial**		**Change**
	Rear-End Crashes	*Side-Swipe Crashes*	*Rear-End Crashes*	*Side-Swipe Crashes*	*Rear-End & Side-Swipe Crashes*
Injury Level					
- Fatalities	-	-	1‡	-	+1
- Injuries	6	3	5	3	-1
- PDOs	7	4	5	4	-2
Subtotal (by Crash Type)	13	7	11	7	-2
Total MPD-related crashes	**20**		**18**		**-2**

BICYCLE-MOTOR VEHICLE CRASHES WHILE RIDING ACROSS PEDESTRIAN CROSSINGS			
	Pre-Trial	**Trial**	**Change**
Injury Level			
- Fatalities	-	-	-
- Injuries	8	12	+4
- PDOs	14	23	+9
Total	**22**	**35**	**+13**

VEHICLE HEAD-ON CRASHES AS A CONSEQUENCE OF AN OVERTAKING MANOEUVRE			
	Pre-Trial	**Trial**	**Change**
Injury Level			
- Fatalities	2	-	-2
- Injuries	3	1	-2
- PDOs	3	3	-
Total	**8**	**4**	**-4**

INFRINGEMENTS RELATED TO MPD RULE OR RIDING ACROSS PEDESTRIAN CROSSINGS				
	Pre-Trial		**During Trial**	
	TINs	*Cautions*	*TINs*	*Cautions*
MPD RELATED				
- Overtake bicycle rider too closely	-	-	6	5
- Not keep out of path of bicycle/pedestrian	-	1	-	-
Sub Total (per Period)	**1**		**11**	
CYCLISTS AT PEDESTRIAN CROSSING				
- Proceed on crossing on bicycle (with red crossing lights)	-	-	1	-
- Bicycle cross on children's pedestrian crossing	1	-	-	-
Sub Total (per Period)	**1**		**1**	
Total Infringements (per Period)	**2**		**12**	

Public support

A summary of the post-trial survey rating of support of the MPD and allowance to ride across pedestrian crossings is shown in Figure 1.

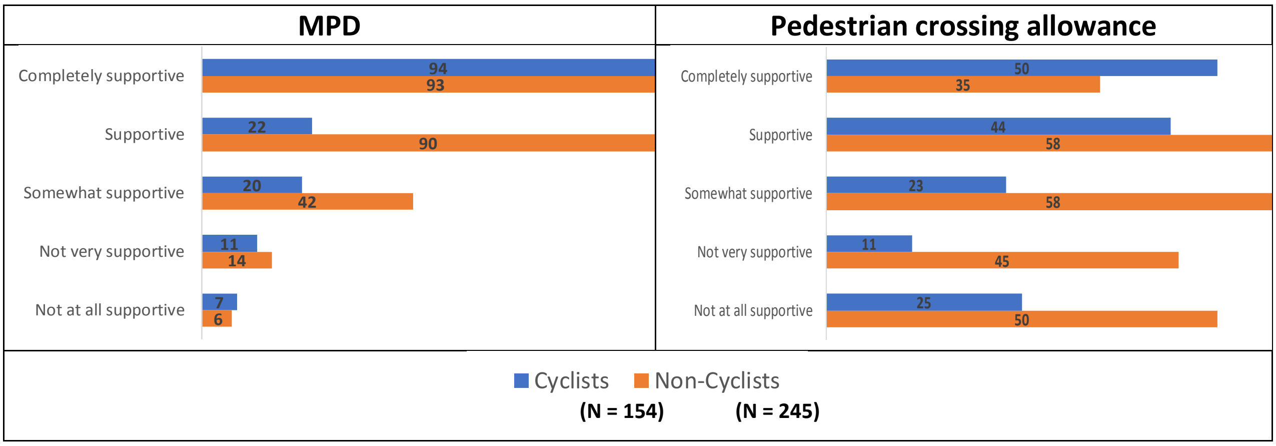


Figure 1. Support of the MPD and allowance to ride across pedestrian crossings in the post-trial survey (number of participants disaggregated by cyclists and non-cyclists)

Conclusions

MPD

The number of cyclist rear-end crashes caused by following motor vehicles reduced slightly during the trial period. However, the crash rate decline may have may have been larger given that an increased number of people cycled throughout the trial period. (Munro, 2015; Munro, 2017)

No evidence seems to suggest an increased crash risk for motorists due to the introduction of the MPD. Indeed, motorist head-on crashes during overtaking manoeuvres decreased during the trial.

The small number of infringements of the MPD rule combined with the fact that in some cases the infringement was based on reports referred from cyclists, suggests that methods or technologies should be investigated that could allow the Police to routinely evaluate and enforce MPD compliance in the future.

Allowance to ride across pedestrian crossings

No crashes occurred between pedestrians and cyclists riding across pedestrian crossings during either the pre- or trial periods. However, crashes between motor vehicles and cyclists riding across pedestrian crossings increased during the trial. Note that crash reporting and coding practices remained the same throughout the entire period covered in this research. However, no specific information is available regarding whether the number of riders riding across pedestrian crossings may have increased during the trial.

The increase of crashes with cyclists riding across pedestrian crossings seems to confirm initial concerns from some ACT residents that cyclists may suddenly ride across pedestrian crossings from footpaths without giving motorists enough time to react, despite the rule requires that riders must slow down to a speed equal of below 10 km/h and be ready to stop when approaching a pedestrian crossing.

Further investigation with a detailed analysis of the causes for each of those crashes and remediation is recommended. Infrastructure changes at shared path and road interfaces, that can calm both bicycle and motor vehicle traffic and increase situational awareness, may help reduce these crash types.

Public perception

Awareness of the trial rules as well as the public perception of their potential safety benefits, increased throughout the trial. However, some ACT residents argued that the MPD rule may not be practical on narrow roads and suggested better education of cyclists regarding the reforms were necessary.

Awareness of cyclists among motorists increased as a result of the safer cycling reforms.

Cycling participation in the ACT

A slight decline in general cycling participation among ACT residents occurred following the commencement of the trial according to the post-trial phone community survey; however, the number of cyclists that reported riding regularly increased during the same period. Independently, according to the National Cycling Participation survey, there was a general increase in cycling in the ACT for the period 2015-2017.

References

ACT Government (2018). Safer Cycling Reforms Brochure. Justice and Community Safety Directorate, Canberra. Accessed on June 2019 from: http://www.justice.act.gov.au/safety_and_emergency/road_safety/safer_cycling_reforms

Munro, C. (2015). National Cycling Participation Survey 2015 - Australian Capital Territory (AP-C91-15). Austroads, Sydney.

Munro, C. (2017). National Cycling Participation Survey 2017- Australian Capital Territory (AP-C91-17). Austroads, Sydney.

Schramm, A.J., Haworth, N.L., Heesch, K., Watson, A., and Debnath, A.K. (2016). Evaluation of the Queensland minimum passing distance road rule: Final report. Brisbane: CARRS-Q. Standing Committee on Planning, Environment and Territory and Municipal Services. Accessed on June 2018 from: https://www.parliament.act.gov.au/in-committees/recent-reports?a=602200

Transport for New South Wales (2018). Trial of the minimum passing distance rule for drivers passing cyclists: Summary of findings. NSW: NSW Government.

Two Decades of Impacts of Road Safety Strategies on Driver Travel Speed Behaviours on WA Road Network

Ttony Radalj[a], Syeda Sultana[b]

[a]Main Roads Western Australia, [b]Road Safety Commission Western Australia

Abstract

Thirteen annual speed surveys were conducted on the Western Australian road network over the period 2000 to 2018 to measure impacts of road safety strategies, in particular speed enforcement strategies, on driver speed behaviours on speed limit roads ranging from 50 km/h to 110 km/h. Effectiveness of speed road safety programmes was estimated in terms of changes in speed data indices (speed compliance rates, excessive speeding, 85th percentile and mean speed). When compared to the 2000 survey, the number of speeding drivers recorded in 2018 was reduced up to 73.3% in the Perth metropolitan area, and similarly but to lesser extent in the rural areas. Over the same period WA fatality crash rates have reduced by 47% from 1.07 in 2000 to 0.54 fatalities/100MVKT in 2018.

Background

Within the domain of road safety it has been well recognised that speed is one of the most important core elements of road safety problem that affects not only the risk of being involved in a crash but more importantly the severity of the crash outcomes which could result in fatality or serious injury. The annual speed survey study design was originally intended to support and evaluate the first phase of the Coordinated Action Program: Speed Project (CAP: Speed), implemented by the WA Police Force in 1998. The main objective of CAP: Speed was to reduce speed-related crashes through the increase use of speed and red light cameras. Subsequently, the annual speed surveys have been used to support a range of speed interventions as part of the WA state road safety strategy, *Towards Zero 2008 -2020* (Office of Road Safety, 2009), including futher expansions of the automated traffic enforcement network.

Cameron (1999) proposed that the CAP: Speed program should be evaluated with respect to driver speed behaviours at general locations on the WA network rather than using travel speed behaviours recorded at speed camera sites which would be more likely biased towards lower speeds. For this reason it was suggested than annual speed surveys should be conducted at general locations covering most speed limit and road types, metro and rural regions. The principal objective of the surveys was to measure changes in driver speed behaviours and use the derived speed indices in the assessment of effectiveness of the enforcement strategies on safety outcomes in terms of reductions in number of fatalities and serious injuries over the years. It was envisaged that results of the survey would also provide substantial grounds upon which future road safety and enforcement strategies could be addressed and formulated.

Methodology

Given that the WA road network covers a vast area, substantial care was taken in the design of the survey such that the data collected would be representative of the state's driver population and their behaviours on these type of roads with varying speed limits ranging from the default 50 km/h speed limit to 110 km/h on rural open area roads. This has been achieved through sampling stratification with respect to: traffic volume, speed limit, divided/undivided road, and number of lanes.

It was envisaged that the sample of approximately 140 sites in each of the regions, the Perth metropolitan and rural regions, would be sufficient in size to provide reliable representativeness of driver speed behaviour at the general road locations of the road network. Based on research studies, it was proposed that the minimum sample size by road type would not be less than 50000 vehicles. The distribution of survey sites by region, road and wherever possible by speed limit stratum was based on the estimates of traffic exposures measured in million vehicle kilometres travelled (MVKT). The minimum sample size estimates for percentiles were derived using the equation as stated by Oppenlander et al. (1961) by which sample size requirement was estimated at 16000 vehicles per strata. For the purpose of consistency in the speed data analysis and comparisons between the surveys an attempt was made to maintain all the sites surveyed in the baseline survey 2000 in all other subsequent surveys. The duration of the Perth metropolitan survey per site was at least two days while the rural speed survey was conducted over at least 7 days resulting in each of the surveys excess of one million vehicles travelling with "free" speeds (headway >= 4 sec) upon which the findings of this study are based on.

Analysis

The changes in driver speed behaviours were assessed by monitoring changes in speed indices such as: compliance rates by road type, days of the week and time of days, compliance by speed limit, proportion of drivers travelling 10+ km/h above posted speed limits, mean speeds relative to earlier surveys and the baseline survey, the 85th percentiles, trends in speed indices. Effectiveness of road safety strategies, especially speed enforcement strategies since 2000 has been demonstrated by the study surrogate measures of reductions in mean speeds across most of the speed limit roads in both regions, and especially in reduction in the number of speeding drivers, travelling at speeds in access of 10 km/h above the speed limit (ref. Table 1).

Table 1. Distribution of mean speeds and percentage of speeding drivers by speed limit and year

Speed Limit (km/h)	Metro						Rural					
	Mean (km/h)		Reduc. (km/h)	% Reduc.	% exc.10+ km/h		Mean (km/h)		Reduc. (km/h)	% Reduc.	% exc.10+ km/h	
	2000	2018			2000	2018	2000	2015			2000	2015
50	52.3	48.9	-3.4	-6.5	22.4	8.9	52.3	48.3	-4.0	-7.6	17.4	8.3
60	60.6	55.9	-4.7	-7.8	14.9	2.9	59.8	57.5	-2.3	-3.8	10.9	6.6
70	69.4	66.5	-2.9	-4.2	11.8	4.5	65.9	65.4	-0.5	-0.8	4.6	4.1
80	77.2	73	-4.2	-5.4	11.0	3.5	77.9	77.1	-0.8	-1.0	7.1	7.7
90	82.6	85.3	2.7	3.3	6.7	2.2	87.9	87	-0.9	-1.0	12.2	6.7
100	91.2	96.2	5	5.5	4.0	2.1	97.1	97	-0.1	-0.1	15.1	5.8
110							102	102.4	0.3	0.3	7.9	7.1
Total					12.6	3.4					8.6	5.9

Compared to 2000, the number of speeding drivers in the metropolitan area in 2018 has reduced by 73%, significantly less but substantially large in the rural regions by approximately 31% (ref. Figure 1.). Similarly, over the same period, WA fatality crash rates have reduced by 47% from 1.07 in 2000 to 0.54 fatalities/100MVKT in 2018. This is not to say that the reduction in the fatality rates could be solely attributed to the reduction in the number of "speeding" drivers, changes in driver speed behaviours, or reduction in overall travel speeds that could be solely attributed to the WA police enforcement strategies, but to overall road safety strategies, in particular to the *Towards Zero* 2008 – 2020. Nevertheless, the data suggests a quite significant correlation between the fatality rates and percentage of drivers travelling at excessive speeds.

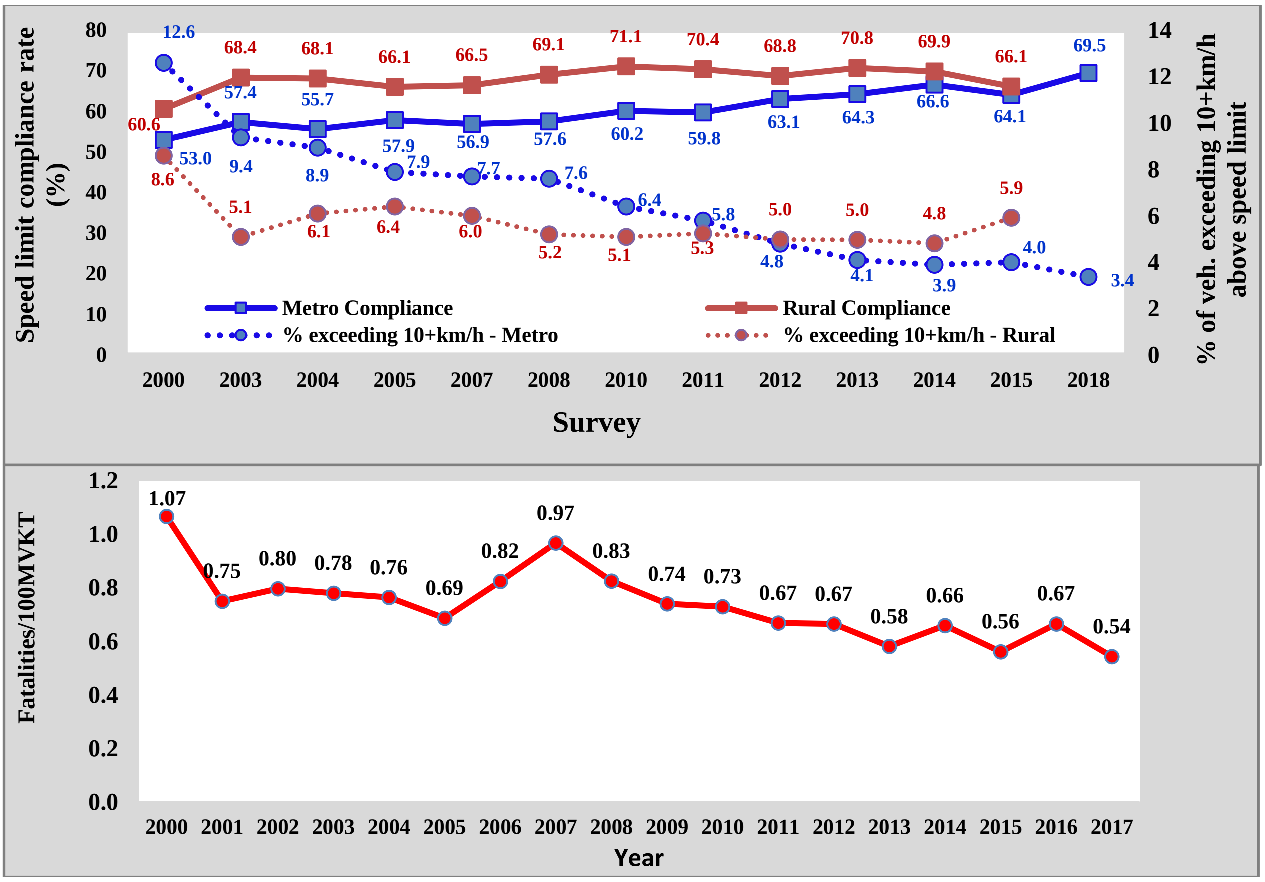


Figure 1. Speed limit compliance on WA network and fatality crash rates, WA 2000 to 2018

Conclusions

The study demonstrated a significant changes in WA driver speed behaviours expressed in in overall reduction in the travel speed, higher compliance to speed limit and reduction in excessive speeding over the two decades. In-depth analysis of speed data collected over thirteen surveys from 2000 to 2018 suggests that driver speed behaviours do differ depending on: speed limit on the road, day of the week and time of day. It can be fairly confidently said that the changes in driver speed behaviours were one of the major contributors in the reduction of fatality and serious injury rates in the state. It is recommended that findings of this study related to the road type and temporal factors be used as components in formulation of speed enforcement and other road safety strategies aimed at reduction of travel speeds. It should be also recognized that monitoring of future driver speed limit compliance would be of high importance in order to assess effectiveness of previously implemented and proposed future speed management and enforcement strategies.

References

Cameron, M., (1999). Methodology for evaluation of the enhanced traffic enforcement program in Western Australia. Report to Office of Road Safety Department of Transport Western Australia, October 1999.

Office of Road Safety (ORS), (2009). Towards Zero – Road safety strategy 2008-2020. Western Australia

Oppenlander, J.C., Bunte, W.F., and Kadakia, P.L., 1960. “Sample Size Requirement for Vehicular Speed Studies”. In: *Traffic Volume and Speed Studies*, Highway Research Board Bulletin 281. Washington, D.C., 1961.

Thailand Rural Road Safety Audit System Toolkit

Chakree Bamrungwong, Ph.D.[a], Nopadon Kronprasert, Ph.D.[b,*], Kaiwan Wattana, Ph.D.[a]

[a]Department of Rural Roads, Ministry of Transport, Bangkok, THAILAND,
[b]Excellence Center in Infrastructure Technology and Transportation Engineering, Faculty of Engineering, Chiang Mai University, Chiang Mai, THAILAND
[*]Corresponding author

Abstract

The Rural Road Safety Audit System (RSAS) Toolkit has recently been developed by Department of Rural Roads of Thailand. RSAS is an on-line decision-making tool designed for road safety practitioners to systematically conduct rural road safety improvement projects in Thailand. This paper presents the overview of the RSAS Toolkit. It helps identify hazardous locations on rural road networks using crash data and iRAP Star Rating model, determine safety deficiencies on road sections, and recommending possible short-term and long-term treatments. The RSAS Toolkit shall be a useful tool in preparing road safety improvement program funding applications for rural road projects.

Overview of RSAS Toolkit

To improve decision-making process in road infrastructure planning and improvement programs, information technologies have been developed as decision tools to help engineers and practitioners, such as road assessment program, road asset management system, and road safety audit toolkit. The systems are very powerful in collecting relevant data, storing and managing databases, analyzing geospatial and statistical data, and disseminating useful information. (FHWA, 2012)

In Thailand, Department of Rural Roads (DRR) has recently developed the rural road safety audit system (RSAS) toolkit, which is a web-based information technology that help road safety auditors and practitioners to perform road safety improvement projects on a 47,000-kilometer rural road network. The capabilities of RSAS are:

- RSAS can assess the safety of individual road sections. Using road asset databases, it applies the Star Rating method proposed by International Road Assessment Program (iRAP) to calculate the risk scores of individual road segments. (Turner and Smith, 2009; iRAP, 2014)
- RSAS can identify the road safety deficiencies of hazardous locations. Using crash databases and Star Ratings of hazardous locations, road attributes that affected the safety problem are determined.
- RSAS can recommend both short-term and long-term safety treatment at specific hazardous locations.

RSAS encompasses 3 main modules. First, the Safety Assessment module integrates the iRAP Star Ratings model to assess the safety of road segments. Second, the Safety Problem Identification module determines the safety deficiencies by inspecting the road alignment and safety facilities needed to prevent the crash occurrence on each road segment. The module presents the street view ready 360-degree camera and road asset databases. Four types of road segments are considered: straight road sections, curve road sections, intersections, and urban/community road sections. Finally, the Safety Treatment module presents the list of safety facilities needed for short-term solutions and the practical guide for long-term solutions at each hazardous location.

This paper will present the framework of RSAS toolkit and its applications. For example, Figures 1 to 3 presents the user interface of RSAS toolkit. Figure 1 shows the main interface of RSAS toolkit.

It displays route information, 360-degree street view, route map with asset information, and the Star Ratings associated with each route. Figure 2 shows the interface of safety assessment page. It presents the Star Ratings by road segment and the road attributes and asset data associated with each segment. Figure 3 shows the safety treatment page. The recommended safety treatments are listed.

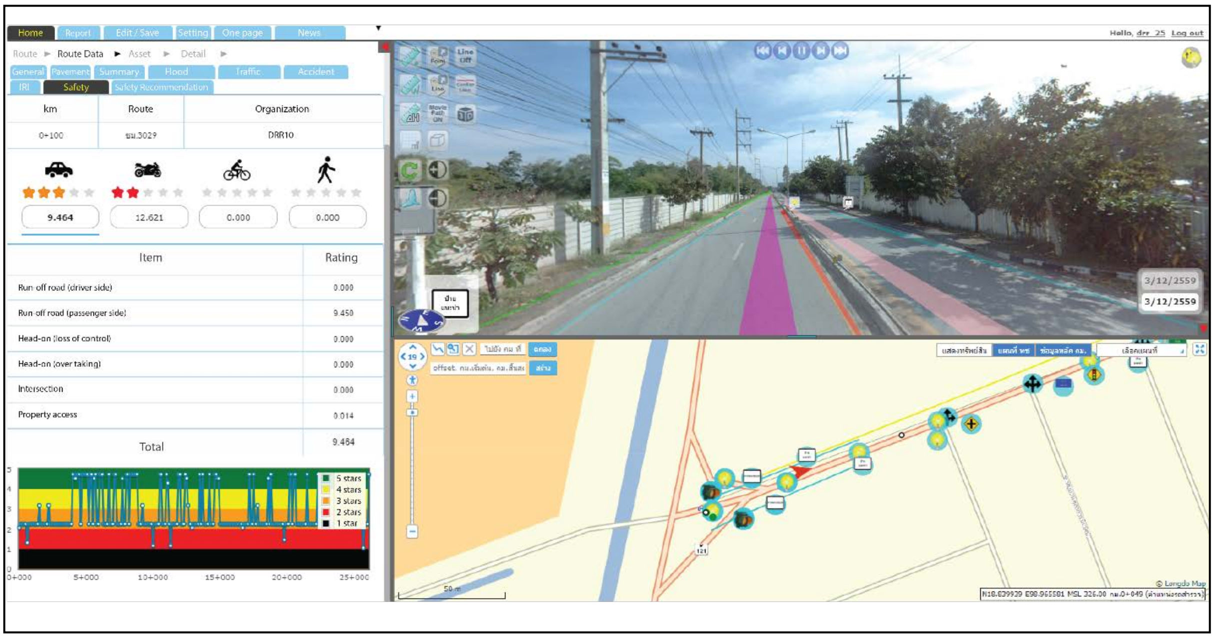


Figure 1. Main interface of RSAS toolkit

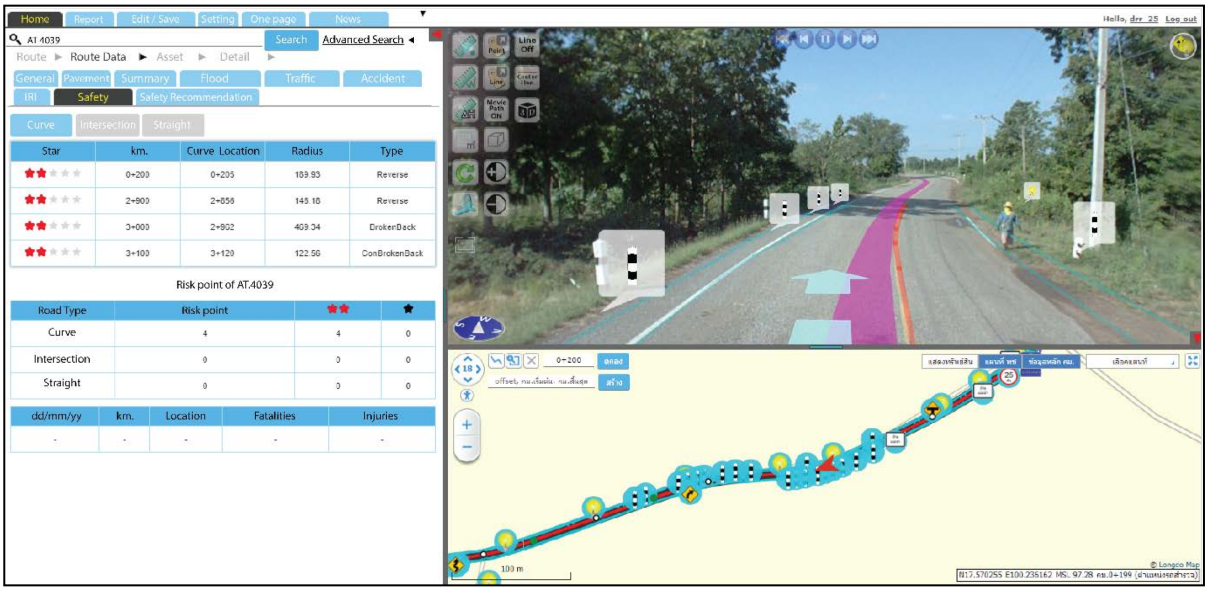


Figure 2. Interface of safety improvement page in RSAS toolkit

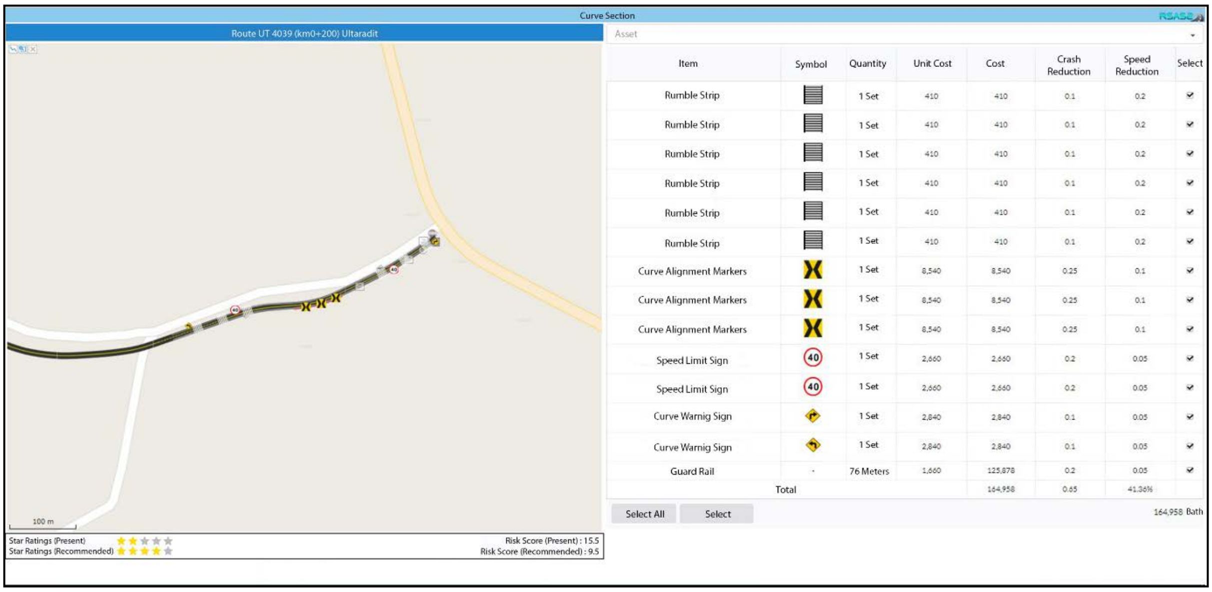


Figure 3. Interface of safety treatment page in RSAS toolkit

References

FHWA (2012). Best practices in geographic information systems-based transportation asset management, U.S. Department of Transportation, Washington, D.C.

Turner, B., Smith, G. (2009). The iRAP road safety toolkit – a website-based approach to addressing road safety problems.

iRAP (2014). iRAP star rating and investment plan coding manual, International Road Assessment Programme.

Changing attitudes to use of carseats in a low income community

Fiona Frost, Greg Donaldson

Road Safety Officer, Blacktown City Council; NSW Highway Patrol.

Contact: Fiona Frost: Fiona.frost@blacktown.nsw.gov.au

Abstract

In late 2018 Blacktown Council was contacted by the local highway patrol sergeant concerned about the large number of infringements being issued for unrestrained children in Mount Druitt. We set about providing education in the community to improve compliance but more importantly to protect the young children in the area.

Background

The area around Mount Druitt in the Blacktown Council area contains a number of small suburbs. It is an area with a high proportion of social housing and low income families. With a high number of infringement notices being issued for failing to restrain children in vehicles, local police were frustrated that the cost of the fines were similar to the cost of a car seat yet drivers were constantly caught with unrestrained children in their vehicle. In a community with a high proportion of low income households the effect of the fines on the household was a greater impost than in many other areas. Blacktown Council current holds free car seat checking days every 6 weeks at various locations. The events at Mount Druitt are less well attended than in other areas of the LGA.

The challenge

This area of Western Sydney is largely low income families, often welfare dependent or in low income jobs. There is a large population of Aboriginal and Torres Strait Islander people in the area as well as Pacific Island and other migrant and refugee peoples. The cost of purchasing car seats is an obstacle for many families.

The Project

Two main communities have been identified; the Aboriginal and Torres Strait Island community and the Polynesian community. The police arranged meetings with the local Aboriginal Health Centre and with local Polynesian church ministers. We are still working with the Aboriginal Health service and more info will be available by the time of the conference.

The Polynesian church leaders were keen to improve the safety of their community. They decided to get senior church leaders involved and a large group gathered to discuss how to provide help in the community. Blacktown Council agreed to hold a car seat checking day at one of the local churches in addition to the normal schedule of car seat checks. This event is scheduled for 16 Feb and more information about the outcomes will be available after this date. The local Police Multicultural Community Liaison Officer worked with local businesses and secured the donation of 3 car seats. It is planned to use these seats for families who attend the car seat checking day but whose seats are too old or damaged to be safely used.

More information will be available as this project continues.

Reducing distracted driving behavior among university students: the effectiveness of an empowerment-based intervention in Cambodia and Vietnam

Le Nguyen[a], Matthew Blanks[a], Linh Pham[a], Trang Truong[b], Chanpha Khun[c], Mirjam Sidik[a]

[a] AIP Foundation, [b] AIP Foundation Vietnam, [c] AIP Foundation Cambodia

Abstract

Distracted driving is a common risky behavior associated with young motorcycle drivers in Cambodia and Vietnam. This abstract aims to explore the impact of the *Safety Delivered* program, using an empowerment-based intervention for university students to reduce distracted driving behavior. AIP Foundation launched *Safety Delivered,* with support from The UPS Foundation, in 4 universities in Phnom Penh (Cambodia), 4 universities in Hanoi and 6 universities in Ho Chi Minh City (Vietnam). The program used multi-faceted trainings, peer-to-peer education, and awareness raising activities. These interventions were successful, leading to substantial improvements in student knowledge, attitudes and behavior at target sites.

Background

Road traffic injury is the leading cause of death for young people aged 5-29 (WHO, 2018). Motorcycles account for 75% and 67% of all road traffic fatalities in Cambodia and Vietnam, respectively (Cambodia National Road Safety Committee, 2018; Vietnam National Traffic Safety Committee, 2016). Many risky behaviors contribute to motorcycle crashes, including distracted driving. Mobile phone use is greatest among the young, and the use of mobile phones while driving increases the risk of road crash by four times (WHO, 2018). Young drivers are more likely to be vulnerable to distraction, given their relative inexperience and are more likely to engage in risky behaviors, such as using a mobile phone whilst riding (Truong et al., 2016).

To assess distracted driving, AIP Foundation conducted a baseline assessment in Cambodia and Vietnam, finding that 82% of university students used a mobile phone while riding and 63% displayed high-risk distracted driving behavior. Aiming to address these findings, AIP Foundation established *Safety Delivered,* working with young, inexperienced motorcycle drivers in Cambodia and Vietnam.

Safety Delivered theorizes that youth play an important role in road injury prevention among their peers, by being role models, talking and advocating (WHO, 2007; Youth for Road Safety, 2012). Therefore, a key component was the recruitment and training of Young Ambassadors for Road Safety (YARS) and the subsequent implementation of distracted driving campaigns. Over 2017-2018, YARS activities included: university based peer-to-peer education, youth dialogue, and community events to address distracting driving, reaching 189,489 students, as well as local stakeholders and Government.

Methodology

The impact of *Safety Delivered* was measured using cross-sectional knowledge, attitude, and behavioral surveys, utilizing a self-reported structured questionnaire, conducted twice: pre- and post-intervention. Representative samples for surveys were obtained through a systematic random technique based on the given sampling frame of total population size of undergraduate students from the first to fourth year of 14 intervention universities. A total of 1943 and 2095 students participated in the baseline and end-line survey, respectively.

Results

Students exposed to *Safety Delivered* who demonstrated high knowledge of laws related to mobile phone use while driving was 60.3%, significantly higher than that of unexposed students, at 16.6%. Similarly, 61.3% of students exposed had high knowledge of what constitutes distracted driving, compared to 45.6% of those unexposed. Students displayed positive attitudes toward reducing distracted driving behavior, increasing from 54.4% at the baseline survey to 60.3% at the end-line survey. Students who were reported using mobile phones while riding made a statistically significant decrease from 82.4% to 71.8%. Students showing high-risk distracted driving behavior reduced substantially from 63.4% to 45.8%.

Conclusions

Overall, *Safety Delivered* has successfully engaged university students in improving their knowledge and attitude, reducing distracted driving behavior. Although the rate of students displaying distracted driving behaviors remains high, demonstrated behavioral changes of this complex target group is still positive and remarkable – especially given the short period of campaign implementation. This suggests that similar approaches can be applied for future interventions to improve and sustain road safety action plans among young people.

References

Cambodia National Road Safety Committee. (2017). *Summary Report: Road crashes and casualties in Cambodia*. Phnom Penh: Cambodia National Road Safety Committee.

Gallegos, M (2012, 15 November). Road safety: how youth can create awareness, featured on The World Bank [blog post]. Retrieved from http://blogs.worldbank.org/youthink/road-safety-youth-can-help-create-awareness/

Toroyan, T & Peden, M. (2007). *Youth and Road Safety*, Geneva: World Health Organization, retrieved from World Health Organization https://www.who.int/violence_injury_prevention/publications/road_traffic/youth_roadsafety/en/

Truong, L., Nguyen, H. & De Gruyter, C. (2016). Mobile phone use among motorcyclists and electric bike riders: A case study of Hanoi, Vietnam. *Accident Analysis & Prevention.* 2016; (91) 208-215. Retrieved from https://www.sciencedirect.com/.

Vietnam National Traffic Safety Committee. (2016). *Vietnam National Traffic Safety Committee Traffic Crash Report*. Hanoi, Vietnam National Traffic Safety Committee.

World Health Organization. (2018). *Global Status Report on Road Safety 2018.* Geneva: World Health Organization. Licence: CC BYNC- SA 3.0 IGO.

YOURS – Youth for Road Safety. (2012). *Youth for Road Safety Action Kit*. Amsterdam: YOURS – Youth for Road Safety. Retrieved from http://www.youthforroadsafety.org/uploads/tekstblok_bijlagen/printable_yours_youth_and_road_safety_action_kit_1.pdf

Examining drivers' a priori acceptance of Level 4 automated cars: An exploration of drivers in Australia, France, and Sweden

Ioni Lewis[a], Sherrie-Anne Kaye[a], Patricia Delhomme[b], and Sonja Forward[c]

[a]Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Institute of Health and Biomedical Innovation, Queensland University of Technology, Kelvin Grove, Queensland, 4059
[b] The French Institute of Science and Technology for Transport, Development and Networks (IFSTTAR), Paris
[c] Swedish National Road and Transport Research Institute

Abstract

There have been rapid advances in cooperative and automated vehicle (CAV) technologies in recent years. This study, underpinned by the Theory of Planned Behaviour and the Unified Theory of Acceptance and Use of Technology, examined whether there were differences in the intentions to adopt Level 4 automated cars reported by drivers from Australia, France, and Sweden. N = 1563 drivers completed an online survey. The results revealed drivers from France reported significantly higher intentions than drivers from Australia and Sweden. In understanding the factors which influence intentions, insights are provided for future efforts aimed at encouraging adoption of such technologies.

Background

Rapid advances in cooperative and automated vehicle technologies have seen many on-road trials of such technologies occurring throughout the world. This study sought to understand individuals' a priori acceptance of Level 4 automated cars. Level 4 is high automation where a vehicle can drive itself and an individual is not required to take action but can choose to drive (SAE International Standard J3016). The extent of one's exposure to such technologies may influence individuals' intentions to use such vehicles. This study explored whether drivers from Australia, France, and Sweden differed in their reported intentions to adopt Level 4 automated cars. Without trials of automated cars in Australia or Sweden, but there being trials in France, a difference was expected in drivers' intentions between the three countries. The study also sought to undestand the factors that predicted intentions in accordance with factors from the Theory of Planned Behaviour ([TPB; Ajzen, 1991]) and the Unified Theory of Acceptance and Use of Technology ([UTAUT]; Venkatesh, Morris, Davis, & Davis, 2003).

Method

An online survey, comprising items based on the TPB and UTAUT, was administered to drivers in Australia, France, and Sweden. Key predictors from these models were measured in addition to the key outcome measure of intentions to use Level 4 automated cars in the future when they become publicly available. Most items were measured on a 7-point Likert scale with higher scores indicating more of the construct. A definition of a level 4 high automated car was provided early in the survey.

The survey took 20 minutes to complete. Participants in Australia were offered either partial course credit if they were a university undergraduate at QUT or the chance to go in the draw to win one of 5 A$50 Coles/Myer vouchers. Participants in France and Sweden were not offered an incentive.

An ANOVA tested for differences in intentions between the three countries and separate regressions were conducted to determine the significant predictors of intentions in each country.

Results

Useable data was provided by a N = 1563 participants (n = 558 in Australia, n = 625 in France, and n = 380 in Sweden). Participants were aged 17-89 years (*M*age = 43.86, *SD* = 17.18) with n = 971 (62%) males. A significant difference in intentions reported between drivers of the three countries, $F(2, 1562) = 46.86$, $p < .001$, with drivers in France (*M* = 4.53, *SD* = 1.87) reporting significantly higher intentions than drivers from Australia (*M* = 3.43, *SD* = 2.08) or Sweden (*M* = 3.73, *SD* = 2.08). No other differences were significant. A series of regressions were then conducted based on the TPB and UTAUT to understand the factors that influenced intentions in each of the three countries. Results revealed some similarities yet also some differences in the factors that predicted intentions in each country.

Conclusion

This study provides insights into individuals' intentions to use automated cars in the future including the factors which influence such intentions. Such insights may help to inform future public education to encourage greater use as implementation of automated vehicles becomes more widespread.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179-211. doi: 10.1016/0749-5978(91)90020-T.

Society of Engineers (SAE) International Standard J3016 Society of Engineers. (2016). Taxonomy and definitions for terms related to on-road motor vehicle automated driving systems. Accessed online from https://www.sae.org/standards/content/j3016_201609/

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Towards a unified view. *MIS Quarterly*, *27*(3), 425-478. doi: 10.2307/30036540.

Safety Performance Analysis of Road Signage Across Highway: Experience from Existing Road Safety Audit in Bangladesh

M. H. M. A. Uddin[a], M. S. Sarker[b], S. Sarker[c], K. Biswas[c], T.A. Khan[d]

[a]Centre for Injury Prevention and Research, Bangladesh (CIPRB), Bangladesh, [b]Roads and Highways Department(RHD), Bangladesh, [c]HeptaTech Limited, [d]Ohio University,USA

Abstract

Roads with flawed design causing loss of innumerable lives. iRAP assessed Bangladesh's most of the roads as 2-stars or less out of 5-stars indicating significant infrastructural deficiency. Here, road crashes claim 68 lives daily and USD316 million annually. To assess the infrastructural hazard, Roads and Highways Department, Bangladesh, conducted road safety audit on 500km crash-prone highway. It reveals that only 10.4% signages are available than required whereas 21.4 % existing sign are either nonfunctioning or wrongly designed. The evaluation summarized that investment of USD1 million could eliminate this hazard and make roadways safer. This article highlighted those findings and recommendations.

Background and Objective

According to World Health Organization (2018), road crash kills around 1.35 million people annually and causes 2-3% of gross domestic product(GDP) loss in the low-and middle- income countries. The report also estimated that 24,954 people are killed each year in Bangladesh where police reported fatalities is only 2376 in 2015. National Research Council (2010) found that road environment factors have been found responsible for 34% of the crashes. International Road Assessment Program (2013) also assessed Bangladeshi road in highest risk bands: 1- or 2-stars and the crash cost amounts to USD316 million anually.

To reduce of the casualty from road-mishap through quantifying major infrastructural deficiency, Roads and Highways Department(RHD), Bangladesh has conducted a safety audit on 500km crash-prone area of its four national highways. As per Accident Research Institute(ARI), 292 fatalities occurred on the audited segment during the year of 2011-2015. The major crash types were hitting pedestrian and head-on collision. Around 89% cases, crashes happened at straight road section.

The main objective of the audit was to identify the major flaws in the infrastructural system and suggest appropriate mitigation measure. The authors were a part of the audit team. The following article will address significant issues observed during the audit associated with safety performances of the road signage.

Methodology

The roadways were selected considering the following factors: traffic characteristics, crash history and life span. A detailed audit checklist was prepared using RHD(2005) and Austroads(2009) guidelineto check whether the road environment essentially accommodated all user's safety needs. Checking adequacy of road signage was one of the prime concerns during the tenure. Independent and skilled audit team was comprised of road safety engineers and social scientists. Various road users were interviewed to address social perspective. Later themes and codes were generated based the data and analyzed through using SPSS which resulted in exhaustive findings and subsequent recommendations as potential mitigation techniques.

Results

A total of 1079 traffic signages were observed across 500km highway which shows dire scarcity of signage. A total of 16.88% (182 Nos) available signages were not adequately visible and functioning due to lack of regular maintenance. Also, roadside activities: roadside shops, billboards, unauthorized parking obstructs visibility of the signage. 4.5% (49 Nos) sign were placed alarmingly close to the hazard violating the guideline of RHD which failed delivering massages to its user timely. Some unknown signages were observed at the center of carriageway without any engineered treatment. Most of the available signages were warning sign whereas information sign was seldom observed. Relatively newly constructed road has more signs compared to the older ones.

Conclusions and Recomendations

Additional 9311 signages, consisting 20% regulatory, 61% warning and 19% information signs, were recommended for installation across the surveyed zone immediately. This new installation as well as repairing of the existing signages would require USD1.0 Million which is nominal in comparison with other road works. The researchers also strongly recommended to engage local community in the process of maintenance to make the initiative sustainable. RHD took cognizance of those recommendations, and accordingly addressed those and asked for budgetary allocation from the government for further improvement.

References

Austroads 2009, *Guide to Road Safety Part 6: Road Safety Audit*, Austroads, Sydney Australia

iRAP (2013). *iRAP Bangladesh Technical Report, 2013*, iRAP

National Research Council (US). Transportation Research Board. Task Force on Development of the Highway Safety Manual, & Transportation Officials. Joint Task Force on the Highway Safety Manual. (2010). *Highway safety manual* (Vol. 1). AASHTO.

Roads and Highways Department (2005).*Road Safety Audit Guideline 2005*, RHD

World Health Organization. (2018). *Global status report on road safety 2018*. World Health Organization.

A Review of International Best Practices to Improve Heavy Vehicle Safety in Urban Environments

Michael Holmes[a]

[a]2018 Churchill Fellow, NRMA-ACT Road Safety Trust

Abstract

Road freight is increasing across Australia's major cities due to rapid economic and population growth in urban centres. The increase in urban freight results in greater interactions between heavy vehicles and other road users sharing existing road infrastructure and can introduce road safety risks due to exposure and physical size incompatibilities. Many developed countries have invested in leading approaches to address the risks associated with heavy vehicle freight in urban environments. This presentation highlights the best practices identified and reviewed as part of a 2018 Churchill Fellowship and provides recommendations for governments, infrastructure planners, constructors and developers to consider in mitigating potential road safety impacts with the urban freight task.

Background and Context

The urban freight task in Australia is increasing significantly in major cities in response to rapid economic and population growth (Chau, 2018). Such growth has fueled a rise in consumer demand for goods and a pipeline of infrastructure projects and construction activity to support urban development (Infrastructure Australia, 2019). The freight task servicing these demands is almost always performed by heavy vehicles (BITRE, 2014), and whilst heavy vehicle road transport in Australia continues to remain one of the most productive and efficient forms of moving freight, productivity should not be at the expense of safety.

Overall, whilst Australia is seeing a decline in fatal heavy vehicle crashes, the number of fatal crashes involving heavy rigid vehicles has remained relatively unchanged over the last decade (BITRE, 2018). Heavy rigid vehicles predominantly perform the urban freight task, servicing the waste, construction and local transport and distribution sectors. At a state level, recent statistics from New South Wales have reflected the national trend whereby fatal heavy vehicle crashes have declined in all regions, but increased in the Sydney metropolitan region (NSW Centre for Road Safety, 2019).

Despite recent progress made to improve the safety of the heavy vehicle industry in general, such as reforms to Chain of Responsibility provisions under the *Heavy Vehicle National Law* and industry investment in Performance-Based Standards (PBS) vehicles, there are still areas requiring immediate attention to improve heavy vehicle safety in urban environments. Factors such as Australia's ageing heavy vehicle fleet, limitations to heavy vehicle accreditation schemes, logistics planning in urban construction projects and Australian Design Rules for heavy vehicles still lag behind international standards and are not commensurate with the nature of road safety risk presented. As a result, many fatal and serious injury crashes continue to occur due to these deficiencies.

Review of International Best Practices

As part of a 2018 Churchill Fellowship funded by the NRMA-ACT Road Safety Trust, international research was conducted to investigate best practices to improve heavy vehicle safety in urban environments in the United Kingdom, Europe and the United States. Following a desktop study of existing best practices, the following elements were reviewed to understand the international approaches currently being implemented, which included heavy vehicle design regulations, accreditation schemes, vehicle safety technology and standards, sustainable logistics practices, training, education and awareness.

The presentation highlights those best practices identified during the research, providing a gap analysis between the standards and practices of each country visited. It explores the above elements in depth using case studies where governments, research agencies, planners, developers, constructors, and heavy vehicle operators have championed heavy vehicle safety in urban environments. Taking into consideration the Australian context, recommendations are further provided for local agencies for consideration to start leading the way in reducing preventable fatal and serious injury outcomes associated with the urban heavy vehicle freight task.

References

Chau, A. (2018). 'Australia's Growing Freight Task: Challenges And Opportunities', speech, Future Freight: Embracing Change Conference. Adelaide, 31 October.

Infrastructure Australia. (2019). 2019 *Infrastructure Priority List: Project and initiative summaries.* Infrastcruture Australia, Sydney NSW. [PDF file]. Retrieved from: https://infrastructureaustralia.gov.au/policy-publications/publications/files/IA18-4005_Priority_List_2019_ACC_H.pdf

Bureau of Infrastructure, Transport and Regional Economics [BITRE]. (2014). *Freightline 1 – Australian freight transport overview.* Department of Infrastructure and Regional Development, Canberra ACT [PDF file]. Retrieved from: https://bitre.gov.au/publications/2014/files/Freightline_01.pdf

Bureau of Infrastructure, Transport and Regional Economics [BITRE]. (2018). *Fatal Heavy Vehicle Crashes Australia, July – September 2018.* Department of Infrastructure and Regional Development, Canberra ACT [PDF file]. Retrieved from: https://bitre.gov.au/publications/ongoing/fhvc/files/Bulletin_Sep_2018.pdf

NSW Centre for Road Safety. (2019). *NSW heavy truck fatal crashes NSW heavy truck fatal crashes – as at 10 February 2019*. Transport for NSW, Sydney NSW. [PDF file]. Retrieved from: https://roadsafety.transport.nsw.gov.au/downloads/dynamic/weekly_stats/heavy-truck-fatal-crashes.pdf

Capacity building in road safety: What do practitioners think?

Mark King[a], Marina Alexander[a]

[a]Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Institute for Health and Biomedical Innovation (IHBI), Queensland University of Technology (QUT)

Abstract

The Decade of Action for Road Safety emphasizes the need to build road safety capacity in low and middle income countries. The term "capacity building" was borrowed from other areas of development activity, and in road safety is restricted mostly to training. This presentation reports qualitative research undertaken with the aim of exploring the experiences and opinions of road safety practitioners involved in capacity building activities in low and middle income countries. The findings indicate that there is a need to conceptualize road safety capacity building more clearly, and as a longer term process rather than a short term program.

Background

In recent years, with the recognition that road traffic crashes are a significant cause of death and injury in low and middle income countries, capacity building has become a common objective in programs aimed at improving road safety in these countries. At the same time there is no clear statement as to what is meant by capacity building in road safety. In the development field, the concept of capacity was articulated in the 1980s, and has since been debated and reinterpreted, for example one school of thought advocates the use of "capacity development" as the preferred term, because "capacity development" implies the lack of existing capacity – which is usually untrue - and the need for Western intervention – which has colonialist overtones. In road safety there has been little debate about such issues, and road safety capacity building tends to take place in brief and focused training programs. As such, a community of practice may have arisen, in which a shared understanding of road safety capacity building has evolved mostly as a set of activities rather than as a development process. The purpose of the research reported here was to explore the experiences and opinions of road safety practitioners involved in capacity building activities in low and middle income countries to ascertain whether such a shared understanding existed, what it comprised, and whether the participants felt a need for better articulation of road safety capacity building, and changes in practices.

Method

Semi-structured interviews were undertaken with 12 road safety professionals who were identified as being directly involved in capacity building work in a low or middle income country. Most were based in Australia, though some were Australians based overseas. They were interviewed via phone, Skype or face-to-face for about 45 minutes, and subsequently asked to verify the transcripts of the interview.

Results and Conclusions

The transcripts are currently being analysed thematically. Initial impressions suggest that the way that capacity building in road safety is funded, in short term, focused programs, means that the activities involve training individuals. Broader perspectives, such as institutional capacity, tend to be limited to occasional overview exercises rather than programs. Participants felt this situations should be improved, if possible, and some noted that their own capacity building objectives were constrained by the client institutions and project parameters. Recommendations for a more considered approach and further research (including research with recipients) are made.

Optimal Size of Roundabout for Safety Considerations

Sewa Ram[a], Amal Jose[b]

[a,]Professor, School of Planning and Architecture, New Delhi,
[b]PhD Scholar, School of Planning and Architecture, New Delhi

Abstract

Recently, Indian roundabouts caused hundreds of fatal accidents due to their poor geometrical designs and unconventional driving behaviour. This study addresses safety concerns in roundabouts by analyzing different roundabout in India with varying sizes and traffic conditions. Study also identifies 240 roundabouts in India and 13 roundabouts of varied traffic conditions and vehicular composition are selected. We have investigated all conflict points of variable severities and locations on a roundabout. Research put forward solutions to reduce vehicular conflicts through optimization of sizes. This approach benefitted in reducing 32 conflicts points to 8 on roundabouts in such a way that all fatal conflicts are eliminated.

Background, Method, Results and Conclusions

The roundabout functions on the principle of yielding for the circulating flow by the entry vehicles. This behavior, however, is not observed in Indian context. Ideally, the design of roundabout should facilitate in conversion of major crossing conflict angle into minor crossing conflict angle (Crown, 1998). It is also observed that size and design of roundabout has a greater influence upon the severity of impact (HCM, 2000). The increasing popularity of roundabouts in India and other countries owes to their safety and operational benefits. Yet, urban roundabouts in India aren't safe due to concerns over geometrical design and driving behaviour.

Researchers, in the past decades, have made an effort to relate the capacity of roundabout with the size of roundabout, however the safety aspect has been generally neglected in finding the capacity of roundabout. The conflicting movement becomes even more severe with heterogeneous traffic operations. Smaller roundabouts have less speed but high degree of crossing conflict. This makes the roundabout vulnerable to safety concerns. On the other hand, larger roundabouts have relatively acute crossing conflict angle but higher operating speeds, again increasing the severity of conflicts. Further, for larger roundabouts, the crossing conflict points are far more scattered along the weaving length.

The study majorly focused on the geometrical design of roundabouts of difference sizes and traffic conditions. This research makes an effort to find out the optimal size of roundabout having safe and less severe conflicts for design vehicle. The objective of the research is to find out the optimal size of roundabout for varying flow condition and design vehicle with an intent of reduced conflict intensity. But, the safety issues and accidents due to driving behaviour is not addressed in this research.

Around 13 roundabouts were selected out of 240 roundabouts which were identified through web – survey. These 13 roundabouts were selected based upon varying size and geometrics. Further, it was also observed that the selected roundabouts varied in terms of traffic conditions and vehicular composition. To carry out the conflict analysis, path of vehicles was traced to locate the conflicts. This provided the crossing conflict angle and distribution of such crossing points across the weaving length. Impact of conflict was determined through spatial analysis and hotspot aggregation of conflicts. Change in momentum for single vehicle momentum differential across the vehicle was used to quantify the impact of crossing conflict. The expected outcome of the research study is to identify the relation between sizes of roundabout with the safe throughput handled by roundabout for design vehicle.

Findings of this research has a high significance of safety concerns in Indian roundabouts. Optimal size of a roundabout w.r.t. flow and design vehicle is very crucial in reducing the intensity of vehicular conflicts. Using this approach, the fatal accidents are either converted to minor ones or nullified, hence increasing the safety standards of roundabouts.

References

HCM (2010), Highway Capacity Manual. Washington, D.C. :Transportation Research Board.

Crown, B. (1998), An Introduction to Some Basic Principles of U.K. Roundabouts Design." Presented at the ITE District 6 Conference on Roundabouts, Loveland, Colorado.

Making Evidence-based Crash Analysis as Routine as Sidra Analysis by using SESAP

Shane Turner, Paul Durdin, Shendi Mani[a]

[a]Abley Limited

Abstract

Achieving safe system or vision zero outcomes at high-risk urban intersections, especially priority cross-roads and high-volume traffic signals is a major challenge for most cities. Even after decades of crash analysis and improvement works many of these intersections still perform poorly. While best practice for optimising the efficiency of intersections requires the use of modelling tools, like Sidra, this is rarely the case with safety analysis. This is despite the large number of evidence-based safety analysis models and tools that are now available to understand intersection crash risk. This paper outlines the SESAP (Site-specific Evidence-based Safety Analysis Process) that has been developed to enable road safety professionals to estimate and predict the safety of intersections and potential upgrades in New Zealand and Australia.

Background

Sidra is an intersection model that is used throughout New Zealand and Australia to quantify the efficiency of intersection. Best practice demands that almost all major upgrades to major intersections are modelled in Sidra to understand the change in vehicle travel time and operating costs; either positive or negative. Best practice in safety analysis does not currently require the same depth of analysis. It is still fairly common for professionals to 'estimate' the likely change in crashes (usually reductions) based on their 'safety experience'. At best, evaluations reference crash reduction factors and apply these to historical crash data, which in many cases doesn't accurately reflect the likely trend in future crashes. Only in rare situations does the safety analysis involve a detailed crash modelling and analysis, as presented in the case study examples in this paper.

Safety Analysis Tools

There are a number of existing analysis tools that are available for assessing the safety impact of existing and proposed intersection and route layouts and operations. Many tools have been developed in the USA, including IHSDM for rural roads, ISATe for interchanges, Highway Safety Manual safety toolkit for urban roads. These USA tools can easily be calibrated to local conditions. In New Zealand there are some analysis tools, including a spreadsheet tool for detailed safety modelling of traffic signals that considers layout, volume of different road users and the operation of the traffic signals. While the analysis tools are less developed than those in the USA, the NZ Crash Estimation Compendium (NZTA, 2016) contains the models and factors needed. Basic crash analysis tools can be developed relatively easily using these models in a spreadsheet tool.

Case Studies Analysis

The three case studies (high risk intersections in Christchurch, Tauranga and Nelson in New Zealand) demonstrate the process that can be used to estimate crash rates at intersections. Often high-risk intersections have an unusual feature or are complex and or the proposed solutions are innovative. The challenge then is to understand how the unusual layout or innovative design option is likely to impact on crash occurrence given the crash models tend to be for standard intersection designs. The analysis process has three steps. The first step is to predict the expected injury crash rate for the current intersection and each option using crash models and factors that most closely represent the intersection options (e.g. base model is a roundabout). Step 2 Assesses the differences that major differences between the intersection design and the base model, based on research or expert opinion (e.g. for a signalised roundabout). The final step is to estimate the expected risk of serious injury and fatal crashes, using speed, X-KEMM-X or crash severity factors.

Reference

NZ Transport Agency, 2016. Crash Estimation Compendium: Version 1, Wellington, New Zealand.

A study on Risk Taking Behaviour among Motorcyclist in East Coast Region, Malaysia

Rusdi Rusli

Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu MALAYSIA

Malaysia has recorded the second largest fatality in road traffic crash in Southeast Asia with 24 road traffic deaths per 100,000 populations in 2015. Motorcyclists are among the highest road user involved in the fatal traffic crashes and mostly are associated with risk taking behaviour. Most of road safety study in Malaysia conducted in west areas or areas with high populated people such as Klang Valley or Shah Alam. This is the first study conducted in the areas with less populated in east coast region. Online survey via Google form has been distributed to the potential respondents. A total of 205 respondents contributed in this survey. This study used descriptive analysis and regression to identify motorcyclist's behaviour towards traffic safety. Results from this study show that 54% of the respondents have personally experienced involving in motorcycle crash. Most of the crash experienced motorcyclist more carefully when riding a motorcycle. 58% of respondent do not agree that experienced motorcycle rider will not be involved in road crashes. More road safety awareness campaign should be conducted especially for motorcyclist in rural areas.

Shift working driver fatigue programme – a pilot programme to raise awareness and motivate change among employees and employers

Adrian Stephenson

New Zealand Transport Agency (NZTA)

Abstract

The NZ Transport Agency (NZTA) is developing a driver fatigue programme to educate and gather the information needed to help prevent shift worker fatigue-related car crashes. Employers will get a baseline level of self-reported fatigue from employees before starting and finishing a shift, and how fatigued they are before driving home. Employees will get served education tips before work and when driving home. There is also a suite of products, resources and tools available to help reduce instances of driver fatigue and begin a culture of awareness and action around fatigued driving in workplaces.

The Issue

New Zealand had 285 fatal and 2,534 serious injury crashes in 2016 (Ministry of Transport, 2018). Being fatigued significantly increases the risk of a crash. Fatigue was identified as a contributing factor in 28 fatal and 119 serious injury crashes (Ministry of Transport, 2017). Shift workers are six times more likely to be involved in a fatigue related road crash than other workers (VicRoads, 2015). Alongside this, a sample review of CAS (crash analysis) data for 2013 fatigue related crashes, revealed most people who were crashing were people who work shifts, long or irregular hours (referred to as shift workers).

Therefore, shift workers are a high-risk group, and this makes sense when you consider some factors that contribute towards fatigue: insufficient sleep, working/driving during times when we usually sleep, and long periods of work or activity without a break (NZTA, 2015).

There is also a 19% difference in perception between staff and management about how overtired workers are in the workplace (WorkSafe NZ, 2017). While employers are interested in fatigue in the workplace, the drive to and from work has often been viewed as an individual's personal responsibility.

The Solution

To understand what employees and employers think and feel about fatigued driving, qualitative research was undertaken. A key finding was that to motivate change, we needed to identify the level of fatigue in the employers' direct workforce and to create an interaction between the employer and the employee. A simple way to simultaneously collect data for the employer and give employees a self-assessment tool with fatigue education tips was required. This led us to the development of a holistic 5-phase programme designed to capture data, engage, educate and analyse (Table 1).

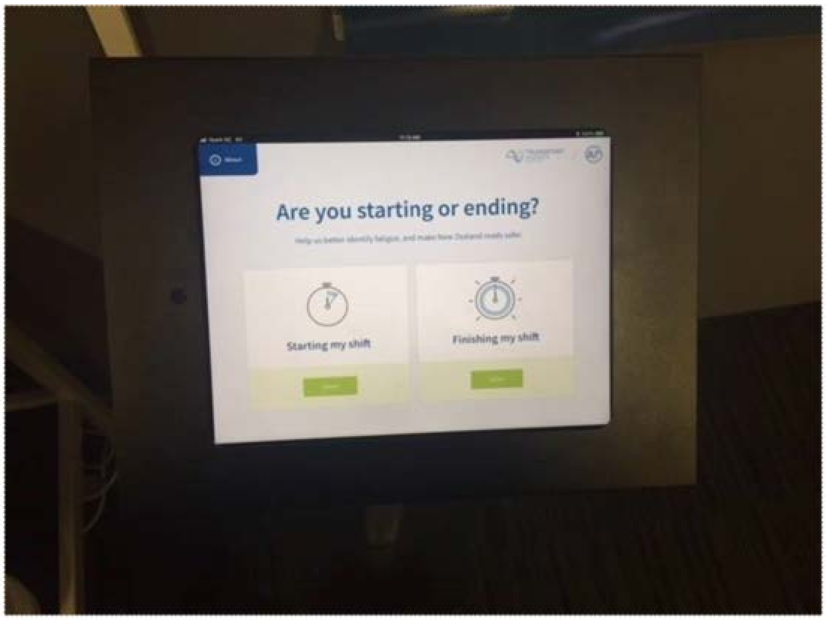
Table 1. Fatigue Holistic 5-Phase Programme

Phase 1 (4 Weeks)	**Phase 2 (2 Weeks)**	**Phase 3 (6 Weeks)**	**Phase 4 (4 weeks)**	**Phase 5 (2 Weeks)**
Data capture	Reporting	Assisting	Capture 2.0	Feedback
Data capture tool is used daily by staff (anonymously) before and after their shift to: •Generate a baseline level of fatigue for staff. •Generate a view of how fatigued staff are before driving. •Provide staff vital fatigue information before work/driving home.	Provide a report of the level of fatigue to management and employees.	Introduce a suite of products, resources and tools to help reduce instances of driver fatigue. All materials support the message the programme is designed to communicate.	The data capture tool is re-implemented to see any change in workforce overall level of driver fatigue.	A second report is provided to the management and employees to see any changes from first capture phase and what areas might still need attention.

To develop the programme, we collaborated with WorkSafe NZ and with Massey University's Sleep/Wake Research Centre to provide insights into similar work, the best way to design the data capture tool (Figure 1), and education tips that would be beneficial to the shift worker.

A phase one trial was undertaken for four months within NZTA's Wellington and Auckland Transport Operations Centres who operate shift rosters (WTOC = 50 staff and ATOC = 65 staff). Staff reported to two questions, two times each day, so not onerous.

Figure 1. Data Capture Tool



Results

Findings showed 26% of WTOC and 23% of ATOC shift workers are fatigued before getting behind the wheel. Overall, there were improvements for WTOC especially for both high risk occasions, starting or finishing night shifts, 8% and 6% respectively. The focus on these shifts had a small impact. Because of their high risk the programme will continue to target them.

ATOC didn't move significantly and was consistent with the first round. Conclusions here are that they are yet to see improvements and should therefore keep focusing on the same high-risk shifts (driving home from either shift, and particularly night shifts).

Another outcome from the pilot is that use of the data capture tool increased 74% for WTOC and 64% for ATOC, which shows the assist phase motivated staff to use the tool more.

Conclusion

Whilst this pilot stage was brief, there have been some improvements and feedback has been positive. The data capture tool and reports provided the catalyst for both employees and employers to talk about fatigue levels, what are the issues and potential solutions to address these.

There were improvements in the trial sites that suggest access to the information and tools has started to help improve some levels of fatigue. Staff and management need to remain conscious of the highest risk shifts and continue to promote taking a 15-minute nap before driving when seriously tired.

A phase two pilot trial is planned to test the approach in other shift working companies and feedback from staff and management from this trial will help shape the next iteration of the programme.

References

Ministry of Transport. (2017). *Fatigue crash fact sheet*. Retrieved from Ministry of Transport website: https://www.transport.govt.nz/assets/Uploads/Research/Documents/0f5a557b3c/Fatigue-2017.pdf

Ministry of Transport. (2018). *Time Series of Casualty and Crash Categories*. Retrieved from Ministry of Transport website:

https://www.transport.govt.nz/mot-resources/new-road-safety-resources/annual-crash-statistics/time-series-of-casualty-and-crash-categories/

NZ Transport Agency. (2015). *Health and Ftaigue*. Retrieved from NZTA website:

https://www.nzta.govt.nz/assets/resources/heavy-learner/health-and-fatigue/docs/health-and-fatigue.pdf

VicRoads. (2015). *Fatigue and road safety*. Retrieved from VicRoads website:

https://www.vicroads.vic.gov.au/safety-and-road-rules/driver-safety/fatigue/fatigue-and-road-safety

WorkSafe. (2016). *Results from WorkSafe's surveys: Understanding Health and Safety Attitudes and Behaviours in the New Zealand Workplaces.* Retrieved from WorkSafe website:

https://worksafe.govt.nz/data-and-research/research/attitudes-and-behaviours-survey-2016/

myLearners – Supporting Victorian Learner and Supervising drivers through a staged approach

Juliet Bartels[a], Sarah Chapman[b], Tim Davern[a]

[a]VicRoads [b]Transport Accident Commission

Abstract

VicRoads and the Transport Accident Commission (TAC) developed myLearners, an electronic logbook mobile application and an educational website to support learner and supervising drivers through the learning to drive journey. myLearners can capture data on learner driver trips, send targeted road safety messages and track engagement in the road safety messages and feedback by the learner and supervising driver.

This extended abstract will provide an overview of the myLearners product.

Background

myLearners was developed by VicRoads and TAC and includes an electronic logbook mobile application and integrated educational website featuring road safety-based learning resources. myLearners enhances the learning to drive process and Victoria's Graduated Licensing System (GLS) and captures data to inform future policy.

myLearners supports learner drivers to develop their capabilities, log their driving practice and encourages gradual progression through the four stages of the learner period. It encourages learner and supervising drivers to work together through the stages and supports supervising drivers to improve their capability, enabling them to review and reflect on their learner's progress.

myLearners functions

More than a digital logbook, myLearners delivers targeted messages to learners and supervisors based on the learner's current driving experience. Messages allow users to better understand the stages of learning to drive and their progress.

Learner and supervising drivers select the specific conditions for each trip, which encourages active consideration and discussion of the type of practice. This aims to ensure practice is appropriate to the learner's ability and that learners experience a range of driving conditions/environments.

myLearners uses data obtained during drives, including hours and trip conditions (e.g road type and weather), to trigger targeted road safety messages.

The targeted messages focus on encouraging learners and supervising drivers to;

- use a staged approach to learning to drive and plan drives appropriate to their logged hours;
- learn about key safe driving behaviours;
- regularly access the road safety resources on the website; and
- communicate and work together.

Educational Website

myLearners includes an educational website which represents a refreshed and digitised version of existing paper based resources.

myLearners resources have been developed in a way that focus on influencing the learner and supervising drivers' behavioural choices and the content is presented in an appealing, concise and digitally engaging format.

Data capture benefits

Since myLearners launched, to date[1], there are 30,158 users, 63,148 approved hours, 130,793 approved trips and 2,431,062 approved kilometres logged.

myLearners uses GPS to automatically track the time, duration and distance of each trip. Other trip conditions require manual selection. myLearners provides a rich source of data enabling a deeper understanding of the learning experience and insights including when learners first practice on a freeway, drive at night, drive with a driving instructor, the duration and frequency of their drives or whether driving practice differs by driver demographics. Supervising drivers' feedback on each trip to learners can also be analysed.

Over time there is the potential to link myLearners data with other VicRoads databases to investigate the relationship between practice patterns and crashes, offences, or performance on the learner permit test, the hazard perception test and the Drive Test.

In summary, myLearners has been designed to support learners and supervising drivers to be more engaged in the learning to drive experience, to have easier and regular access to road safety content and through the data capture, will allow greater insights into the learning process to assist with future policy development.

[1] VicRoads myLearners data, 24 September - 4 February 2019

Full Gear – Community Youth Road Safety Program

Elisa Ryan,

Youth Development Officer, Community Department, Glenorchy City Council, Tasmania.

Abstract

The Full Gear Project was co-designed by young people, a local community house and the Glenorchy City Council and aimed to address unsafe/illegal motorcycle riding and to promote positive road safety messaging in the community. This paper explores how social issues and safety issues can be jointly addressed, the role of social workers and other support organisations in addressing road safety with young people and the impacts on the local and broader community.

Background

The Towards Zero - Tasmanian Road Safety Strategy 2017 -2026 states that both motorcyclists and young people are vulnerable road users and are over-represented in serious casualties.

The Full Gear Project was established to address the issue of unsafe and illegal trail bike riding and hooning on the streets of Chigwell (a low socio-economic suburb in Tasmania).

Glenorchy City Council (in conjunction with a local community centre) was successful in obtaining a Department of State Growth, Community Road Safety Grant and co-designed a pilot program with young people who were engaging in the target risky behaviours.

Planning and delivery

Consultation with young people revealed that 'cost' of gaining a licence was the primary reason for engaging in unlicensed riding and the resultant high-risk riding behaviours. Rather than assisting with the cost of gaining a licence in isolation, this was used as an opportunity to deliver a road safety program to further the knowledge and skills of participants in riding safely.

The road safety program (delivered over eight weeks) was a mutual exchange of experience and knowledge. Each session explored a topical issue guided by the ideas, knowledge and experiences of the local young participants, supported by experts and community organisations. Threaded into each session was the development of local road safety campaigns and planning for the promotion of the group's message to the community.
In exchange for their contribution, the young people were funded to complete the Pre-Learner Motorcycle Course ($695.00 per person)

Working with Bucaan Community House, who had already formed a trusted relationship with the participants, enabled visiting services to contribute whilst utilising the support and familiarity of staff known to the young people.

Outcomes and observations

Positive outcomes indicating the success of this program include: completion rates; increase in the number of young people who obtained licences through the program; improvement of attitudes to road safety and an increase in employment.

Verbal feedback also demonstrates that participants have improved self-confidence and sense of importance as change-makers in the community. These personal achievements can manifest themselves into positive behaviours on the road, therefore, creating a safer community.

Three further programs were delivered following the success of the pilot.

Case Study

Jacob, a 16-year-old participant, was successful in obtaining part-time work as a motorcycle pizza deliverer. Jacob's brother has a methamphetamine addiction and often gets violent towards members of the family in his home. Now that Jacob has his licence he has the freedom to be out of the house when situations are volatile. Jacob is extremely proud of his achievement and this is evident in the way he handles himself on the road. He says in his post-program survey "I feel like if I didn't do this course I would have been more likely to ride on the road unlicensed and around the bush and that wouldn't have been good."

Figure 1. Full Gear Billboard Campaign designed by the young participants

References

Department of State Growth, Transport. (2016). *Towards Zero - Tasmanian Road Safety Strategy 2017-2026*.

Developing the Drive Community toolkit: Working with community-based groups to support driver licensing education programmes

George Vaeau[a], Sarah Howell[b],

[a]Accident Compensation Corporation (ACC), [b]New Zealand Transport Agency (NZTA)

Abstract

The Drive Community toolkit, developed by ACC and NZTA working with community groups, extends young driver education resources and supports community-based driver licensing education programmes. Community groups are well-positioned to support harder-to-reach at-risk young drivers through their holistic support services. The award-winning toolkit contains best-practice interactive resources, designed for classroom sessions. These support young adults through the graduated driver licensing system (GDLS) to become safe and skilled drivers. Demand for the toolkits has been high and initial feedback has been extremely positive.

Background

Young drivers (aged 16-24 years) in New Zealand (NZ) are over-represented in death and serious injury crashes compared to other age groups (Ministry of Transport, 2017). The riskiest period for driving is the first 6-12 months on a Restricted licence, when a novice driver is first legally able to drive unsupervised, and their risk of a fatal or injury crash is up to seven times higher than at any other time (Lewis-Evans, 2010).

ACC and NZTA partnered to offer digital resources, known as the Drive products, to support young people progress through the GDLS to become safe and skilled young drivers.

Method

To extend the reach of Drive resources, we worked with community groups to understand their needs in community-based driver licensing education. Many work with harder-to-reach at-risk young drivers. From them we learned that a digital suite of products did not best serve community providers. Instead, a toolkit of physical resources was designed to support and enhance programmes being run by community providers. Feedback from community groups and young people throughout the development process helped inform the design of the resources.

In the toolkit are resources designed using best-practice in road safety and driver education. There are; a collection of adaptable in-class activities designed to be interactive and engaging, a virtual reality app on hazard identification, and the Drive cards which gamify learning the NZ Road Code, the official guide to NZ's traffic law and safe driving practices, required for the written component of the GDLS. A 'Drive Community NZ' Facebook group for community educators has been set up to connect those using the toolkit to share their experiences and resources.

Results

Demand for the toolkit from community groups around the country has been high. Initial feedback suggests that the Drive Community toolkit resources will complement work done by community educators to support young people progress through the GDLS to become safe and skilled young drivers. The toolkit has also been recognised for design awards both in NZ and Australia in categories of Public Good, and Social and Community.

Conclusion

We have worked with community groups to understand their needs and support their work by providing a toolkit of resources. This work has allowed us to widen out young driver education offerings and start work to support a harder-to-reach group of young drivers, leveraging off the success of community groups to work with these young people. Further evaluation is planned to understand how the resources are being implemented, the impact the initiative has had on young drivers, and what further resources can be developed. 504

References

Lewis-Evans, B. (2010). Crash involvement during the different phases of the New Zealand Graduated Driver Licensing System (GDLS). *Journal of Safety Research*, *41*, 359-365.

Ministry of Transport. (2017). Young drivers 2017. Retrieved from Ministry of Transport website: https://www.transport.govt.nz/assets/Uploads/Research/Documents/31ad77c71e/young-drivers-2017.pdf

Time to Re-Think Our Approach to Road Safety Education?

Teresa Senserrick[a], Oscar Oviedo-Trespalacios [a], Catherine McDonald[b]

[a] Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology (QUT), Australia

[b] University of Pennsylvannia School of Nursing, United States

Abstract

In other health-related fields, education regarding risky behaviours has progressed from abstinence-only ("don't do it") messaging to harm reduction approaches. The latter does not preclude the "abstinence is safest" message, but acknowledges that risks can be inevitable and, therefore, also includes education on ways to reduce potential harms should the risky behaviour occur. Wide adoption of this approach regarding alcohol and other drug use, for example, is associated with improved safety behaviour and reduced harm. We argue road safety education is generally limited to abstinence-only approaches and question whether it is time also to take a harm reduction approach.

Background

Road safety education messaging, such as in public campaigns and new driver/rider licensing courses, tends to focus on prevention of risky behaviours. This includes "don't do it" cautions and ways to achieve this; e.g. how not to combine driving and substance use, change sleep/driving times to avoid fatigued driving, use of speed and seatbelt reminders, and phone blocking apps. The 'Fatal Five' behaviours account for substantial trauma on our roads and therefore prevention messaging is highly justifiable. However, taking into account human error, we have limitations in attention and alertness, are 'wired' to be social, including staying connected to families and friends, and are subject to peer and time pressures, as examples. Therefore, the chance we can avoid all risks at all times on all trips can be unrealistic in our multifaceted, often busy and highly connected lives.

Harm reduction

Historically, 'harm reduction' (also 'risk reduction' or 'risk/harm minimisation') is associated with education regarding alcohol/other drugs. Messaging ranges from ensuring a sober trusted ally is at-hand should an adverse reaction occur, for example, to more active interventions such as needle exchange programs, safe injecting rooms and pill testing. The approach is also evident in the move away from asbtinence-only sex education in schools to inclusion of safe sex messaging and initiatives to improve access to condoms, for example, in efforts to reduce sexually transmissible diseases and teenage pregnancies. Research provides evidence of considerable success in establishing safer behaviours and reducing harm outcomes (e.g. Charlet & Heinz, 2017; Resiak, Mpofu & Athanasou, 2016; Stranger-Hall & Hall, 2011).

Harm reduction approaches in road safety

Limited road safety education examples adopting a harm reduction approach are evident in forward planning circumstances (e.g. designated driver campaigns). However, many risks arise during a trip. For example, despite contrary intentions, motorists can find themselves speeding when failing to be vigilant due to cues from surrounding traffic and road designs. Fatigue on-set or distractions (e.g. a phone alert after forgetting to mute) can also occur unexpectedly. Education for new motorists commonly promotes strategies to maintain a crash avoidance space around the vehicle. A harm reduction approach would push this further to educate motorists that, should they find themselves in circumstances that compromise their vigilance, then allow an even greater safety space, especially forward headways – improve the chance you will have time and space to react should you be late in detecting a hazard. This is not to promote risk-taking, which is still portrayed as dangerous and to be avoided. However, it also acknolwedges that total compliance is challenging, therefore, if such risks eventuate, then adopt a safer action to minimise potental harm.

Conclusion

Abstinence-only education has limitations in preventing risk behaviours and harmful outcomes While some road safety risks should never be compromised (e.g. drink driving), realistically, some risks are inevitable on-road. This presentation will promote discussion on potential benefits of enhancing road safety education to acknowledge this and adopt a harm reduction approach. A variety of road user and risk scenario examples will be explored.

References

Charlet, K., Heinz, A. (2017). Harm reduction: a systematic review on effects of alcohol reduction on physical and mental symptoms. *Addiction Biology, 22*(5), 1119-1159 (doi:10.1111/adb.12414).

Resiak, D., Mpofu, E., Athanasou, J. (2016). Drug treatment policy in the criminal justice system: a scoping literature review. American Journal of Criminal Justice 41. 3-13 (doi:10.1007/s12103-015-9329-z).

Stanger-Hall, K. F., Hall, D. W. (2011). Abstinence-only education and teen pregnancy rates: why we need comprehensive sex education in the U.S. *PLoS One, 6*(10), e24658. (doi:10.1371/journal.pone.0024658).

Death and severe injuries on NZ roads: Different things to different people

Siobhan Isles[1], Paul Graham[2], Zeeman van der Merwe[3], Angela Pidd[4], Bridget Dicker[5], Joe Hedditch[3], Meisha Nicolson[4], Verity Oliver[5], Auren Xu[3], Ivy Kennedy[4], Ian Civil[1]

[1] NZ Major Trauma National Clinical Network, [2]NZ Transport Agency, [3] Accident Compensation Corporation, [4] Ministry of Health, [5] Order of St John

Abstract

Many sources record road-related deaths and injuries but use different definitions. Achieving safer roads requires an accurate description of road trauma. To create a comprehensive picture of road-related trauma, a collaboration of five agencies in New Zealand brought together data from seven databases and matched individuals. The resulting analysis allowed a true representation of road trauma beginning with all injuries, the number presenting to hospital, hospital admissions, serious life-threatening injuries, and deaths. The study addressed important gaps in the understanding of road trauma. It demonstrated that interagency collaboration can address deficiencies in individual databases and allow a common definition for road traffic injuries.

Background: Road traffic injuries are associated with high societal costs in health, social and financial terms. Different agencies use different measures yet report them similarly making it difficult to determine the true picture of where injury occurs, who is injured and how, what the severity of that injury is, how it is managed, and what the cost is. An example would be the way the transport agencies define severity of injury which relates to whether the patient was taken to hospital or not. The trauma network definition is based on the Injury Severity Score (ISS). To determine whether these gaps could be addressed a range of transport and health agencies collaborated and matched data sources to develop agreed definitions and confirm numbers of patients in each category, and their health and financial outcomes.

Method: Five agencies; NZ Major Trauma National Clinical Network (MTNCN), NZ Transport Agency (NZTA), Accident Compensation Corporation (ACC), Ministry of Health (MoH), Order of St John (OStJ) brought together data for the financial year 1 July 2016-30 June 2017 from seven databases (Crash Analysis System (CAS), ACC Claims data, OStJ electronic Patient Report Forms, NZ Major Trauma Registry (NZMTR), National Non-Admitted Patient Collection, National Minimum Dataset, Vehicle Risk Rating register. The agencies agreed definintions on road", "road trauma" , and "severity of injury". Using the National Health Index (NHI) number (a unique health identifier applied to each individual in New Zealand) to match individual patients that could potentially be in more than one dataset an overall picture of the numbers of patients injured in road related trauma was determined. The circumstances surrounding their injury, demographics, severity of injury, and cost of care, were described

Results: Using a collaborative approach the contributing organisations' varying definitions of road, road trauma and severity of injury were resolved. A single agreed definition was reached. Road was defined as public open road or urban highway. Private road and farms were excluded. Road trauma was defined as an injury occurring on a road associated with a form of transport. Pedestrians falling over not involving a form of transport were excluded. Injury severity was agreed as that defined by ISS with ISS>12 describing patients with severe injury. Starting with the dataset comprising the number of individuals who had ACC claims for personal injury as a result of road related trauma a cohort of ~44,000 was described. This represented the entire dataset for such patients in New Zealand. Various sub-cohorts of this group of ~44,000 were outlined (Figure 1) culminating in 343 deaths and ~1,000 with severe injuries as determined by inclusion in the Major Trauma Registry. Car occupants made up the majority of patients (63%) and vehicle type was only unavailable in

0.8%. The total cost of care was $130m, with a median of $203 and IQR of $71-91. The highest costs was associated with truck occupants, motorcyclists and cyclists. Notable deficiencies in the datasets included only 13% of patients admitted to hospital after a cycle injury having CAS reports and an inability to match injuries to the vehicle risk rating as the register was incomplete for the year studied.

Conclusions: The study proved the feasibility of the methodology which has enormous potential to objectively quantify the burden of trauma in New Zealand. The study addressed important gaps in the understanding of the personal outcomes following road trauma and demonstrated the potential for collaboration between disparate agencies to provide additional value for all

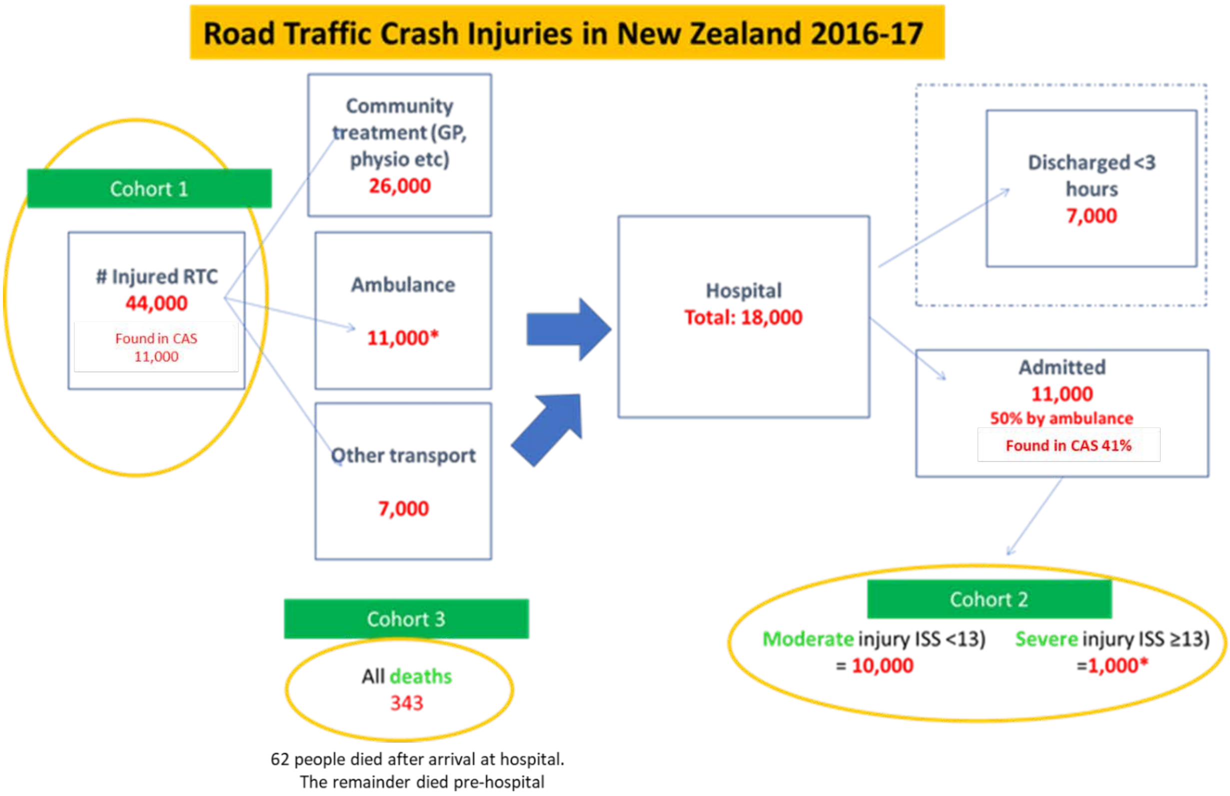


Figure 1. Road traffic crash injury count for NZ July 2016-June 2017)

Databases used

Crash Analysis System: https://www.nzta.govt.nz/safety/safety-resources/crash-analysis-system/

National non-admitted Patient Collection https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-non-admitted-patient-collection

National Health Index https://www.health.govt.nz/our-work/health-identity/national-health-index

National Minimum Dataset https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/national-minimum-dataset-hospital-events

Electronic Patient Report Form https://www.stjohn.org.nz/News--Info/St-John-ePRF/

Hector VR®: Harnessing Co-Design Principles to Build A Mixed Reality Driving Simulator for Older Drivers

Alicia Eugene[a], Michael Mortimer[b], Sue Thomson[c], Ben Horan[b]

[a]Harvest Community Sector Consultants, [b]Deakin University, [c]McLean Care

Abstract

Driving is key to independence for many older people. However, ageing-related declines in processing, attention and cognition can impact driving competence. This project is the first of its kind in Australia to use a "mixed reality" solution to develop a driving simulator specifically with, and for, older drivers. As a decision assistance tool, the Hector VR® driving simulator provides older drivers with objective information about their driving competence including reaction time and compliance with road rules. Evaluation results confirm the utility of a co-design approach in developing a fit-for-purpose driving simulator with a high degree of user acceptance.

Background

Research consistently highlights that accident risk increases for the older driver population (Langford and Koppel, 2006). A number of factors are likely to contribute to this increased risk, including age-related changes in sensory and perceptual processing, attention, and cognitive ability (Ni, Kang and Andersen, 2010).

However, mobility is key to independence for many community-dwelling older people and driving cessation is associated with a number of negative outcomes. These include marked declines in quality of life and general health (Edwards, Lunsman, Perkins, Rebok and Roth, 2009), increases in clinically significant depression (Mezuk and Rebok, 2008), reduced social networks (regardless of the ability to use public transport) (Mezuk & Rebok, 2008) and premature entry to residential aged care (Edwards, Perkins, Ross and Reynolds, 2009).

The question of how to support older people to maintain their driving competence; or to relinquish their drivers licence based on an objective assessment of their ability is therefore an increasingly pressing policy issue in many developed countries with ageing populations.

Driving simulators are recognised as a useful means of conducting driving-related research in a low-risk environment with ease of data collection and standardisable results (Michaels et al., 2017).

Method

This project used a co-design method to create a driving simulator with, and for, older drivers. Co-design is a participatory research approach that involves a partnership between researchers and stakeholders, with collaboration right from the outset (Goodyear-Smith, Jackson and Greenhalgh, 2015) to test designs to improve implementation and effective uptake (Peters, Adam, Alonge, Agyepong and Trang, 2013).

User evaluations were undertaken across three development phases (alpha, beta and final release) by a total of 63 individual participants aged 64 and above, with the two eldest participants both aged 93 years old. With the exception of one, all participants held a current Australian drivers licence with 57% of all participants being female and 43% male. All participants resided in regional NSW.

The phased development approach enabled feedback by participants to inform and guide subsequent development stages in an interative co-design process. Each participant undertook at least one virtual driving experience, answered a series of driver behaviour questions and completed pre- and post-surveys based on a modified Technology Acceptance Model 2 (TAM-2) standardised evaluation tool (Vankatesh & Davis, 2000). Likert-scale questions were used to elicit feedback on the level of user acceptance, ease-of-use and attitudinal information relating to future intention to use the technology. Focus groups were also held at the completion of testing to provide further detail.

Figure 1. Hector VR® driving simulator in use.

Results

Fit-for-purpose simulator design

As demonstrated in Table 1 below, the aggregate results show positive end-user feedback and acceptance with more than 75% of participants indicating they would use the driving simulator in the future if they wanted to know more about their driving competence.

Table 1. Results Summary

	Strongly Disagree (%)	**Disagree (%)**	**Neutral (%)**	**Agree (%)**	**Strongly Agree (%)**	**Total Positive Response (%)**
Combining VR technology with the shell of a real car enhanced the overall design.	**0**	**0**	**17**	**66**	**17**	**83**
The driving simulator is easy to use.	0	5	14	73	8	81
The results from the driving simulator are useful.	0	0	3	73	24	97
I found it easy to understand the simulator test results.	0	0	0	81	19	100
If I wanted to know more about my driving competence I would use the simulator.	0	8	14	59	19	78

Conclusions

This project demonstrates that a co-design approach is effective in engaging older drivers in the development of a mixed reality driving simulator. Older drivers involved confirm an intention to use the Hector VR® driving simulator to gain information about driving competency and found the results produced by the simulator of use. Overall, the driving simulator is fit-for-purpose for its intended older driver user group and may make a useful contribution to dignified decision making about driving cessation for older drivers.

Acknowledgement

This project received funding from the Department of Health.

References

Edwards, J. D., Lunsman, M., Perkins, M. Rebok, G.W. & Roth, D.L. (2009) Driving cessation and health trajectories in older adults *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, vol. 64, pp. 1290-1295, 2009. doi:10.1093/gerona/glp114

Edwards, J.D., Perkins, M., Ross, L.A., & Reynolds, S.L. (2009) Driving Status and Three-Year Mortality Among Community-Dwelling Older Adults *J Gerontol A Biol Sci Med Sci*. Vol 64A. No 2, pp 300 – 305. doi:10.1093/gerona/gln019

Goodyear-Smith, F., Jackson, C. and Greenhalgh, T. (2015) Co-Design and Implementation Research: Challenges and Solutions for Ethics Committees *BMC Medical Ethics* 16:78 doi:10.1186/s12910-015-0072-2

Langford, J & Koppel, S. (2006). Epidemiology of older driver crashes – Identifying older driver risk factors and exposure patterns. *Transportation Research Part F: Traffic Psychology and Behaviour*. 9. 309-321. doi:10.1016/j.trf.2006.03.005.

Mezuk,B. & Rebok, G.W. (2008) Social Integration and Social Support Among Older Adults Following Driving Cessation, *The Journals of Gerontology: Series B*, Volume 63, Issue 5, Pages S298–S303, https://doi.org/10.1093/geronb/63.5.S298

Michaels, J., Chaumillon, R., Nguyen-Tri, D., Watanabe, D., Hirsch, P., Bellavance, F. et al. (2017) Driving simulator scenarios and measures to faithfully evaluate risky driving behavior: A comparative study of different driver age groups. *PLoS ONE* 12(10): e0185909. https://doi.org/10.1371/journal.pone.0185909

Ni, R., Kang, J., and Andersen, G. (2010) Age-related declines in car following performance under simulated fog conditions *Accid Anal Prev* 42 (3): 818 – 826. doi:10.1016/j.aap.2009.04.023.

Peters, D., Adam, T., Alonge, O. O., Agyepong, I. A., & Tran, N. (2013). Implementation research: What it is and how to do it. *BMJ (Online)*, *347*, [f6753]. https://doi.org/10.1136/bmj.f6753

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204. doi:10.1287/mnsc.46.2.186.11926

Speed Management? Let's Talk About it!

Haris Zia[a], Dale Harris[a], Dave Smith[a]

[a]Abley Limited

Abstract

Inappropriate or excessive speed is a major cause of road trauma. Effective speed management is fundamental and critical to solving this issue. Most of the current guidance is focused on the analytical aspects of speed management and setting speed limits. However, critical to the success of any speed management project is effective engagement and consultation with stakeholders and the community. Currently there is little guidance on this important part of the process and as such, it is often overlooked by practitioners. This paper identifies good practice guidance for engagement and consultation to effectively implement speed management interventions.

Background

Speed limit setting guidelines in Australia and New Zealand generally require or recommend that consultation be undertaken as part of speed limit reviews. It is important to distinguish between engagement and consultation in the speed limit setting process. The NZ Transport Agency Engagement Handbook (2018) states that:

Engagement is different from consultation. It's about creating the right environment within which to undertake consultation. Good engagement begins before consultation, it continues through the required consultation phase, and beyond any decision.

Research

Austroads commissioned a research project to establish good practice on engagement and consultation with stakeholders and the community as part of effectively implementing speed management interventions. This research was informed by a desktop review and interviews with representatives from Australasian jurisdictions.

Results

Internationally, there is very little best practice guidance for engaging and consulting stakeholders and communities on speed management interventions. Most jurisdictions in Australia and New Zealand adhere to the basic requirements for consultation as part of speed limit setting guidelines.

VicRoads has provided guidance on speed management engagement as part of their Speed Zoning Guidelines (VicRoads, 2017). The overriding community engagement principle in this document is:

When determining or changing a speed limit, engagement with affected communities and road users shall be undertaken so that expectations and impacts are understood and considered.

The Department of Transport and Main Roads have prepared a Queensland Speed Conversation document which is targeted to the public and promotes the link between speed and road safety (Queensland Government, 2017).

The NZ Transport Agency's Engagement Handbook (2018) provides an engagement framework based on five principles (Figure 1) that encourage road controlling authorities to undertake extensive community engagements, to engage consistently and potentially modify their approach based on community and stakeholder input.

Figure 1. Five Principles for Positive Engagement (source: NZ Transport Agency, 2018)

Best Practice Guidance

Based on the desktop review and interviews, best practice guidance for engagement and consultation is summarised below:

- Undertake surveys to understand public attitudes towards speed. This is necessary to ensure messages are relevant and targeted.
- Engagement and consultation should focus on speed and its close link to road safety outcomes rather than speed limits.
- Engagement should be undertaken throughout the project phase, but especially before the formal consultation process. It is important for road controlling authorities to explain their strategic objectives early to build understanding and support.
- While state authorities are responsible for setting speed limits, there is scope for a shared role between state and local authorities in community and stakeholder engagement. High-level strategic direction from the state authority, coupled with knowledge of local authorities, is considered good practice.
- State authorities should take responsibility for supporting local authorities in their engagement and consultation practices by providing training, tools and templates, and support for developing and resourcing communication strategies.
- State and local authorities should listen to and consider the views of stakeholders and the public.
- Engagement and consultation should use a range of media such as local newspaper ads, social media (Facebook) and online advertising to ensure wide coverage.
- Speed management interventions should be planned and implemented at a pace at which stakeholders and the public can accept and support.

References

NZ Transport Agency. (2018). *Engagement handbook*. Wellington, New Zealand: Author. Retrieved from https://www.nzta.govt.nz/safety/speed-management-resources/engagement-resources/engagement-handbook/

VicRoads. (2017). *Speed Zoning Guidelines Edition 1*. Melbourne, Australia: Author. Retrieved from https://www.vicroads.vic.gov.au/-/media/files/technical-documents-new/traffic-engineering-manual-v3/tem-vol-3-part-211--speed-zoning-guidelines-jun-2017.ashx

Queensland Government. (2017). *The Queensland speed conversation – Let's change the way we look at speed*. Brisbane, Queensland: Author. Retrieved from https://www.tmr.qld.gov.au/-/media/Safety/roadsafety/Strategy-and-action-plans/Speed-conversation-strategy.pdf

What's needed to improve the Drug Driving issue in Victoria?

Yeewah Yam[a]

[a]Royal Automobile Club of Victoria, Melbourne, Victoria

Abstract

In response to the growing drug driving problem in Victoria and increased government funding to tackle the issue, RACV interviewed experts to investigate the regulatory and non-regulatory management of drug driving in Victoria and identified key areas of improvement. There was strong emphasis for further research to be undertaken to improve the cost-effectiveness and relevance of drug driving laws and roadside drug testing (RDT). Interviewees stressed the power of education and therapeutic approaches that combat drug driving as part of a broader public health issue. Overall, effective implementation of these strategies will involve collaboration between government and non-governmental institutions.

Background

Drug driving is a growing social and road safety issue in Victoria. In the last five years, approximately 41% of drivers and motorcyclists killed who were tested had drugs in their system, and one-fourth of Victorians who use drugs admit to driving under the influence of recreational drugs (TAC, 2018). The Victorian government has invested $17.9 million to introduce 10 new purpose-built booze-and-drug buses and increase the frequency of RDTs from 40,000 in 2014 to 100,000 in 2017 (TAC, 2018; Towards Zero, 2016). With increasing resources allocated to combat drug driving, the effectiveness of the current approach to managing drug driving requires examination. Thus, this project aimed to:

- identify and investigate issues and opportunities for improvement within current Victorian drug driving policies and enforcement practices, and
- shape RACV's policies to improve the drug driving problem in Victoria.

Method

Seven small-group and individual one-hour semi-structured interviews were conducted with 12 representatives from various governmental, academic, and research institutions. These interviewees work extensively on road safety policy, enforcement and communications, drug addiction rehabilitation, and/or drug use research.

Findings and Conclusion

Key discussions included the effectiveness of current RDTs, the drugs tested for, distinction between testing for presence and impairment, resourcing issues, and impairment due to prescription medications.

Most interviewees perceived the drug driving management approach to be working as well as possible, given current resources and capabilities of RDT technology. However, more research is required to refine RDT technologies and understand the effects of individual drugs on driving performance. Over time, this would reduce RDT costs and resourcing, and improve enforcement efficacy.

Evolving drug trends should be continuously monitored to inform the drugs tested for. With the potential impact of emerging issues such as medicinal cannabis, increasing polydrug use, development of new synthetic drugs and increasing prescription medication use, such research will ensure drug driving policies and enforcement remain relevant in an ever-changing landscape.

There was consensus that current penalties are adequate and harsher penalties are unlikely to be effective, thus focus should be shifted from regulation to education and therapeutic interventions. Public education would encourage self-regulation and increase knowledge of drug driving, including about the lesser-known impairing effects of prescription medications. Nevertheless, drug driving is part of a larger public health problem; there will always be drivers who remain undeterred by penalties or self-regulation due to drug addiction and dependency. Thus, a holistic therapeutic approach that acknowledges drug driving as part of a wider social problem would be effective for reducing drug driving.

All interviewees agreed that RACV – a highly reputable non-government organisation with a focus on road safety – is well-placed to support government policies through public communication and support for drug driving research. Moving forward, RACV intends to be the bridge between the public and law enforcement, and research by communicating key drug driving messages (especially relating to prescription medication) in an accessible, engaging manner. Overall, a collaborative effort between non-government organisations, public health agencies, research institutions, and government is integral to improve Victoria's drug driving problem.

References

Transport Accident Commission. (2018). *More drug tests, more places, more often.* Retrieved from https://www.tac.vic.gov.au/road-safety/tac-campaigns/drug-driving

Towards Zero. (2016). *Towards Zero 2016-2020. Victoria's road safety strategy & action plan* [PDF file]. Retrieved from https://www.towardszero.vic.gov.au/__data/assets/pdf_file/0010/183556/STU_0206_RS_STRATEGY_2016_web.pdf

Exploring policy and support strategies to improve experiences of the VicRoads medical review process

Yeewah Yam[a]

[a]Royal Automobile Club of Victoria, Melbourne, Victoria

Abstract

To encourage and empower drivers to manage their fitness to drive and undergo a fitness to drive medical review if necessary, RACV examined the perceptions and experiences of drivers and the people who have supported someone through review ('supporters') to identify potential support strategies. The research identified gaps in public knowledge about fitness to drive, and dissected the perceptions, triggers, barriers, and emotions related to the medical review from the perspective of the drivers and supporters. Key improvements were also identified, the implementation of which will require collaboration between government and non-governmental entities.

Background

To ensure drivers remain safe on the roads, drivers in Victoria are legally obligated to advise VicRoads of any serious, permanent or long-term medical condition or disability that may impair driving ability. However, the idea of a medical review can be deeply personal and difficult for drivers. To encourage and empower individuals to manage their fitness to drive, perceptions and experiences of the review were examined.

Building upon a prior qualitative VicRoads study which explored the early experiences of drivers entering review and strategies to improve awareness and trust of the system (Steel & Fayle, 2018), this research expanded to qualitatively *and* quantitatively investigate the perceptions and experiences of both drivers *and* supporters to identify potential best practices and support strategies.

Method

Adopting a mixed methods approach, an online survey which examined attitudes and experiences was first conducted with 253 participants across Victoria (150 Drivers who had undergone review or are considering review; 103 Supporters).

To gain richer insights into personal experiences, in-depth interviews (11 individual and three paired driver-supporter interviews) were also conducted with 11 Drivers and six Supporters. Three relevant experts selected by the RACV project team were also interviewed.

All drivers and supporters were recruited via a research recruitment agency identified by the hired consultants.

Results

Eighty-three percent of survey participants knew of drivers' obligation to report any conditions that may impair driving ability, but there was uncertainty about what constituted "any" condition.

Approximately one-third of drivers inaccurately thought the review *always* results in license cancellation. This assumption was exacerbated by fears of losing their independence, livelihood and identity. With these negative perceptions, driver-supporter conversations about undergoing review are often challenging. Therefore, as authority figures, support and advice from medical professionals was appreciated (and expected).

Forty-seven percent of drivers who had undergone review did so mainly due to a sense of obligation, triggered by a doctor's recommendation, or a request from VicRoads or concerned family/friends. Another 47% were primarily driven by a sense of social responsibility.

While drivers (69%) and supporters (60%) often retrospectively rated their experience positively with pride, contentment and relief, nervousness and frustration were common during review. Besides procedural hinderances, emotional barriers due to the symbolism of driving and fear of major lifestyle repercussions also impeded satisfaction with and willingness to undergo review. Additionally, drivers sometimes felt little information was available, with about 20% not knowing where to seek advice at all. Fear and a perceived lack of information meant drivers tended to over-emphasise the negative outcome (i.e. losing their licence), even though almost 90% of drivers can continue driving after review.

To prevent misconceptions and improve acceptance of the review, its aim of risk prevention – not just regulation – must be entrenched in public conversation. Compassion and empathy for drivers with medical conditions will also improve the review experience, the process, and attitudes towards fitness to drive.

Potential support strategies to alleviate drivers' and supporters' apprehensions include increased education, clearer information, financial subsidies and better access to driver assessment services and alternative transport, and consistent evaluation to improve procedural efficiency. Such initiatives will also mitigate increasing future demands that the system will need to cope with.

Conclusions

Overall, these insights into the perceptions and (often emotional) fitness to drive journey of drivers and supporters have shaped RACV's fitness to drive messages communicated to the public and will further inform strategies to encourage self-management of fitness to drive. Finally, collaboration between licensing regulators, health organisations and leading community organisations is required to investigate and implement the suggested improvements to better support the system, drivers and supporters.

References

Steel, S. & Fayle, K. (2018). Exploring collaborative user-centered design to develop ideas for greater social responsibility towards fitness to drive. *Proceedings of the 2018 Australasian Road Safety Conference, 5-8 October 2018, Sydney, Australia*

Exploring the road safety impacts of public transport: a case study of Melbourne

Long T. Truong [a], Graham Currie [b]

[a]School of Engineering and Mathematical Sciences, La Trobe University, [b]Public Transport Research Group, Monash University

Abstract

This paper explores the impacts of travel to work by public transport on road safety at a macroscopic level using a case study of Melbourne. Random effect negative binomial regression is employed to model crashes at the statistical area level 2 (SA2). Results indicate that using public transport (i.e. train, tram, and bus) for travelling to work tends to reduce severe as well as total crashes, highlighting the great potential of public transport as a road safety solution. Safety issues related to cycling, walking, and motorcycling to work are also discussed.

Background

In 2018, there were approximately 1,150 road deaths in Australia and many more serious injuries, costing Australia around 1.7% of its GDP (BITRE, 2007, 2019). The current national road safety strategy's goal is unlikely to be met by 2020, despite significant investments on road safety. Overall, public transport is a relatively safe travel mode compared to private vehicle, in terms of fatality rates per trip and per passenger kilometre (Savage, 2013). Therefore, mode shift from private vehicle to public transport is now considered to be a potential means of improving road safety (Litman, 2016). This however is largely ignored in current Australian transport policies, road safety action plans, and the Safe System vision (ATC, 2011; TIC, 2016). Furthermore, little research has investigated how public transport travel contributes to road safety at a macroscopic level, which often showed mixed effects (Moeinaddini et al., 2015; Dong et al., 2016; Wang et al., 2017). This paper therefore aims to explore the impacts of travel to work by public transport on road safety at a macroscopic level using a case study of Melbourne.

Method

Random effect negative binomial regression is employed to model crash frequencies at the statistical area level 2 (SA2) in Melbourne, to account for spatial heterogeneity (Truong et al., 2016). Three models are developed for total crashes and severe (fatal and serious injury) crashes respectively. Population is used as the key exposure variables. Explanatory variables are selected based on a review of literature, including journey to work mode share (e.g. train, tram, bus, walk, bicycle, motorcycle, and car), transport network (e.g. intersections and public transport stops/stations), sociodemographic (e.g. income and age group), and land use characteristics (e.g. land use mix). Data are obtained from the 2016 ABS census and Victoria's open data directory, which are then aggregated into SA2 zones using ArcGIS. The modelling is conducted using NLOGIT.

Results

Modelling results are presented in Table 1. Results indicate that a higher proportion of travel to work by train is associated with fewer total crashes and severe crashes ($p<0.001$). Similarly, the proportions of travel to work by bus/tram are negatively associated with both total crashes and severe crashes ($p<0.01$). However, higher proportions of cycling/walking to work are associated with more total crashes and severe crashes ($p<0.001$). A higher proportion of motorcycling to work is also associated with more total crashes and severe crashes ($p<0.01$). Results also confirm expected effects of exposure and explanatory variables (e.g. population, the proportion of young people, number of signalized intersections, and public transport stops/stations).

Table 1 Results of random effect negative binomial regression for the frequency of total crashes and severe crashes

Variable	Total crashes		Severe crashes	
	Estimate	Std. Error	Estimate	Std. Error
Log of population	0.283 ***	0.03	0.352 ***	0.024
Proportion of people aged 0-14	-2.440 ***	0.394	-3.269 ***	0.318
Number of signalised intersections	0.015 ***	0.002	0.014 ***	0.001
Number of public transport stops/stations	0.005 ***	0.001	0.003 ***	0.000
Proportion of roads with a speed limit>100 km/h	10.262 ***	2.313	14.006 ***	1.556
Proportion of industrial area	1.026 ***	0.155	1.086 ***	0.099
Land use mix - entropy measure	-0.255 *	0.102	-0.408 ***	0.073
Proportion of commuting by train	-1.364 ***	0.255	-2.220 ***	0.179
Proportion of commuting by tram	-1.986 **	0.61	-3.857 ***	0.391
Proportion of commuting by bus	-3.315 ***	0.947	-4.687 ***	0.673
Proportion of commuting by cycling	3.816 ***	1.153	3.919 ***	0.694
Proportion of commuting by walking	2.765 ***	0.467	3.450 ***	0.292
Proportion of commuting by motorbike	30.724 **	10.095	31.609 ***	7.194
Intercept	2.236 ***	0.285	0.756 **	0.239
Standard deviation of parameter distribution	0.272 ***	0.016	0.393 ***	0.011
Dispersion parameter	15.970 ***	1.467	107.023 ***	30.291
Log likelihood	-1619.946		-1271.703	
Log likelihood (intercept only)	-1784.972		-1400.975	

Note: * p<0.05; ** p<0.01; *** p<0.001; all models were significant at p<0.001

Conclusions

Overall, it is evident that using public transport for travelling to work tends to reduce severe as well as total crashes, which highlights the great potential of public transport as a road safety solution. Road safety issues related to pedestrians, cyclists, and motorcyclists are also evident as crashes tend to increase with walking, cycling, and motorcycling to work.

References

ATC, 2011. National road safety strategy 2011–2020. Australian Transport Council.

BITRE, 2007. Estimating urban traffic and congestion cost trends for Australian cities. Working paper 74. Bureau of Infrastructure, Transport and Regional Economics, Canberra.

BITRE, 2019. Australian Road Deaths Database. Bureau of Infrastructure, Transport and Regional Economics.

Dong, N., Huang, H., Lee, J., Gao, M., Abdel-Aty, M., 2016. Macroscopic hotspots identification: A Bayesian spatio-temporal interaction approach. Accident Analysis & Prevention 92, 256-264.

Litman, T., 2016. The Hidden Traffic Safety Solution: Public Transportation. American Public Transportation Association (APTA).

Moeinaddini, M., Asadi-Shekari, Z., Sultan, Z., Zaly Shah, M., 2015. Analyzing the relationships between the number of deaths in road accidents and the work travel mode choice at the city level. Safety Science 72, 249-254.

Savage, I., 2013. Comparing the fatality risks in United States transportation across modes and over time. Research in Transportation Economics 43(1), 9-22.

TIC, 2016. National Road Safety Action Plan 2015-2017. Transport and Infrastructure Council.
Truong, L.T., Kieu, L.-M., Vu, T.A., 2016. Spatiotemporal and random parameter panel data models of traffic crash fatalities in Vietnam. Accident Analysis & Prevention 94, 153-161.
Wang, J., Huang, H., Zeng, Q., 2017. The effect of zonal factors in estimating crash risks by transportation modes: Motor vehicle, bicycle and pedestrian. Accident Analysis & Prevention 98, 223-231.

Merging in the Years Ahead – providing interactive road safety education to senior drivers

Belinda Maloney

RAA Manager Community Education

Abstract

With older South Australian drivers continuing to be overrepresented in our state's road toll, RAA provides ongoing road safety education to older road users. RAA's new program, *Years Ahead – Road Rules Quiz,* uses interactive technology to generate valuable data, which highlights the knowledge gaps faced by older road users. The program provides participants with up-to-date information and allows RAA to understand the challenges and issues faced by these drivers so that we can target these particular issues in future advocacy and education.

Background

RAA has always advocated for people to continue driving as long as they are safe to do so. The question we asked ourselves was: what can we do to support this ideology, to keep these drivers safe?

Older drivers continue to be overrepresented in the road toll each year in South Australia. A total of 243 older road users (65+ years) were killed on our roads in the last 10 years, equating to approximately 24% of the state's total road toll over the same period. This is concerning given that they only make up 18.2% of the population is South Australia. Of these fatalities, 101 were drivers of a vehicle and 57 were pedestrians (*Bureau of Infrastructure, Transport and Regional Economics, 2019)*. As South Australia has an older and more car dependent population compared with the rest of Australia, this issue is significant (18.2% of SA is 65+ years compared to the national average of 15.8%) (*Australian Bureau of Statistics, 2018*).

In line with safe system principles (*National Road Safety Strategy, 2018*), RAA addresses this issue by providing a number of education programs for senior road users, including the Years Ahead program. Years Ahead has now been delivered for 10 years and has educated more than 16,000 participants.

Method

Over the past 12 months, RAA has introduced a new Road Rules interactive quiz to the Years Ahead program suite. Using the Lumi software, we have a converted a PowerPoint presentation into an interactive program. The Lumi Click handsets (see Figure 1) are user-friendly devices that display on-screen feedback to attendees.

We have used this technology to present a number of the most misunderstood and newest road rules in a multiple choice quiz. Each participant is provided with a Lumi Click handset, enabling them to answer each question in real time. The group's results are then displayed which, particularly when quite varied, generates a robust discussion around the choices made and what the legislation states for each question.

Following the presentation, the facilitator encourages participants to periodically take the online driving test or obtain the latest version of the Driver's Handbook to update their road rule knowledge. Once the session is complete the data is then collated and saved by the program.

Figure 1 (IClick – Interactive Presentation Solutions, 2016)

Results

To date, RAA has used the interactive Road Rules Quiz to educate and inform around 90 groups – comprising 2,000 individuals – across South Australia. This has provided us with a substantial sample size from which to extract valuable data.

The retrospective analysis of the questionnaire data from these presentations has provided us with an insight into older drivers' knowledge of the Australian Road Rules. In the majority of questions, around one quarter to a third of participants chose the incorrect answer, with a couple of questions scoring even higher.

For example:

- 77% of people did not know the safe following distance behind another vehicle
- 75% did not know the law requiring drivers to indicate when leaving a roundabout
- 37% did not know which driver gives way at a zip merge.

Implications

The data collected demonstrates extensive knowledge gaps in older South Australian road users. This has prompted the RAA to develop a second Road Rules Quiz and cross-promote older driver refresher courses through our community engagement programs.

RAA's aim is to continue providing quality education programs to older drivers in the hope that we make an impact on the number of fatalities in this state as we head towards zero.

References

Australian Bureau of Statistics. (Dec 2018). 2016 Census QuickStats. Retrieved from http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/4

National Road Safety Strategy. (May 2018). The Safe System Approach - National Road Safety Strategy. Retrieved from https://roadsafety.gov.au/nrss/safe-system.aspx

Bureau of Infrastructure, Transport and Regional Economics. (Feb 2019). Road Deaths Australia – Monthly bulletins. Retrieved from https://bitre.gov.au/publications/ongoing/road_deaths_australia_monthly_bulletins.aspx

IClick – Interactive Presentation Solutions (2016). IClick home. Image retrieved from http://www.iclickinc.com/solutions/keypads/click

Motorcycle Crashes Resulting in Hospital Admissions in South Australia: Crash Characteristics and Injury Patterns

James Thompson[a], Matthew Baldock[a], Tori Lindsay[a]

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

Abstract

This study examined records from the Royal Adelaide Hospital for 763 motorcyclists (admitted January 2008-November 2010 and April 2014-December 2016). Records were linked with police-reported crash data and blood test results. Compared with 1617 car drivers admitted over the same periods, motorcyclists were younger, more commonly male, more likely to hold a learner permit, and less likely to be over the legal alcohol limit. Their crashes were more likely to be single vehicle and more common on weekends and in 50 and 80 km/h speed limits. They also had a higher injury severity. Countermeasures to improve motorcycling safety are discussed.

Background

Motorcycle and scooter riders have a high risk of serious or fatal injury if they crash (Johnston, Brooks, & Savage, 2008; Keall & Newstead, 2012; Lin & Kraus, 2009; Van Eslande & Elvik, 2012). In South Australia, motorcyclists account for a substantial proportion of the State's road trauma, comprising 17% of serious injuries and 12% of fatalities between 2012 and 2016 (Baldock, 2018). To identify countermeasures, the present study examined crashes in which a motorcycle (or scooter) rider was injured and admitted to the Royal Adelaide Hospital (RAH) in South Australia.

Method

Records for 763 motorcyclists (including 70 scooter riders) who were admitted (four hours or more) to the RAH (January 2008-November 2010 and April 2014-December 2016) were linked with police-reported crash data and forensic blood test results for alcohol and drugs. Rider characteristics, crash characteristics and injury patterns were examined and comparisons made to 1617 car drivers (and car derivatives, e.g. utility vehicles) admitted to the RAH over the same periods.

Results

Rider characteristics

Compared to injured car drivers, injured motorcyclists were younger (mean age 39.3 versus 44.9 years, $t(2378)=6.7$, $p<.001$) and more commonly male (93% versus 58%). They differed in licence status ($\chi^2_{(5)}=33.8$, $p<.001$), with a larger proportion of motorcyclists holding a learner permit (6% versus 2%) and smaller proportion holding a provisional licence (9% versus 13%). They were less likely to be over the legal limit of alcohol (8% versus 20%, $\chi^2_{(1)}=42.1$, $p<.001$) but did not differ in the likelihood of testing positive to proscribed drugs (methamphetamine, THC and/or MDMA) (19% versus 16%, $\chi^2_{(1)}=1.5$, $p=.220$). Their helmet use was high (98%).

Crash characteristics

Table 2 shows that, compared to crashes involving injured car drivers, those involving injured motorcyclists were overrepresented on weekends, during the afternoon, in single vehicle crashes, on sloping roads, on curved roads, on roads with speed limits of 50 and 80 km/h, during daylight hours, in dry weather and on dry roads.

Table 1. Crashes involving injured motorcyclists compared to injured car drivers

Variable	Test statistic	Nature of difference
Day of week	$\chi^2_{(6)}$=25.1, *p*<.001*	Motorcycle crashes more common on weekends (39% vs 29%)
Time of day	$\chi^2_{(3)}$=49.5, *p*<.001*	Motorcycle crashes more common during the afternoon (50% vs 39%), car crashes between midnight and 6am (5% vs 13%)
Crash location	$\chi^2_{(1)}$=2.7, p=.103	No difference, metro or rural (50%-50% vs 54%-46%)
Single/multiple vehicle	$\chi^2_{(1)}$=5.0, *p*=.025*	Motorcycle crashes more commonly single vehicle (53% vs 48%)
Vertical alignment	$\chi^2_{(3)}$=80.3, *p*<.001*	Motorcycle crashes more common on sloping roads (23% vs 9%)
Horizontal alignment	$\chi^2_{(1)}$=25.7, *p*<.001*	Motorcycle crashes more common on curved roads (32% vs 22%)
Road surface	$\chi^2_{(1)}$=<0.1, *p*=.872	No difference, sealed or unsealed (96% sealed for both groups)
Speed limit	$\chi^2_{(7)}$=58.3, *p*<.001*	Motorcycle crashes more common on roads with speed limits of 50 (21% vs 17%) and 80 km/h (20% vs 11%), car crashes on roads with speed limits of 100 km/h or higher (28% vs 19%)
Light conditions	$\chi^2_{(1)}$=52.5, *p*<.001*	Motorcycle crashes more common during daylight (80% vs 65%)
Weather conditions	$\chi^2_{(1)}$=13.1, *p*<.001*	Motorcycle crashes more common in dry weather (95% vs 90%)
Road conditions	$\chi^2_{(1)}$=16.9, *p*<.001*	Motorcycle crashes more common on dry roads (93% vs 87%)

* *p*<.05.

Injury patterns

Motorcyclists had a higher severity of injury than car drivers (mean Injury Severity Scale 9.2 versus 6.4, *t*(1192)=5.7, *p*<.001) and were more likely to sustain injuries to multiple body regions (75% had injuries to two or more regions versus 60%, $\chi^2_{(1)}$=22.3, *p*<.001). Additionally, linear regression (*F*(7, 372)=6.1, p<.001) showed that older age (*t*=3.0, *p*=.003), higher blood alcohol concentration (*t*=4.3, *p*<.001) and higher speed limit (*t*=2.8, *p*=.005) increased injury severity for motorcyclists.

Conclusions

This study provides a detailed picture of current crash and injury patterns for a high-risk road user group, which is necessary to facilitate future improvements in their safety. Based on present findings, motorcycling safety can be improved through countermeasures related to: Graduated Licensing Systems (e.g. inclusion of on-road test of abilities for novice riders before being allowed on the road), infrastructure (e.g. improving road surfaces on curves, improving and maintaining delineation and curve warning signage, and widening lanes and sealed shoulders on curves), motorcycle technology (e.g. advances in combined braking, traction control and anti-lock braking systems) and clothing (i.e. encouraging use of clothing that provides superior protection).

References

Baldock, M.R.J. (2018). *Recommendations for a Graduated Licensing System for Motorcyclists in South Australia* (CASR149). Adelaide: Centre for Automotive Safety Research.

Johnston, P., Brooks, C., & Savage, H. (2008). *Fatal and serious road crashes involving motorcyclists. Monograph 20.* Canberra: Department of Infrastructure, Transport, Regional Development and Local Government.

Keall, M.D., & Newstead, S. (2012). Analysis of factors that increase motorcycle rider risk compared to car driver risk. *Accident Analysis and Prevention, 49,* 23–29.

Lin, M.R., & Kraus, J.F. (2009). A review of risk factors and patterns of motorcycle injuries. *Accident Analysis and Prevention, 41*, 710–722.

Van Eslande, P., & Elvik, R. (2012). Powered two-wheelers within the traffic system. *Accident Analysis and Prevention*, *49*, 1–4.

Integrating Safe System principles into Road Safety Auditing

Kenn Beer[a], Paul Hillier[b], Aut Karndacharuk[c]

[a]Safe System Solutions Pty Ltd, Brunswick, Vic. 3056, [b]ARRB, Ultimo NSW 2007,
[c]Roads and Maritime Service, Parramatta NSW 2150

Abstract

On 21 February 2019, Austroads released an update to the Guide to Road Safety (AGRS) Part 6, which is now called Managing Road Safety Audits. The current guide remains for now as Part 6A, but where there is any contradiction, the new Part 6 takes precedence.

Key new items in the guide relate to the duties when engaging auditors, the duties when undertaking road safety audits, and the duties of road transport authorities.

Background

On 21 February 2019, Austroads released an update to the Guide to Road Safety (AGRS) Part 6, which is now called Managing Road Safety Audits. The current guide (Austroads 2019b) remains for now as Part 6A, but where there is any contradiction, the new Part 6, which provides guidance on the procurement, management and conduct of road safety audits, takes precedence. It aims to:

• inform practitioners new to road safety audit principles and concepts (especially project clients and project managers) and encourage the conduct of audits and other assessments to maximise their benefits

• ensure practitioners are aware of up to date operating environments and contexts (e.g. the Safe System approach to road safety), and recent developments in predictive risk assessments.

The Guide emphasises the responsibilities of road and transport agencies and key players such as project managers, project sponsors and auditors to maximise alignment with Safe System principles by integrating them into the road safety audit process. This can be achieved by:

• relating possible crash forces to tolerable levels of the human body when identifying hazards and assessing fatal and serious injury risks

• categorising road safety audit findings and/or treatment options by their Safe System alignment

Key items that practitioners need to note (Austorads 2019a)are as follows:

Engaging auditors

Key duties include requirements to:

- Ensure that the Auditors have adjusted their approach to reflect this new guidance
- Be absolutely sure that the Auditors are completely independent of the project (Section 4.1.2)
- Be sure the Auditors to be engaged understand the Safe System approach (Section 4.1.1)
- Ensure the Audits are comprehensively considering Safe System principles (Section 3.3 and 3.4). This should be done by either:

  - Getting a Safe System Assessment undertaken at an early stage of a project and providing that to the Audit team; or
  - Ensuring the Auditors are following a process whereby they clearly demonstrate how findings and recommendations align with Safe System principles.
- Ensure there is a process for closing out audit findings and recommendations (Section 4.5).

Undertaking Road Safety Audits

Key duties include requirements to:

- Make sure the person undertaking the audit understands the Safe System approach to road safety and how it relates to infrastructure (Section 4.1.1)
- Apply Safe System principles in the audit process (Section 3.3). This should be done by:
  - Relating possible crash forces to tolerable kinetic energy levels, regardless of the likelihood, when identifying hazards and assessing Fatal and Serious Injury risks; and
  - Categorising RSA findings and treatment options, if provided, by their alignment with the Safe System (Primary, Step-Towards, Supporting or Non-Safe System).

Road Authorities

Key duties include requirements to:

- Have a documented Road Safety Audit policy (Section 2.4)
- Be absolutely sure that Auditors are completely independent of the project and have no potential conflict of interest (Section 4.1.2)
- Put in place systems to record and monitor Road Safety Audit outcomes (Sections 4.6 and 4.7)
- Embed Safe System thinking into your organisation (Section 4.8)

Discussion

This radical shift from traditional road safety audit practices will require some existing road safety auditors to acquire familiarity with Safe System principles and their application. Comparing the old and new guides highlights where the new guide will lead to improved safety outcomes. Both practitioners and those intending to contract practitioners to undertake an audit should be aware of these changes so as to ensure that any work that is undertaken is compliant with the new guidelines.

References

Austroads 2019a Guide to Road Safety Part 6: Managing Road Safety Audits Available at: https://austroads.com.au/publications/road-safety/agrs06

Austroads 2019b Guide to Road Safety Part 6A: Implementing Road Safety Audits Available at: https://austroads.com.au/publications/road-safety/agrs06A

Title Of Extended Abstract Times (20 word limit)

Thompson, J[1], Mudford, J[1], Condon, L[2], Rowe, B[2]

VicRoads[1] and Deloitte Access Econonics[2]

Abstract

The L2P – Learner driver mentor program (L2P) is a Transport Accident Commission (TAC) funded initiative which is coordinated by VicRoads. L2P provides supervised driving experience to young learner drivers aged 16-21 who do not have access to a supervising driver or vehicle. In 2018, Vicroads commissioned an evaluation to assess the program's perofmrnace and contribution to young driver safety in Victoria. L2P was found to generate significant road safety benefits along with social and economic value by increasing economic participation and reducing social isolation.

Background,

L2P supports disadvantaged young people to achieve the 120 hours of supervised driving required under Victoria's GLS. The primary object of the evaluation was to review the existing funding arrangements and service model to assess the program's overall merit and worth. Deloitte Access Economics was appointed to conduct the evaluation which highlighted a number of program improvements which have subsequently informed significant program reform.

Method

The evaluation consisted of six stages; needs analysis, funding model review, value for money analysis, road safety assessment, rapid review of alternative models and synthesis process. A program logic was developed to support the identification of evaluation questions and performance indicators. Data collection included primary and secondary sources, including demographic data, stakeholder surveys and interviews with 599 mentors, 396 learners and 51 program Coordinators and published and unpublished research literature.

Results

The L2P program was found to have a benefit-cost ratio of 1.68 due to significant road safety, mobility and social benefits to learner driver participants, and social benefits to the volunteer mentors. Over 1,600 young people gain supervised driving experience from the program annually. Participation in the program improves road safety by reducing the prevalence of unlicensed driving, reducing crash risk after obtaining a licence and improving young people's perceptions of risky driving. The program is estimated to prevent 8 fatal and serious injury crashes and 26 casualty crashes from 2015-19.

The L2P program has successfully graduated 4,400 learners to their P licence since 2012 and engages with more people from socio-economically disadvantaged areas and more than half of L2P participants were from rural areas. The evaluation found there is evidence that the L2P program increases the life aspirations, confidence, social, and behavioural outcomes of learner drivers. Mentors participating in the L2P program were found to have a reduced level of social isolation.

The evaluation identified areas for improvement including expanding the program to increase the help meet need levels, and direct resources towards those socially and transport disadvantaged, particularly those in interface and rural areas.

Conclusions

This is the third and most comprehensive evaluation of the L2P Program in Victoria. It has demonstrated its significant road safety and social value and provided an opportunity to establish a strong, yet conservative, measure of its economic value which strengthens the program's credentials and probability of long-term sustainability and expansion. One of the most significant findings of the evaluation are those benefits which accrue alongside the road safety benefit of supervising driver; essentially L2P's success is the result of a strong partnership between government and community.

The effects of driver feedback and financial incentives on driving behaviours: A randomised control trial.

Mark Stevenson[a-c], Jasper Wijnands[a], Duncan Mortimer[d], Anthony Harris[d]

[a]Transport, Health and Urban Design Research Lab, Melbourne School of Design, [b]Melbourne School of Engineering, [c]Melbourne School of Population and Global Health, University of Melbourne, [d]Centre for Health Economics, Monash Business School, Monash University.

Abstract

A new strategy that may contribute to reducing the burden associated with road traffic injury is the use of driver feedback and financial incentives to change driver behaviours. The current study assesses the on-road efficacy of an optimised combination of feedback and incentives in changing risky driving behaviours. A total of 232 drivers were recruited to participate in the study. Following a baseline period, participants were randomly assigned to i) no intervention, ii) weekly personalised driver feedback, and iii) weekly personalised driver feedback plus a financial incentive. Data collection is complete and we will complete the analysis in April 2019.

Background.

Although much has been achieved in reducing road trauma in Australia over the past 4 decades, there are still more than 1100 deaths and 50,000 hospitalised injury cases from transport-related causes each year (Australian Institute of Health and Welfare, 2013; Bureau of Infrastructure, Transport and Regional Economics, 2015). The ongoing burden of road injury points to the need to consider new and or alternate strategies that target road traffic injury. A new strategy that may contribute to reducing the burden associated with road traffic injury is the use of driver feedback and financial incentives to change driver behaviours. To date, there is evidence that financial incentives have an effect on changing health risk behaviours such as smoking (Giles, Robalino, McColl, Sniehotta, & Adams, 2014) and a laboratory-based study undertaken by the authors also indicates that financial incentives moderate certain driving behaviours (Mortimer, Wijnands, Harris, Tapp, & Stevenson, 2018). Recent studies have also demonstrated that financial incentives can be more effective when combined with feedback, but further work is required to optimise their combined effects (Dijksterhuis et al., 2015). The current study is the first to assess the on-road efficacy of an optimised combination of feedback and incentives in changing risky driving behaviours. The design of our optimised intervention relies on use of in-vehicle telematics to monitor driving behaviour, transmit individualised feedback to drivers, and link driving behaviours with financial incentives (Horrey, Lesch, Dainoff, Robertson, & Noy, 2012).

Method, Results and Discussion.

A total of 232 drivers (aged 18-35 years) from across Australia, were recruited to participate in the study at the time they obtained their motor vehicle insurance through QBE Insurance. The consenting participants' driving behaviour was monitored for a 'baseline' period comprising 4 weeks. Following the baseline period, participants were randomly assigned to one of three intervention groups (no intervention, weekly personalised driver feedback, and weekly personalised driver feedback plus a financial incentive). Once allocated to an intervention group the drivers were observed for a 24-week period with the insurer's telematics software facilitating the weekly personalised driver feedback which was sent to the participant by SMS messaging to their smart phone.

Group 1, the control group received no-intervention. All drivers in this group were sent to their smart phone a brief weather alert that provided details on adverse weather that could affect their driving. Participants in Group 2 (the feedback only group) received trip-related feedback regarding safe and unsafe driving behaviours and practices, as well as accessing a dashboard, which provided the participant with a driving score and more detailed information about their individual driving behaviour and practices namely, the proportion of trips exceeding posted speed limits, harsh braking and night-time driving. Group 3 participants received the weekly personalised driver feedback plus a weekly update on how their financial incentive was tracking. Based on the findings from our laboratory study [4], participants in this group were placed under a penalty-based incentive scheme whereby participants were informed that they would begin the 24-week intervention period with an initial balance of $200, with the potential to lose $25 every four weeks, dependent upon their driving behaviour from the previous month (i.e., a maximum of one day of risky driving was allowed).

Aside from the data obtained from the telematics device, a survey of all participants was undertaken at the beginning of the study to assess behavioural change and economic parameters including resource utilisation for a cost effectiveness evaluation. The insurer's telematics software provided the important outcome measures namely, i) the proportion (over a seven day period) of daily trips in which the driver exceeded the posted speed limits by 10km, ii) the proportion (over a seven day period) of trips in which sudden heavy braking was required (usually an evasive driving action).

Data collection was completed in February 2019 and at the time of writing, we have finalised the analytical protocol and will complete analysis in April 2019. If our *a priori* hypothesis is found to be supported namely, that feedback or financial incentives change driving behaviour, the implications will be highly significant to road safety policy, globally.

Acknowledgments.

This research is supported by ARC Linkage grant LP150100680, Insurance Box Pty Ltd. and the Transport Accident Commission. MS is supported by an NHMRC Fellowship (APP1136250).

References

Australian Institute of Health and Welfare. (2013). *Pointer S. Trends in hospitalised injury, Australia: 1999–00 to 2010–11*. Injury research and statistics series no. 86. Cat. no. INJCAT 162. Canberra, ACT.

Bureau of Infrastructure, Transport and Regional Economics (BITRE). (2015). *Road trauma Australia 2014 statistical summary*. Canberra, ACT.

Dijksterhuis, C., Lewis-Evans, B., Jelijs, B., De Waard, D., Brookhuis, K., & Tucha, O. (2015). The impact of immediate or delayed feedback on driving behaviour in a simulated Pay-As-You-Drive system. *Accident Analysis & Prevention*, 75, 93-104. doi:10.1016/j.aap.2014.11.017

Giles, E. L., Robalino, S., McColl, E., Sniehotta, F. F., & Adams, J. (2014). The Effectiveness of Financial Incentives for Health Behaviour Change: Systematic Review and Meta-Analysis. *PLoS ONE, 9*(3), e90347. doi:10.1371/journal.pone.0090347

Horrey, W. J., Lesch, M. F., Dainoff, M. J., Robertson, M. M., & Noy, Y. I. (2012). On-Board Safety Monitoring Systems for Driving: Review, Knowledge Gaps, and Framework. *Journal of Safety Research, 43*(1), 49-58. doi:10.1016/j.jsr.2011.11.004

Mortimer, D., Wijnands, J. S., Harris, A., Tapp, A., & Stevenson, M. (2018). The effect of 'smart' financial incentives on driving behaviour of novice drivers. *Accident Analysis & Prevention, 119*, 68-79. doi:10.1016/j.aap.2018.06.014

The Road to Recovery for Vulnerable Road Users Hospitalised for Orthopaedic Injury

Anna Devlin[a], Ben Beck[a], Pam M. Simpson[a], Christina L. Ekegren[a], Melita J Giummarra [a, b], Elton R. Edwards[a,d], Peter A. Cameron[a,f], Susan Liew[d,e], Andrew Oppy[g], Martin Richardson[h], Richard Page[i,j] and Belinda J. Gabbe[a, c]

[a]School of Public Health and Preventative Medicine, Monash University, [b]Caulfield Pain Management and Research Centre, [c]Swansea University Medical School, [c]Department of Orthopaedic Surgery, The Alfred Hospital, [d]Department of Surgery, Monash University, [f]Emergency and Trauma Centre, The Alfred Hospital, [g]Department of Trauma and Orthopaedic Surgery, The Royal Melbourne Hospital, [h]Department Surgery, University of Melbourne, [i]Barwon Centre for Orthopaedic Research and Education, [j]School of Medicine, Deakin University.

Abstract

Vulnerable road users are susceptible to sustaining series injury that can lead to life-long consequences. This study aimed to compare three vulnerable road user groups for health-related quality of life, return to work status and level of function at 6- and 12-months post-injury. The Victorian Orthopaedic Trauma Outcomes Registry comprised 6,186 patients who sustained orthopaedic trauma as a pedestrian, cyclist or motorcycle rider in Victoria from 2009 to 2016. Distinct differences in demographics and recovery outcomes between the groups were found. This research has implications for targeting treatment towards individuals at risk of a poor recovery after orthopaedic transport injury.

Background

Pedestrians, cyclists and motorcycle riders are vulnerable road users who comprise more than half of all global road transport fatalities (World Health Organisation, 2018) and are more susceptible to serious injury. Little is known about the mental and physical health outcomes of vulnerable road user groups after transport injury as road users included in outcome studies to date are rarely considered separately, with pedestrians often combined with cyclists (Gabbe et al., 2017; Heron-Delaney, Warren & Kenardy., 2017; Kenardy et al., 2017). Consequently, the rate of recovery and improvements in health-related quality of life for different vulnerable road user groups after orthopaedic injury remains unclear.

Aims

The aim of the present study was to characterise and compare patient reported outcomes at 6- and 12-months post-injury for patients involved in an on-road collision as a pedestrian, pedal cyclist or motorcycle rider.

Method

A registry-based cohort study was conducted using data from the Victorian Orthopeadic Trauma Registry of patients admitted to four major hospitals in Victoria, Australia for orthopaedic injury following an on-road collision that occurred between January 2009 and December 2016. Patient demographics, major trauma status, injury type, pre-existing conditions, pre-injury work status, highest level of education completed, funding source and patient reported outcomes were extracted from the registry. The three outcome measures collected at six- and 12-months post-injury comprised health-related quality of life (3-level EuroQol 5 dimensions questionnaire (EQ-5D-3L)), functional recovery (Glasgow Outcome Scale-Extended (GOS-E)) (Dolan, 1997) and return to work status.

Results

There were 8,528 patients admitted to participating hospitals during the eight-year period. Of these patients, 6,186 sustained their orthopaedic injury on a road, street or highway. Most patients were motorcycle riders (42.8%) followed by pedal cyclists (32.6%) and pedestrians (24.6%). Difficulties with usual activities were the most prevalent item reported at 6-months post-injury reported by 73% of pedestrians, 67% of motorcycle riders and 44% of pedal cyclists. A higher proportion of motorcycle riders (63%) and pedestrians (66%) reported problems with pain at 12 months compared to pedal cyclists (33%). The prevalence of reported problems with anxiety/depression remained unchanged from 6 and 12-months for pedestrians, motorcycle riders, and pedal cyclists with 50% of pedestrians reporting problems compared to 38% of motorcycle riders and 20% of pedal cyclists. Multivariable linear and logistic regression models revealed that an average pedal cyclist had a reduced odds of reporting problems across all EQ-5D-3L quality of life domains compared to an average pedestrian and motorcycle rider. Compared to the average pedestrian, the average motorcycle rider had a lower adjusted odds of problems with anxiety/depression at 6 and 12 months post-injury (AOR = 0.75; 95% CI: 0.65 to 0.86).

Conclusion

Our analyses showed that firstly pedal cyclists consistently demonstrated reduced odds of reporting problems across all domains compared to pedestrians. Second, of particular concern is that the prevalence of individuals who reported problems with depression/anxiety remained stable from 6- to 12-months post-injury for both motorcycle riders and pedestrians. Given that 50% of pedestrians reported problems with mental health at 12-months post-injury further research is required to understand the barriers to recovery and to target rehabilitation and trauma care towards individuals who need it the most.

References

Dolan, P. (1997). Modeling valuations for EuroQol health states. Medical Care, 1095-1108.

Gabbe, B. J., Simpson, P. M., Cameron, P. A., Ponsford, J., Lyons, R. A., Collie, A., . . . Braaf, S. (2017). Long-term health status and trajectories of seriously injured patients: A population-based longitudinal study. PLoS medicine, 14(7), e1002322.

Heron-Delaney, M., Warren, J., & Kenardy, J. A. (2017). Predictors of non-return to work 2 years post-injury in road traffic crash survivors: Results from the UQ SuPPORT study. Injury, 48(6), 1120-1128. doi:10.1016/j.injury.2017.03.012

Kenardy, J., Heron-Delaney, M., Hendrikz, J., Warren, J., Edmed, S. L., & Brown, E. (2017). Recovery trajectories for long-term health-related quality of life following a road traffic crash injury: Results from the UQ SuPPORT study. Journal of Affective Disorders, 214, 8-14. doi:https://doi.org/10.1016/j.jad.2017.02.031

World Health Organization. (2018). Global status report on road safety 2018. World Health Organization.

Accelerating the supply of safer vehicles through Government fleet

Danilo Messias[a], James Soo[b]

[a]Vehicle & Motorcycling Policy, VicRoads; [b]Vehicle & Motorcycling Policy, VicRoads

Abstract

Vehicle safety technology has seen a dramatic development in the past decade with the focus being shifted from passive safety features aimed at protecting the occupant in a crash to active safety features intended at avoiding collisions altogether. To realise the full road safety benefits of these features, their uptake must be accelerated and one of the methods to achieve it may be through Government fleet policy. This study investigates strategies for the development of a vehicle purchasing policy for Government fleet ensures the purchase of the safest vehicles whilst balancing their needs of model availability and cost.

Background

Towards Zero 2016-2020 is the Victorian Government road safety strategy to significantly reduce road trauma by 2020. As part of the strategy, the Government will require its vehicle fleet to be equipped with the best safety features available through a fleet purchasing policy. It is acknowledged ex-government fleet vehicles flow through to the broader community at the end of their lease, resulting in an increased uptake of in-vehicle technologies in the broader fleet. It is also expected that manufacturers will react to a stricter purchasing policy by equipping their vehicle models with the latest safety features.

VicFleet is the agency responsible for managing the Victorian fleet and its purchasing policy. Currently, it requires that vehicle models must have a 5-star safety rating published by the Australasian New Car Assessment Program (ANCAP) to be placed on an Approved Vehicle List (AVL) from which all agencies and departments must select vehicles for purchase. Besides safety, VicFleet must consider other aspects such as the cost of purchasing and maintenance, vehicle's residual value, suitability (fit-for-purpose), diversity of models in each category and environmental aspects (emissions).

Method, Results & Discussion

In this study, a number of alternatives for a new vehicle purchasing policy will be analysed in terms of its potential to accelerate the uptake of emerging safety features and its suitability to balance the needs of VicFleet.

Firstly, the study will review the existing VicFleet and VicRoads vehicle purchasing policies and compare them with policies in all states and territories

Secondly, the study analyses the past and present ANCAP protocols to predict the future uptake of new safety features in 5-star rated vehicles. Then it will investigate the star rating most common vehicle models sold in Australia in each category and the safety features offered as standard, option or in the highest variants only.

Then, an in-depth study of the Victorian Fleet composition over the last 5 years will be conducted. The objective is to understand the prevalence of a selected number of safety features and its evolution over the last years. The result will serve as a baseline of the current fleet against which potential new purchasing policies can be compared with.

Lastly, the results will be taken into consideration to design a number of fleet purchasing policy strategies. The benefits and drawbacks of each alternative will be identified and placed in a decision matrix. The purchasing policy alternative that is expected to deliver the best safety outcomes whilst maintaining a balance with VicFleet's need will be put forward to VicFleet as a recommendation for a policy to be adopted.

The study also includes a methodology to evaluate the success and benefits of an improved policy which includes targets for the uptake of specific features and on-going monitoring of VicFleet's fleet.

References

Australasian New Car Assessment Program (ANCAP) (2018). ANCAP vehicle model's safety ratings. Mawson, ACT.

Mackenzie, J., Mongiardini, M., Ponte, G., Sommariva, M. (2018) VicRoads fleet purchasing policy review. Adelaide, SA.

Practical Driving Test Anxiety:

Analysis and treatment of the phenomenon. A proposal

Paolo Perego[b], Cecilia Fiocchi[a], Federica Biassoni[b]
[a]Wellbeing Psychology Graduate, Università Cattolica del Sacro Cuore, Milan, Italy
[b]Traffic Psychology Research Unit, Università Cattolica del Sacro Cuore, Milan, Italy

Abstract

People taking the practical driving test, often cope with a big amount of anxiety, which could have negative effects on their performance during the task. The present work shows the results of a training conducted at a driving school involving candidates to the practical driving test, in order to reduce their anxiety level. The training is composed by cognitive and emotion regulation tasks and activities. The preliminary data analysis suggests that, on a short term, the training was effective in reducing the anxiety. Further research is required for looking into the long term effectiveness.

Background, Method, Results and Conclusions

Getting the driving license is on the one hand a very important event for young people, since it provides more independence and autonomy (Barkley & Cox, 2007). On the other hand, driving is a complex activity, since the surrounding environment is very unpredictable and out of control (Jian-you et al., 2013). Furthermore driving involves a huge number of different physical skills (coordination, speed perception, movements, different senses) and cognitive skills (attention, perception, automatism, intention reading, memory, decision making) (Mazer, Gelinas & Benoit, 2004). Therefore, people could feel anxious before their driving test. This feeling is called "performance anxiety", a state of tension and fear felt when someone has to face an evaluative situation (Spielberger, 1972). Based on the assumption that emotions could influence cognitive processes (Lazarus, 1991), anxiety can have negative effects on people's behaviour during a demanding task (Onyekuru & Ibegbunam, 2014), for instance deeply influencing the cognitive performance. That is why performance anxiety is proved to affect the driving behaviour. In order to reduce performance anxiety and increase the wellbeing perception during the period of exam preparation, and therefore optimizing the performance during the test, a training, composed of 9 cognitive and emotion-regulation tasks, has been created. The tasks were aimed firstly at increasing the participants' self-confidence and self-efficacy perception, thanks to an increased awareness of their own abilities. Secondly, the purpose of the training was to increase the ability to focus attention and to reduce distraction during the driving task, by learning how to reduce negative thoughts linked to the exam. Finally, one activity was aimed at practicing physical relaxation and at learning the ability to manage the arousal generated by anxiety. 28 students, whose exam anxiety was previously assessed resulting significant, aged between 18 and 22 years, were divided into two groups. The experimental group participants (n.14) attended a 2 hours training at their driving school. The STAI Questionnaire (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; Pedrabissi & Santinello, 1989) was used to assess the participants' anxiety level before the training, just after the training, and on the day when they performed the exam. Results show that for the experimental group participants, the average anxiety level after the training was significantly lower than before the training (t-test was performed: T1=19,031; T2=17,673; df=13, p<0,05). Moreover, the experimental group anxiety level measured on the day of the exam, proved to be lower than the control group one, though the difference was not statistically significant. These results show that the training is effective in reducing anxiety in a short term period, while a long term effectiveness and the actual influence on driving behavior needs further research to be verified.

References

Barkley, R. A., & Cox, D. 2007. A review of driving risks and impairments associated with attention-deficit/hyperactivity disorder and the effects of stimulant medication on driving performance. Journal of Safety Research, 38(1), 113–128.

Jian-you Z., Xiao-fen S., Liang Z., Shuang-xi Z., Xi-yang N. 2013. Driving Behavior Theory and Computer Simulation System of Driver's Risk Perception Based on 3D. Procedia Social and Behavioral Science, 96, 1686-1695

Lazarus, R.S., 1991. Emotion and Adaptation. Oxford University Press, New York.

Mazer B., Gelinas I., Benoit D., 2004. Evaluating and retraining driving performance in clients with disabilities. Crit Rev Phys Rehabil Med, 16, 291- 326

Onyekuru, B.U., Ibegbunam, J.O. 2014. Relationships among test anxiety, locus of control and academic achievement among college students. European Scientific Journal. vol.10 (13)

Pedrabissi, L. and Santinello, M. (1989) STAI State-Trait Anxiety Inventory Forma Y Manuale. Organizzazioni Speciali, Firenze.

Spielberger, C. D. 1972. Anxiety as an Emotional State, in C. D. Spielberger (ed.) Anxiety: Current Trends in Theory and Research. New York: Academic Press.

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). Manual for the State-Trait Anxiety Inventory. Palo Alto, CA: Consulting Psychologists Press.

Development of fatality and injury risk relationships for cyclist-vehicle impacts

David B. Logan[a], Bruce Corben[b], Brendan Lawrence[a], Amir Sobhani[c]

[a]Monash University Accident Research Centre (MUARC), [b]Corben Consulting, [c]Regional Roads Victoria

Abstract

There is very little literature addressing cyclist fatality and serious injury (FSI) risk in impacts with motor vehicles. This study built on established curves relating pedestrian FSI risk to vehicle impact speed and incorporated the effects of cyclist speed and impact angle. A technique was developed that considered a vehicle-cyclist crash as two impacts: (a) the first impact between the cyclist and the vehicle and; (b) the second impact between the cyclist and road/roadside infrastructure. Combining the FSI risk of each yielded an estimate of cyclist FSI risk. This pilot method will need to be validated using real-world data.

Background

There have been several curves developed to quantify the relationship between pedestrian fatality and serious injury risk and vehicle impact speed. Unlike pedestrians, cyclist travel speed is often of similar order of magnitude to that of the motor-vehicle and therefore this variable and impact angle also plays a role in crash severity. As part of assisting a state road authority (VicRoads) with the development of a tool to evaluate intersection safety for pedestrians and cyclists, this project sought to develop prototype relationships to quantify cyclist FSI risk as a function of vehicle and cyclist impact speed and angle.

Method

A review of the literature identified several curves quantifying pedestrian FSI risk with vehicle impact speed (e.g. Davis, 2001; Rosén and Sander, 2009). However, there is limited literature establishing a corresponding relationship for cyclists. Kröyer (2015) treated cyclists in the same way as pedestrians, creating aggregate curves without accounting for crash configuration or cyclist travel speed. Kröyer also used sample spot speeds rather than actual impact speeds.

In this study, the outcome for a cyclist was considered as a combination of two impacts to the cyclist: the first with the vehicle and the second with the road/road infrastructure. The severity of the first impact is related to the velocity change of the cyclist during the initial interaction with the car. Assuming that the mass of the cyclist is small compared with the vehicle and the cyclist engages fully with the vehicle when struck (i.e. post-impact they are travelling at the speed of the motor vehicle), their velocity change is given by:

$$\overrightarrow{V_{rel}} = \overrightarrow{V_c} - \overrightarrow{V_b} \qquad (1)$$

where

$\overrightarrow{V_c}$: car velocity;

$\overrightarrow{V_b}$: cyclist velocity;

$\overrightarrow{V_{rel}}$: cyclist velocity change during the impact.

The magnitude of this velocity change represents the speed change, ΔV_1, of the cyclist during impact 1. The cyclist is then assumed to be travelling at the speed of the impacting vehicle, colliding with the road/roadside infrastructure at speed V_2 (assuming no vehicle braking).

The individual FSI risk of each impact was determined using a suitable pedestrian impact risk curve (this study used Davis, 2001) and the two values weighted and summed. Neal-Sturgess, Carter, Hardy, Cuerden, Guerra & Yang (2007), in a study of 70 European real-world pedestrian and cyclist crashes, attributed the source of individual injuries to each impact. They found that 53% of cyclist injuries were caused by the vehicle impact and 47% with the ground. The following relationship was used to combine the individual impact risk values:

$$Pr(FSI) = wPr(FSI \mid \Delta V_1) + (1 - w)Pr(FSI \mid V_2) \quad (2)$$

where

$Pr(FSI \mid \Delta V_1)$ is the probability of a fatal/serious outcome given impact #1 speed change

$Pr(FSI \mid V_2)$ is the probability of a fatal/serious outcome given impact speed #2

w is the proportion of injuries sustained in impact #1 = 0.53

Results

Figure 1 shows a sample cyclist risk curve for a hypothetical cyclist crash involving a right-turn-against crash between a turning vehicle and a through cyclist (25 km/h) at an impact angle of 75 degrees.

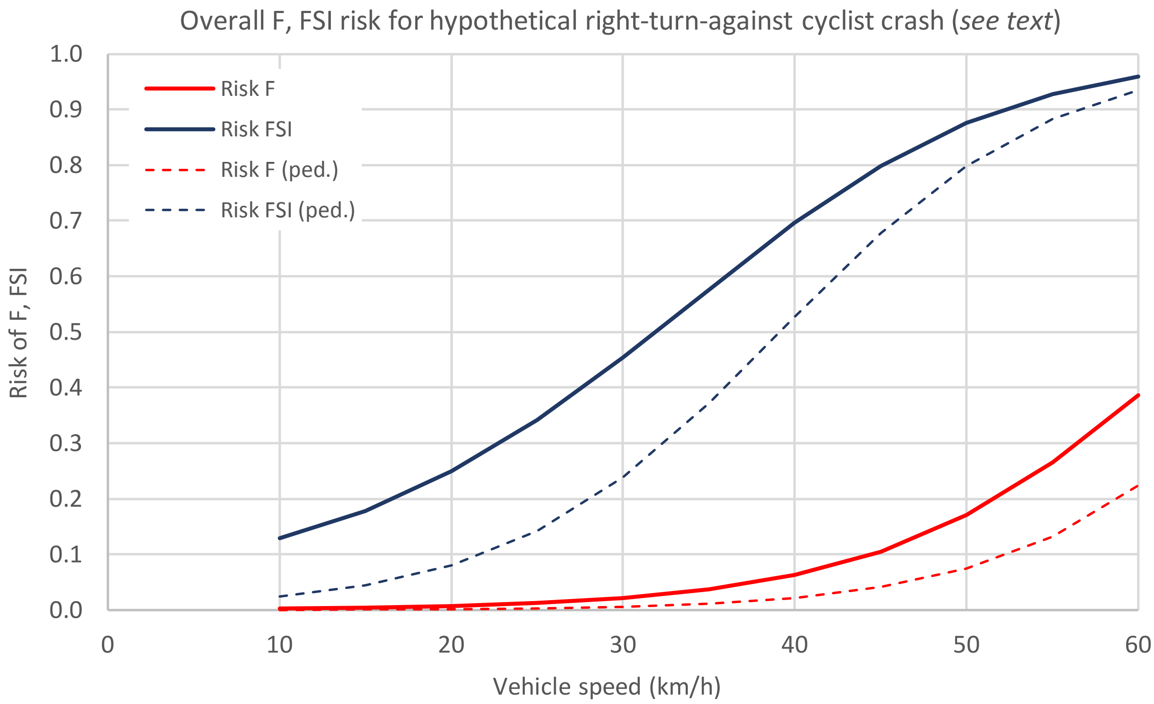


Figure 1. Sample cyclist FSI risk curve.

Conclusion

This study proposed a new method for estimating cyclist fatality and serious injury risk based on previously-established pedestrian FSI risk curves and impact speed and angles. Further work is required to validate the model.

References

Davis, G.A., 2001. Relating severity of pedestrian injury to impact speed in vehicle-pedestrian crashes: simple threshold model. Transportation Research Record 1773, pp. 108-113.

Kröyer, H.R.G., 2015. The relation between speed environment, age and injury outcome for bicyclists struck by a motorized vehicle – a comparison with pedestrians. Accident Analysis & Prevention 76, pp. 57-63.

Neal-Sturgess, C.E., Carter, E., Hardy, R., Cuerden, R., Guerra, L., Yang, J., 2007. APROSYS European In-Depth Pedestrian Database. 20th International Technical Conference on the Enhanced Safety of Vehicles (ESV). Lyon, France, 18/6-21/6/2007.

Rosén, E. and Sander, U., 2009. Pedestrian fatality risk as a function of car impact speed. Accident Analysis and Prevention 41(3), pp. 536-542.

Effectiveness of 40 km/h Speed Limits in Reducing Crashes on Melbourne Roads with Strip Shopping and Factors Influencing Effectiveness

Karen Stephan[a], Brendan Lawrence[a], Stuart Newstead[a]

[a]Monash University Accident Research Centre

Abstract

The effectiveness of reducing the speed limit to 40 km/h on Melbourne arterial roads with strip shopping was evaluated in a quasi-experiment. The treatment was associated with a 14% reduction in casualty crashes, 17% reduction in fatal and serious injury crashes, translating to a benefit-cost ratio of 13. Characteristics associated with a larger reduction in casualty crashes were two-lane roads, sheltered parking on both sides, fewer off-street parking facilities, presence of a railway station but without parks or sports fields. FSI crash reductions were larger on roads with fewer off-street parking facilities without a painted chevron median.

Background

Since 2005, speed limits were reduced to 40km/h on 49 Melbourne roads with strip shopping to reduce crashes. Both static and LED signs were used, and the reduced speed limit operated part-time at most sites. Past evaluations found a non-significant reduction in crashes at the initial 18 sites (Scully, Newstead & Corben, 2008) and for the next 24 roads treated under the Safer Road Infrastructure Program, a 19.5% reduction ($p<0.05$) in casualty crashes when 40km/h was permanently in operation but no significant effect when the 40 km/h was part-time (Budd & Newstead, 2016). By mid-2014, more roads were treated under the Safe Systems Road Infrastructure Program.

We aimed to measure:

1. the crash reduction effectiveness, and benefit-cost ratio (BCR), of reducing the speed limit across all 49 segments;
2. whether characteristics of roads where treatment was effective differed from those where it was not.

Method

We conducted a quasi-experimental study to estimate the crash rate change after reducing the speed limit controlling for the crash rate change that occurred in the relevant local government area over the same time, using Generalized Estimating Equations (GEEs). This controls for potential confounders such as changes in population size and distribution, traffic, cyclist and pedestrian volumes, police-reporting, road safety campaigns and other local variations.

Sites were categorized according to whether or not there was a reduction in crashes, and the size of the reduction. We used logistic regression and GEEs to determine whether roads where the treatment worked differed from roads where it did not, in terms of the design of the road, the roadside environment, and facilities and amenities nearby. The characteristics were chosen from those shown to be associated with crash risk on strip shopping roads in metropolitan Melbourne (Stephan, 2015).

BCR estimates were based on project and annual maintenance costs and a 15 year project life.

Results

Overall casualty and fatal and serious injury crash rates reduced significantly, particularly for vehicle-only crashes (the most common crash type).

Table 1. Change in crash rates after speed limit reduction

	Change in casualty crash rate	95% Confidence Interval	Change in fatal and serious injury crash rate	95% Confidence Interval
Overall	**-14%**	**-21% to -5%**	**-17%**	**-26% to -7%**
Vehicle-only	**-20%**	**-30% to -10%**	**-25%**	**-36% to -1%**
Pedestrian-involved	-14%	-31% to +6%	-15%	-31% to +5%
Cyclist-involved	-6%	-18% to +7%	+5%	-18% to +34%

* p<0.05 in bold type

Estimated present-value crash savings were approximately $159 million, with a cost of $12 million (discount rate 7%). The BCR was 13.0.

There was no difference in effectiveness between permanent or part-time operation of the 40 km/h speed limit but the characteristics of the road and environment did have an influence.

Characteristics associated with a larger reduction in casualty crashes were two-lane roads, sheltered parking on both sides, fewer off-street parking facilities, where there was a railway station nearby but no parks or sports fields adjacent. The FSI crash reduction was larger on roads with fewer off-street parking facilities without a painted chevron median.

Conclusions

Reducing the speed limit to 40 km/h on arterial roads with strip shopping is a cost-effective method to reduce crashes. Future treatments should target roads with features where the treatment was shown to be more effective.

Acknowledgements

This project was funded by VicRoads under the Safe System Road Infrastructure Program (SSRIP). VicRoads provided data and we also acknowledge Luke Thompson of MUARC for assistance with data collection.

References

Budd, L. & Newstead, S. (2016). *Phase 2 Evaluation of the Safer Road Infrastructure Program Stage 3 (SRIP3)*. Contract number QD2-865702. Consultancy Report to VicRoads

Scully, J., Newstead, S. & Corben, B. (2008). *Evaluation of the Crash Effects of Strip Shopping Centre Treatments in Victoria. Project Number RSD-0759*. Consultancy Report to VicRoads

Stephan, K.L. (2015). *A Multidisciplinary Investigation of the Influence of the Built Urban Environment on Driver Behaviour and Traffic Crash Risk*. PhD thesis, Monash University, Australia, Retrieved from https://monash.figshare.com/articles/A_multidisciplinary_investigation_of_the_influence_of_the_built_urban_environment_on_driver_behaviour_and_traffic_crash_risk/4712170

Evaluating retro-reflective screens to aid conspicuity of tabletop carriages at passive level crossings.

Matthew Baldock[a], Christopher Stokes[a], James Thompson[a]
[a]Centre for Automotive Safety Research, University of Adelaide

Abstract

The aim of this project is to design and undertake an experimental evaluation of the potential effectiveness of a prototype retro-reflective strip or screen installed at level crossings for the purpose of improving the detection by motorists of tabletop carriages and other trains at the crossings. A prototype screen was produced and footage recorded of trains passing through a crossing at night. A laboratory-based experiment using the footage will be run to assess whether the screen improves detection of, and reaction time to, the presence of trains. The presentation will describe the experiment and the results.

Background

An earlier report that was prepared for the Australasian Centre for Rail Innovation (ACRI) in 2015 (LC11 Passive Crossings and Tabletop Carriages) discusses passive solutions to improve the conspicuity of tabletop carriages at railway level crossings at night. The issue to be addressed is that unladen tabletop carriages have a low profile and so may not be detected by motorists at level crossings, particularly at night, leading to an increased crash risk.

One of the countermeasures for this problem that was suggested in the report was the use of retro-reflective strips or screens on the far side of the crossing to the driver. The idea behind such installations is that they would be illuminated by a vehicle's headlights when approaching the level crossing. The presence of a passing train would intermittently obscure the retro-reflective surface, thereby alerting the driver to its presence through 'silhouetting'. An advantage for such a countermeasure is that it would be relatively inexpensive to implement at a large number of passive crossings and would require no additional energy requirements (e.g. electricity supply or battery power).

Method

A prototype retro-reflective screen was produced that was 1200mm long and 200mm wide. It was constructed from polycarbonate (a production screen would likely be made of aluminium or steel as per standard road signs) fitted with 3M Diamond Grade fluorescent material. It was attached to a sign post using cable ties (a production screen would be attached using metal pole brackets).

Following pilot testing, a suitable level crossing will be chosen at which to apply the prototype for real world testing. The retro-reflective screen will be attached to a post on one side of the crossing, facing traffic that would approach from the other side of the railway. The research team will record footage of trains passing through the crossing during both daylight and night-time hours, and with and without the treatment in place. The footage will be recorded from the point of view of the driver of a car, at two different distances from the crossing.

The footage will then be used in a laboratory-based reaction time experiment. Participants will view footage of the crossing and indicate as quickly as possible whether a train is present at the crossing. The accuracy and speed of responses will be measured (a two-alternative forced-choice reaction time design). They will not be told about the retro-reflective screen. The clips will feature all combinations of distance from the crossing, ambient illumination, presence/absence of trains, presence/absence of the screen, and high/low beam headlights. The order of the clips will be varied between participants to prevent learning effects.

It is hypothesised that responses will be more accurate and quicker for the night-time sites with the retro-reflective treatment than for the night-time sites without the treatment. The hypothesis will be tested using multivariate analysis of variance, with appropriate post-hoc comparisons. The daytime conditions are included to check for unintended consequences.

Results and Discussion

These will be provided in the presentation, with implications drawn for the viability of the proposed countermeasure.

Stop, Ask, Listen and Collaborate: Working Towards Zero with Local Government

Frances Taylor[a], Christopher I. Davis[b], Christopher-Bree Nyko[a]

[a]Transport Accident Commission, [b]Mildura Rural City Council

Abstract

Local Governments (LGs) are in a unique position to provide road safety authorities with insight into local factors that contribute to road trauma in their communities.

Victorian LGs are responsible for a significant portion of Victoria's road network. Approximately 30 per cent[1] of all fatalities in Victoria occur on LG roads.

The Transport Accident Commission (TAC), interested in exploring this knowledge as well as the resourcing capacities of each LG, stopped and listened to all 79 municipalities in Victoria. They told us how we could assist in their journey towards zero.

Background

The Inquiry into The National Road Safety Strategy 2011-2020[2] identifies road safety as a national problem that requires all three levels of government to be an active part of the solution.

A key focus of the TAC's engagement with LGs was to understand their local road safety issues and needs and identify how the TAC can support LGs to lead Towards Zero aligned road safety initiatives in their local communities.

Engagement Method

Interviews with each LG

Face to face interviews were undertaken with LG staff.

Questions asked by the TAC sought to understand existing LG landscape around: infrastructure and road user behaviours; extent of community engagement activities; depth of road safety and strategic planning, design and delivery capacity and capability; financial capacity to fund works; enablers and constraints of current external funding models; and understanding of the Safe System.

Workshops with LGs

Workshops brought together LGs based on their geographic location. The workshops reviewed and confirmed the findings from Stage One, and then provided a forum for LGs to work together and discuss opportunities for improved safety on local roads.

Key findings from our consultations with LGs

Consultation revealed that most LGs are delivering road safety initiatives, with some delivering quality road safety outcomes in their areas. On the other hand, many LGs are under resourced, lack understanding of Safe System principals and face issues with legacy infrastructure or other internal and external factors when trying to implement the Safe System. Workshops discussed challenges and opportunities including, but not limited to: risk based funding; improved timelines; training needs; resource support; and funding approaches from government agencies.

What we learnt through the engagement process

Every LG is unique. LGs are all keen to work together, discuss their road safety challenges, seek solutions to barriers, and share their successes. They experience varying levels of financial and resourcing capacity which directly influences their ability to implement Safe System outcomes.

Through the intensive consultation with LGs, significant knowledge and relationships have been developed. Ongoing communication and engagement by the TAC is crucial to maintain trust and ensure programs are supporting LGs to undertake road safety initiatives and develop their capacity and capability in delivering positive road safety outcomes.

Conclusion

Despite the significant number of barriers and impediments LGs face in the delivery of positive road safety outcomes, LGs eagerly engaged in the consultation process and were optimistic about the opportunities to overcome challenges. LGs stressed the value of working collaboratively with the TAC and other Government agencies to improve the delivery of road safety outcomes and initiaves aligned to the Towards Zero Strategy.

The TAC gained valuable insights into the unique barriers, impediments and enablers specific to each Victorian LG, and will continue to support and work with LGs across the system to achieve zero deaths and serious injuries on Victorian roads.

References

Crash Statisics 2013-2018 (2019, February 24) Retrieved from https://www.vicroads.vic.gov.au/safety-and-road-rules/safety-statistics/crash-statistics

Inquiry into the National Road Safety Stratgy 2011-2020 (September 2018) https://roadsafety.gov.au/nrss/files/NRSS_Inquiry_Final_Report_September_2018_v2.pdf

Regional and remote road safety: A national view

Lisa Wundersitz[a], Peter Palamara[b], Kate Brameld[b], Simon Raftery[a], James Thompson [a], Matthew Govorko[b], Melissa Watts[c]

[a]Centre for Automotive Safety Research, University of Adelaide, SA
[b]Curtin-Monash Accident Research Centre, Curtin University, WA [c]Road Safety Commission, WA

Abstract

Road crash fatality rates continue to be unacceptably higher in regional/remote areas than major cities. This study investigates the causes of road crashes in regional/remote areas and provides strategic guidance to identify the most effective approaches to eliminate harm on the road network in these areas. Consistent with the Safe System approach, strategic planning across all components of the system is necessary to allocate resources and eliminate harm in regional/remote areas over a realistic long-term time frame. The paper concludes with a discussion of evidence-based countermeasures and new initiatives urgently needed to eliminate harm on regional/remote roads.

Background

Drivers and riders in regional/remote areas in Australia face an unacceptably greater risk of death and serious injury than those in major cities. In the current National Road Safety Action Plan (2018-2020), remote road safety, and the investigation and implementation of key interventions, is identified as a critical action. The aim of this project was to understand the causes and contributing factors behind crashes in regional/remote areas in Australia and to provide strategic guidance to identify evidence-based actions that are needed to prevent such road trauma.

Method

The project incorporated a review of the recent literature, an analysis of trends in regional/remote crash data, a review of regional/remote road safety responses since the commencement of the National Road Safety Strategy 2011-2020 and wide consultation with stakeholders.

Results

Around one third of Australians live in regional/remote areas, but two thirds of fatal crashes occur in these regions. The fatality rate is five times greater in regional/remote areas (12.2 deaths/100,000) than in major cities and is highest in very remote areas (see Table 1).

Table 1. Australian population and fatal crash statistics by remoteness area, 2016

Remoteness area	Population[a]		Fatalities[b]		Fatality rate per 100,000
	N	%	N	%	
Major cities	17,331,653	72.7%	458	35.3%	2.6
Inner regional	4,341,032	18.2%	428	33.0%	9.9
Outer regional	2,041,946	8.6%	290	22.4%	14.2
Remote	293,765	1.2%	49	3.8%	16.7
Very remote	202,413	0.8%	70	5.4%	34.6
Total (Australia)[c]	23,850,784	100%	1,296	100%	5.4

[a] Source: ABS, 2017
[b] Source: BITRE, 2018
[c] Includes unknown remoteness area.

Key road safety issues in regional/remote areas were identified:

- High incidence of single vehicle and head on crashes
- High levels of alcohol and illicit drug use, unlicensed driving, non-use of seatbelts and driver fatigue
- Increased risk of crash and injury at higher speeds and disparity between speed limits and the quality of the road and existing infrastructure
- Increasing incidence of crashes involving motorcyclists
- Higher burden of road trauma among Aboriginal people
- High incidence of older, less crashworthy vehicles
- Delays in post-crash emergency response

Discussion

Given the sheer size, scale and lower quality of the regional/remote road network, long term strategic perspectives are important, and jurisdictions should use network safety plans to determine how to allocate resources. Systemic change is integral and treatment options should support corridor safety plans that incorporate solutions beyond infrastructure alone and facilitate enforcement, quality rest stops, and alternative transport options.

The speed limits in regional/remote areas are high and do not reflect the risks of travelling on lower quality roads or in the absence of adequate infrastructure. Speed management can be difficult in regional/remote areas but all efforts are to be encouraged. Vehicle based speed management technologies offer potential solutions as well as fleet management incentives. Jurisdictions expressed a desire for national leadership around the harmonisation of appropriate speed limits.

Vehicle safety, arguably, offers the most potential for regional/remote areas. Newer, safer vehicles can provide a higher level of occupant protection and offer technologies that can mitigate common crash types. Policies and incentives to accelerate proven safety and driver assist technologies into the driving fleet are needed with those involving government fleet purchasing the most promising.

Alternative transport services (e.g. NT Remote Bus Program) can provide critical services for remote Aboriginal communities enabling access to health, employment, education and social opportunities. Such alternative safe transport options should continue to be trialed and expanded. Community led collaborative programs in remote and Aboriginal communities to improve access to licensing and fit child restraints have achieved positive outcomes and should continue to be implemented and expanded.

Acknowledgements

This project was funded by Austroads. Acknowledgments of contributions to this project are made to Melissa Watts, Brett Clifford and Joanna Robinson from the Austroads Working Group and also Jeremy Woolley, Sally Edwards, Trevor Bailey and Emma Hawkes.

References

Australian Bureau of Statistics (ABS). (2017). 3218.0 Regional population growth, Australia, 2016-17. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0

Bureau of Infrastructure Transport and Regional Economics (BITRE). (2018). Road trauma Australia 2017 statistical summary. Canberra, ACT: BITRE.

Victoria's Automated Driving System (ADS) permit scheme

Steven Huxtable

Road User and Vehicle Access, Road Safety Victoria

Abstract

On-road trials of automated vehicles are critical to their safe development and deployment. They also serve as an opportunity to build government's knowledge about the technology, as well as public awareness and perception. Victoria's Automated Driving System (ADS) permit scheme is a performance-based framework within which vehicle manufacturers, technology developers and mobility providers can lawfully operate an automated driving system for testing and development purposes, with or without a human 'driver'. This paper discusses the concept behind the scheme, and aims to share the learnings to date.

Background

The road environment is complex and dynamic, with many moving parts; different vehicle types and road users all moving at different speeds and in different directions in close proximity. To combat the challenges of such a complex environment, on-road testing in live traffic is a necessity. With this, however, comes certain risks which need to be properly managed.

The introduction of automated vehicles will also see a shift from the human driving the vehicle, to an ADS driving the vehicle. This shift will change fundamentally the role of the human in the driving task. As humans are required to play a lesser role, it will be unreasonable to continue hold them responsible for the actions of a vehicle under the control of an ADS.

Concept

The ADS permit scheme recognises the shift in driving responsibility from the human to the entity responsible for the ADS. By taking a performance-based approach, the ADS permit scheme aims to ensure that those engaging in on-road trials have necessary safety management processes in place to ensure the safety of the trial, without stifling innovation.

Applicants must satisfy minimum eligibility requirements, submit a safety management plan and be covered by public liability insurance. Permit holders and vehicle supervisors must comply with conditions, including mandatory reporting requirements, to ensure safety and provide an avenue for shared learning.

Recognising that an ADS is driving the vehicle when engaged, its development can be compared with the existing learner permit scheme. At first, vehicle supervisors may have to intervene frequently. Over time, as automated driving technology matures, the role of the vehicle supervisor will decrease. However, there will likely always be a need for on-road trials as technology changes and progresses. For this reason, a more complete framework is required, which will support the development of automated vehicles long into the future.

This ongoing need resulted in the development of a true, performance-based driving permit for testing and development of automated vehicles. The presentation will include an explanation of the concept and requirements of the scheme.

Application

The ADS permit scheme commenced in September 2018, with those looking to operate an automated vehicle in automated mode (with the ADS engaged and performing the dynamic driving task) on Victorian roads now requiring an ADS permit. Part of the presentation will involve an explanation of how the scheme functions, and will include any key learnings to date.

Rider, motorcycle and trip-related factors associated with motorcycle injury crash risk in Victoria, Australia

Trevor Allen[a], Karen Stephan[a], Stuart Newstead[a], Mark Symmons[b], Michael Lenné [a], Rod McClure[c], Peter Hillard[a], & Lesley Day[a]

[a]Monash University Accident Research Centre, [b]Australian Catholic University, [c]Faculty of Medicine and Health, University of New England

Abstract

This population based case-control study aimed to investigate risk factors associated with serious injury motorcycle crashes in Victoria, Australia. Cases were adult riders admitted to hospital following a recent motorcycle crash on a public road. Controls were adult riders observed passing a recent case crash site. All participating riders completed a structured questionnaire. Data were analysed using multiple conditional logistic regression. Analysis identified rider, motorcycle and trip-related factors that were: a) significantly associated with crash risk, and b) prevalent in at least 15% of cases. These findings have direct application for evidence-based strategies to improve motorcycle safety.

Background

Motorcyclists are over-represented in road trauma statistics, in part due to their greater vulnerability. Less than 1% of all distance travelled on Victorian roads is by motorcycle or scooter (ABS, 2016; Allen, 2017), yet about 20% of those seriously injured in 2017-18 were motorcyclists or pillions (Source: TAC). Descriptive case studies can help us understand crash trends and possible causative factors. However, population based case-control studies provide a more sophisticated understanding of crash risk by controlling for exposure characteristics of the active rider population (Hurt et al., 1981; Haworth et al., 1997). The most recent Victorian-based study of this type was conducted more than 20 years ago. The aim of this case-control study was to investigate contemporary risk factors associated with serious injury (non-fatal) motorcycle crashes in Victoria. Focus was specifically on rider, motorcycle and trip-related factors associated with injury crash risk that were prevalent in at least 15% of cases.

Method

Eligibility and recruitment

Cases were 204 riders of motorcycles or scooters who had recently been injured in a crash and admitted to one of 14 study hospitals. Study design and recruitment details have been described previously (Day et al., 2013). Case eligibility criteria included: the crash occurred on a public road within 150km of Melbourne CBD between 6am and midnight, the rider was aged 18 years or over, and the motorcycle had current Victorian registration. Controls were 511 riders observed passing the location (or closest possible location) of a case crash site on the same type of day and within 2 hours of the crash time (where possible). Controls were invited by post to the registered vehicle owner. All procedures were approved by the ethics committees of Monash University and study hospitals.

Data collection and analysis

All riders completed a structured questionnaire which included questions about the rider, their motorcycle and the related trip. Data were analysed using multiple conditional logistic regression with multiple imputation for missing data.

Results and Discussion

Table 1. Rider, motorcycle and trip-related factors found to be a) significantly associated with serious injury crash risk, and b) prevalent in >15% of cases.

	Associated with *increased* risk	**Associated with *decreased* risk**
Rider-related factors	• Greater typical weekly riding distance in past 12mths (>200 km/week) • Ever stopped riding for >12mths • Greater typical weekly driving distance in past 12mths (>200km/week) • Increasing risk taking score	• Greater recent riding distance (>100 km in past week) • Off-road motorcycle experience • Familiarity with route by car/other vehicle
Motorcycle-related factors	• Owned motorcycle <=2yrs (compared with >4 years) • Cruiser type motorcycle (compared with all other types) • Increasing bike age	• Anti-lock brakes fitted
Trip-related factors		• Rider wearing tinted visor or lenses • Increasing weight of load/gear

Rider-related risk factors

While there was an expected association between riding exposure and crash risk, recent riding (past week) was associated with decreased risk, suggesting a protective effect of recent familiarity with riding. While having stopped riding (ever) for more than 12 months was associated with increased risk, about half of these riders had returned to riding for more than 5 years. The decreased risk associated with off-road experience should be investigated further.

Motorcycle-related risk factors

Less familiarity with the motorcycle was associated with increased risk, as was increasing age of the bike. The decreased risk associated with motorcycle ABS fitment is promising given this is the first study (to our knowledge) that controlled for rider-related factors. Further research is needed to understand the increased risk associated with cruisers.

Trip-related risk factors

The results for wearing a tinted visor or lenses suggest a possible benefit for perceiving hazards during daylight hours. The decreased risk associated with increasing weight of load/gear may be related to a more conservative approach to riding when carrying a significant load.

Conclusions

A number of rider, motorcycle and trip-related factors were found to be associated with either increased or decreased injury crash risk. It is hoped that findings from such a robust research methodology will be pivotal in shaping discussions on road safety policy by government, the rider community and other stakeholders and highlight areas where more research or evaluation is needed.

Acknowledgements

The case-control study from which this data was sourced was funded by the Australian Research Council (LP110100057), VicRoads, the Transport Accident Commission of Victoria, and the Victorian Government Department of Justice, with in-kind support from Victoria Police, Victorian Automobile Chamber of Commerce. Ambulance Victoria provided daily crash notification and location information. We thank the MICIMS full-time project team (Josie Boyle, Rob Jackel, Geoff Rayner) as well as all project research nurses, research assistants and field-based researchers.

References

ABS. (2016). Survey of Motor Vehicle Use, 30 June 2016. Australian Bureau of Statistics, Canberra(9208.0).

Allen T, McClure R, Newstead S, Lenné M, Hillard P, Symmons M & Day L (2016). Exposure factors of Victoria’s active motorcycle fleet related to serious injury crash risk. Traf. Inj. Prev. 17: 870-877.

Day, L., Lenne, M. G., Symmons, M., Hillard, P., Newstead, S., Allen, T., & McClure, R. (2013). Population based case-control study of serious non-fatal motorcycle crashes. BMC Public Health, 13, 72. doi: 10.1186/1471-2458-13-72.

Haworth, N., Smith, R., Brumen, I., & Pronk, N. (1997). Case-control study of motorcycle crashes (CR 174): Federal Office of Road Safety, Canberra

Hurt, H., Ouellet, J. & Thom, D.R. (1981). Motorcycle accident cause factors and identification of countermeasures. U.S. Department of Transportation. National Highway Traffic Safety Administration 1: Technical Report: 1-435.

TAC (2019). Searchable road trauma statistics. http://www.tac.vic.gov.au/road-safety/statistics/online-crash-database (accessed 11/2/19). Transport Accident Commission, Victoria, Australia.

Comfort accessories for elderly drivers: Influence on occupant injury risk.

Tom Whyte[a,b], Nick Kent[a], Lisa Keay[b], Kristy Coxon[c], Julie Brown[a,b]

[a] Neuroscience Research Australia, [b] University of NSW, [c] Western Sydney University

Abstract

The aim of this study was to analyse the effect of various comfort accessories, observed to be used by 26% of elderly drivers, on occupant injury risk. A collection of frontal sled tests using a 5th percentile Hybrid III dummy showed increased sternal deflection when the dummy was seated on cushioning, indicating potential for increased thoracic injury. When a lumbar support roller and cushion were used the dummy submarined under the lap belt which would pose an increased risk of severe abdominal injury.

Background

Twenty-six percent of drivers aged 75 and over have been observed using a comfort accessory, such as cushions, back supports and seat covers in their vehicle (Fong, Keay, Coxon, Clarke & Brown, 2016). The effect of the comfort accessories on occupant injury risk, however, is unknown. In the context of child passengers, similar accessories impair crash protection. Elderly drivers are more fragile and frail than younger vehicle occupants and hence impaired effectiveness of the restraint system can have significant impacts in this population. The primary body regions of concern for three-point seat belt related injury risk are the thorax and abdomen. The aim of this study was to examine the effect of comfort accessories on impact crash protection.

Method

Frontal sled tests were conducted on a deceleration sled at the Transurban Road Safety Centre at NeuRA with a 5th percentile female Hybrid III dummy, intended to represent a small stature older occupant, at a severity of 32 *g* peak sled deceleration, 43 km/h initial velocity and 70 ms pulse duration typical of a moderate-to-severe frontal crash. Eight identical front seats from 2002-2007 model commercially available Australian passenger car were used with a new seat for the baseline test and each of the following seven accessories: seat wedge cushion, swivel seat cushion, lumbar support roller, lumbar cushion, mesh lumbar support, large lumbar support and a padded seat cover. The dummy was instrumented with a rotational potentiometer in the chest, a 6-axis load cell at the upper neck and triaxial arrays of accelerometers in the head and the chest. Dummy instrumentation therefore measured sternal deflection, upper neck loads, head acceleration and chest acceleration. The Head Injury Criterion (HIC_{15}) was calculated from the head accelerations and the Neck Injury Criterion (N_{ij}) from the upper neck load cell using critical intercept values for the 5th percentile female (Eppinger et al. 1999). The deceleration event was captured by a high-speed camera recording at a sampling rate of 1 kHz. High-speed video was used to assess whether the pelvis of the dummy submarined under the lap portion of the belt.

Results

The peak responses of the dummy are shown in Table 1. Accessories placed on the seat surface under the dummy (seat wedge, swivel seat cushion and padded seat cover) increased the sternal deflection by up to 56% compared to the baseline test. Lumbar support accessories, with the exception of the large lumbar support, were associated with an increase in HIC_{15} compared to the baseline test by up to 26%. The dummy submarined when the lumbar support roller and the lumbar cushion were used (see Figure 1) whereas no submarining occurred in the baseline test or with the other accessories.

Table 1. Peak dummy responses for each comfort accessory in frontal sled test (32 g, 43 km/h)

Test condition	**HIC_{15}**	**N_{ij}**	**Peak chest acceleration (g)**	**Sternal deflection (mm)**
Baseline (no accessory)	694.7	0.589	89.3	30.1
Seat wedge cushion	618.5	0.540	82.1	47.0
Swivel seat cushion	492.9	0.500	82.7	45.1
Lumbar support roller	747.6	0.448	68.4	34.1
Lumbar cushion	843.9	0.457	87.5	33.6
Large lumbar support	597.1	0.590	91.9	31.8
Mesh lumbar support	878.0	0.601	86.1	33.1
Padded seat cover	735.0	0.572	92.6	37.2

Figure 1. Post-crash belt position for the baseline test (left) and lumbar support roller (right) showing the belt intruded into the abdomen when using the lumbar support roller

Conclusions

The results indicate comfort accessories have the potential to negatively impact restraint system effectiveness in a moderate-to-severe frontal crash. While the absolute risk of injury to older occupants cannot be calculated due to the unavailability of applicable injury risk curves based on Hybrid III 5th percentile female responses, increased sternal deflection indicates a potential higher risk of chest injury when seated on cushions. Lumbar supports negatively altering the initial position of the pelvis were associated with observed submarining and this also potentially increases risk of injury. Collaboration with clinicians and older drivers is needed to develop appropriate guidelines for the use of comfort accessories in cars.

References

Fong, C., Keay, L., Coxon, K., Clarke, E., Brown, J., 2016. Seat belt use and fit among drivers aged 75 years and older in their own vehicles. Traffic Injury Prevention, 17(2), p142-150.

Eppinger, R., Sun, E., Bandak, F., Haffner, M., Khaewpong, N., Matlese, M., Kuppa, S., Nguyen, T., Takhounts, E., Tannous, R., Zhang, A., Saul, R., 1999. Development of improved injury criteria for the assessment of advanced automotive restraints systems – II. National Highway Traffic Safety Administration.

Overview and Outcomes of Victoria's Passing Distance Cycling Safety Public Education Campaign

Allison McIntyre[a], James Sinclair[b], Jodi Page-Smith[c], Paulette Ziekemijjer[c] and Nina Ellis[c]

[a]Allison McIntyre Consulting, [b]PassBox, [c]Transport Accident Commission

Abstract

Research shows close passing is associated with the level of safety and discomfort felt by cyclists. A TAC public education campaign aimed to address safe passing distance and encourage more respect for cyclists. The TAC's campaign was seen and well understood by the market. Surveys collected data on mutual respect and the endorsement of recommended passing distances. Passbox conducted a naturalistic study of passing distance in Melbourne pre- and post-campaign. Some small but significant changes in the desired direction were observed. Results also showed that infrastructure has an important role to play and the benefits of bicycle lanes.

Background

The 2016 findings from a Victorian parliamentary inquiry recommended the development of a public education campaign around the distance motorists should leave when passing cyclists. Research from New Zealand shows that close passing is associated with discomfort while cycling and the level of safety felt by cyclists (Balanovic et al., 2016). Every cyclist deserves to be safe and feel safe when using the roads. This paper provides an overview of the TAC campaign and some outcomes.

The Campaign

The TAC developed a public education campaign (illustrated in Figure 1) to address passing distance and encourage more empathy towards cyclists. The main campaign components were aired in November 2017 and March 2018. The message was that drivers should allow cyclists at least one metre's space in speed zones up to 60km/h and 1.5 metre's space in higher speed zones.

Figure 1. The campaign illustration of the desired passing distance drivers should give cyclists

Method

Data were collected via three research components:

1. Post campaign surveys measuring the recall and understanding of the advertising.
2. Surveys before and after the campaign which included measures of:
    - endorsement of the recommended 1m and 1.5m passing distance,
    - ease of judging a metre when passing cyclists,
    - mutual respect among cyclists and drivers.
3. The Passbox naturalistic study of passing distance. Data were collected in Melbourne during November 2016-March 2017 (pre) and January - March 2018 (post). A Passbox device (video, sonar, GPS) was fitted to bicycles of participants; 18 participated in both waves of the study. Data from about 20,000 passing events was collected and included:
    - Passing distance to the cyclists' left and right
    - Number and width of vehicle lanes
    - Bicycle lane presence and type
    - Passing vehicle type
    - Parking bays and parked vehicles

Results

A range of results from the above data sources will be explored. Some key survey results included:

- Recall of the advertising was higher than TAC norms
- 90% who saw the advertising understood the intended message
- Endorsement of 1m passing distance
- Small but significant improvements in mutual understanding and ease of judging a metre when passing a cyclist

Table 1. Responses to passing distance and mutual respect questions pre and post campaign

	Pre (Oct 2017) n=614	**Post (Nov 2017)** n=745	**Post (Mar 2018)** n=336
Drivers should leave at least a metre safety space for cyclists on 60km/h roads - *% agree/strongly agree*	85%	87%	85%
Drivers should leave at least a 1.5 metre safety space on roads with speeds >60km/h - *% agree/strongly agree*	75%	78%	75%
It is easy for you to judge how far a metre is when overtaking a cyclist - *% disagree*	34%	29%*	27%*
Most drivers don't understand what it is like to be a cyclist on the road - *% agree/strongly agree*	76%	73%	69%*
Most cyclists and drivers show each other courtesy on the roads - *% disagree/strongly disagree*	47%	43%*	42%*
** signifcant difference compared to Oct 2017*			

Some key Passbox results:

- 13,000 passing events from the cyclists and locations present in both waves of the study.
- Regression modelling (comparing like with like) showed a significantly lower (1.99%) rate of close passing post-campaign.

- Regression modelling on all passing events showed that two or more lanes, narrow road width and presence of parking were associated with highest rate of close passing; bicycle lanes were associated with lowest rate.

Conclusions

The TAC's campaign implementation was effective; it was seen and understood by the market. Some of the results from surveys and Passbox indicated small but significant changes in the desired direction. It will be important to monitor if these positive beginnings can be sustained. The Passbox study shows that infrastructure characteristics have a clear role to play in passing distance. Comparisons to literature and methodological issues will be discussed.

References

Balanovic, J., Davison, A., Thomas, J., Bowie, C., Frith, B., Lusby, M., Kean, R., Schmitt, L., Beetham, J., Robertson, C., Trotter, M., Kortegast, P. & Burton, J. (2016). Investigating the feasibility of trialling a Minimum Overtaking Gap law for motorists overtaking cyclists in New Zealand. NZ Transport Agency Internal Report.

Acknowledgements

Ben Bishop (Wallis Group) - campaign tracking and attitudinal survey research
Passbox team– Jonathan Nolan, James Savage, Shoshana Vasserman and Susana Marquez.

Validating Self-Report Transport Manager Safety Surveys

Lori Mooren, PhD[a] , Rena Friswell, PhD[b], Raphael Grzebieta, PhD[b,c], Ann Williamson, PhD[b], Jake Olivier, PhD[b]

[a] Safety and Communications Pty Ltd, [b]Transport and Road Safety Research, University of New South Wales, [c]Victorian Institute of Forensic Medicine, Monash University.

Abstract

Safety management research has focused largely on identifiable policies, practices and technologies and has relied heavily on self-report surveys of managers. This paper suggests that, in some cases, there is a strong argument for validating manager self-report surveys. It further argues that management culture can moderate the effectiveness of policies, practices and technologies. Evidence was found for the efficacy of 17 safety management characteristics in a qualitative study (n=15) designed to validate an earlier manager survey study of safety management in heavy vehicle transport operations (Mooren et al., 2014). The results suggest a better validation rate for companies with lower crash claim rates.

Background

A previous study compared safety management characteristics of companies that operate heavy trucks with low rates of insurance claims (zero per truck in a 3-year period) and companies with higher claims rates (at least 0.17 per truck) as part of a 5-year Australian Linkage Grant project investigating the safety management system for heavy vehicle transport. Manager surveys about company practices identified 37 safety management characteristics or practices that distinguished low from higher claiming companies. However, 20 of these characteristics were unexpected because managers in higher claiming companies more often reported safety management characteristics consistent with good safety outcomes in the safety literature. For example, higher claimers reported more policies, more driver training and more driver monitoring than did lower claimers.

Because self-report measures can be unreliable, a validation was necessary to ensure strong evidence of practices for a safety management system. The high number of unexpected results reinforced the need for follow-up. This paper presents the validation results.

Method

A subsample (n=15) of the surveyed companies stratified by size and claim rate participated in the validation study which involved confirmatory management and driver interviews/surveys, workplace observations, and company document review.

A qualitative analysis was conducted of these convergent data sources to better understand the previous survey findings.

Results

Table 1 shows that 82% of the unexpected results in higher-claiming companies were not validated; whereas 94% of characteristics that were more likely at lower-claiming companies in the previous survey were validated. Characteristics validated as more prevalent in low claiming companies were:

- Risk assessment/management (8 characteristics) – consider safety features in truck purchasing, fewer defect notices, pre-trip inspections, check traffic conditions, limit speed on poorer quality roads, safety audit own sites, document fatigue management, and time limit responses to drivers' safety concerns;

- Driver management (8 characteristics) - check accident histories of driver applicants, employ fewer drivers over 60 years, pay by time worked (not by trip or load), pay waiting time, use experienced drivers to check/coach others, formally investigate unsafe behaviours, encourage driver input into work health and safety, and offer incentives for safety innovations;

Table 1. Number of management characteristics that were validated, by the direction of differences between low and higher claimers found in previous survey

<table>
<tr><th colspan="2">Previous manager survey</th><th colspan="4">Results of in-depth validation</th></tr>
<tr><th rowspan="2">Characteristics were:</th><th rowspan="2">Direction was:</th><th colspan="4">Number (%) of characteristics:</th></tr>
<tr><th>validated</th><th>not validated</th><th>inconclusive</th><th>Total</th></tr>
<tr><td rowspan="2">More prevalent in low claimers</td><td>Expected</td><td>16 (94.1)</td><td>0 (0.0)</td><td>1 (5.9)</td><td>17 (100)</td></tr>
<tr><td>Unexpected</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td rowspan="2">More prevalent in higher claimers</td><td>Expected</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Unexpected</td><td>11 (55.0)</td><td>4 (20.0)</td><td>5 (25.0)</td><td>20 (100)</td></tr>
<tr><td>Total</td><td></td><td>27 (73.0)</td><td>4 (10.8)</td><td>6 (16.2)</td><td>37 (100)</td></tr>
</table>

The validation study also revealed an additional characteristic emerging from manager and driver interviews. Managers in the low claiming companies took more proactive and consultative actions regarding safety, suggesting greater commitment to safety.

Conclusions

The results show the benefits of validating manager self-report surveys through in-depth investigations. The lower reliability of manager reports in poorer safety performing companies might be an indicator of a weak safety culture.

Acknowledgements

The authors thank the participating company representatives. We acknowledge the financial and technical support provided by ARC Linkage Grant LP100100283 and partners, the NSW Centre for Road Safety, Transport for NSW, Transport Certification Australia, National Transport Commission, Zurich Financial Services, and the Motor Accidents Authority of NSW to make this paper possible. At the time when this research work was carried out Dr. Lori Mooren was supported by the ARC Grant, Prof. Williamson was supported by an NHMRC Senior Research Fellowship and Prof. Grzebieta was supported by the NSW Centre for Road Safety at Transport for NSW. The authors also acknowledge the contributions and assistance provided by Mr. Peter Johansson, Mr. Roger Hancock, Dr. Soames Job and Dr. Charles Karl.

References

Mooren, L, Williamson, A., Friswell, R., Olivier, J., Grzebieta, R., Magableh, F. 2014, What are the differences in management characteristics of heavy vehicle operators with high insurance claims versus low insurance claims? Safety Science, 70, 327-338.
http://dx.doi.org/10.1016/j.ssci.2014.07.007

Benchmarking distracted driving against other key risky driving behaviours

Oscar Oviedo-Trespalacios[a], Sonali Nandavar[a], Barry Watson[a], Ioni Lewis[a], Md Mazharul Haque[b], Katherine White[c], Tim McLaren[d], Craig Newland[d], & Kate O'Donnell[d]

[a] Centre for Accident Research and Road Safety- Queensland (CARRS-Q), Queensland University of Technology (QUT), Brisbane, Australia, [b] Queensland University of Technology (QUT), School of Civil Engineering and Built Environment, Science and Engineering Faculty, Brisbane, Australia, [c] Queensland University of Technology (QUT), School of Psychology and Counselling, Brisbane, Australia, [d] Australian Automobile Association (AAA), Canberra, Australia

Abstract

Speeding, drink driving, drug driving, distracted driving, and fatigued driving are the most significant behavioural contributors to road trauma worldwide, yet little is known about the differences in crash risks and prevalence between each of these behaviours. This study invited international road safety experts to be part of a semi-quantitative risk assessment process considering the perceived crash risk associated with these behaviours, population factors, group exposure, and individual exposure. From this, insights into the relative importance of these behaviours were obtained.

Background

There is growing concern about the dangers of distracted driving on the road. However, the relative risks of these behaviours, and how they compare to other risky driving behaviours such as speeding, drink driving, drug driving and fatigued driving, are still unknown. Hence, this study aimed to develop an understanding of the relative importance of risky driving behaviours in road trauma, considering population factors (i.e. age group), group exposure (i.e. the proportion of drivers engaging in risky driving behaviours), and individual exposure (i.e. exposure to the behaviour while driving).

Method

A semi-quantitative approach to risk assessment based on the Analytical Hierarchy Process (AHP; Saaty, 2008) was utilised to quantify experts' (n=32) judgements relating to risk and the driving behaviours. The AHP is considered a very flexible methodology used in different disciplines (Holgado et al., 2016). In addition to this, experts were asked about crash risk, the percentage of drivers who engage in these behaviours, and percentage of time spent engaged in these behaviours. Experts considered two populations: young (18-25 years) and mature (26-65 years) drivers. The experts were recruited via email through CARRS-Q's international network of collaborators.

Results

The expert responses to the AHP were analysed following the Saaty (2008) methodology. The results demonstrated the relative importance of behaviours in the following order: driving while looking at phone for more than two seconds (28%), fatigue/sleepiness while driving (22%), drink driving (12%), drug (marijuana) driving (10%), speeding (9%) and talking on a phone (9%), and driving while using music (5%) or GPS applications (5%). Other expert responses are reported in Table 1.

Table 1. Experts' opinions about relative risk of crashing of risky driving behaviours, percentages of drivers who engage in these behaviours and time spent engaged

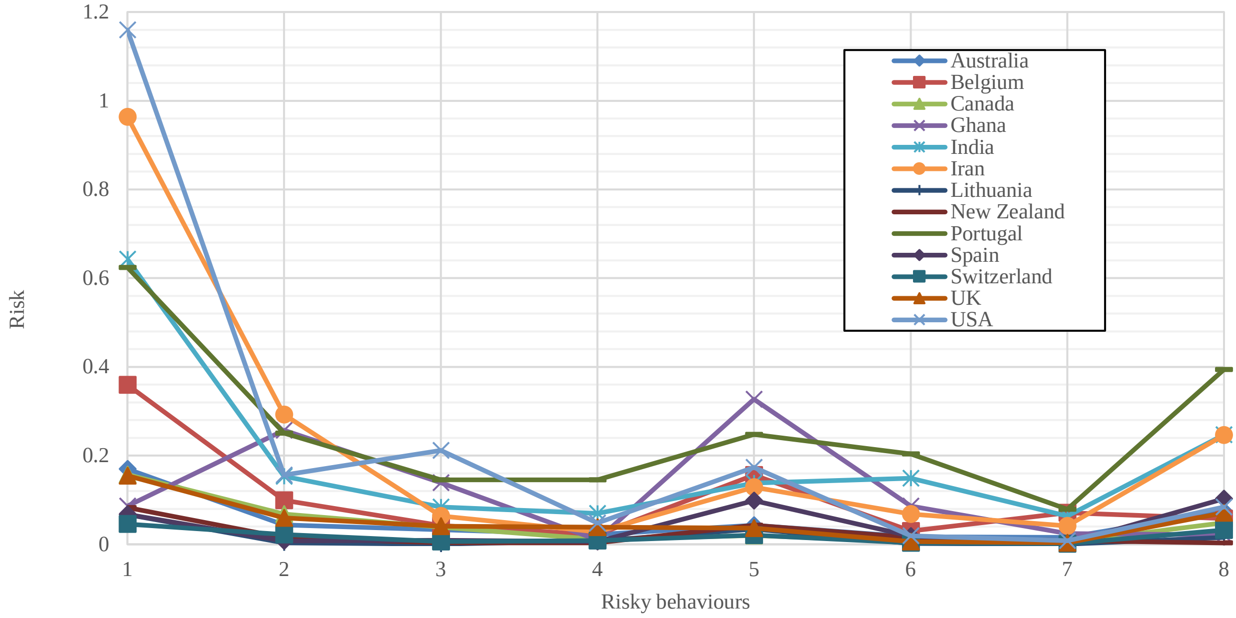
Risky Behaviours	Relative risk of crashing				Percentage of drivers who engage in the behaviour				Percentage of driving time spent engaged			
	Young Drivers		Older Drivers		Young Drivers		Older Drivers		Young Drivers		Older Drivers	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Drive while using a mobile phone for tasks that require holding the phone and looking at the screen continuously for more than 2 seconds	3.80	1.06	3.41	1.17	60%	25%	57%	23%	37%	28%	34%	26%
Drive while undertaking a conversation on a mobile phone (either hands-free or handheld)	2.89	1.00	2.57	1.00	63%	26%	62%	25%	41%	30%	42%	28%
Drive while using music apps and changing songs	2.66	1.13	2.52	1.17	71%	24%	56%	26%	45%	31%	34%	26%
Drive while looking at a GPS or map application	2.65	1.16	2.39	1.22	59%	29%	58%	24%	37%	28%	36%	26%
Speed more than 10 km/h over the limit	2.88	1.15	2.65	1.20	60%	29%	61%	28%	44%	29%	43%	26%
Drive after consuming 3 alcohol standard drinks	3.41	1.15	3.20	1.18	30%	22%	34%	22%	21%	20%	23%	20%
Drive after smoking marijuana	3.16	1.29	3.09	1.27	28%	21%	23%	19%	19%	18%	17%	19%
Drive while having problems in maintaining wakefulness (Being close to falling asleep)	3.62	1.33	3.69	1.19	44%	25%	46%	20%	25%	17%	33%	22%

The results from the AHP and expert responses were utilised to calculate a risk index through the following equation:

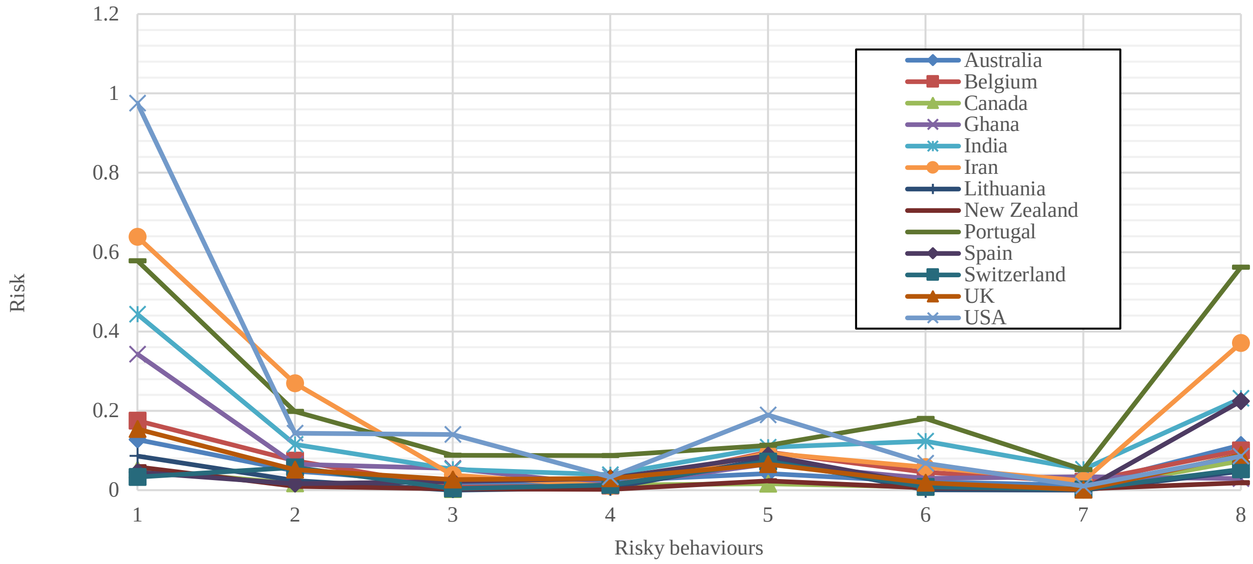
Risk index = Crash risk * percentage of drivers who engage in the behaviour * percentage of driving time spent engaged

Figure 1 illustrates the results of the risk index. Experts considered driving while looking at the phone for more than two seconds as the main concern among the risky driving behaviours, with younger drivers being at an increased risk than older drivers. Based on the expert ratings, older drivers seem to be at a higher risk of the behaviour of fatigue and sleepiness while driving compared to young drivers. Other risky behaviours such as speeding and alcohol and drug driving had similar risk indexes between young and older drivers.

(a)



(b)



Note: (1) Drive while using a mobile phone for tasks that require holding the phone and looking at the screen continuously for more than 2 seconds, (2) Drive while undertaking a conversation on a mobile phone (either hands-free or handheld), (3) Drive while using music apps and changing songs, (4) Drive while looking at a GPS or map application, (5) Speed more than 10 km/h over the limit, (6) Drive after consuming 3 alcohol standard drinks, (7) Drive after smoking marijuana, and (8) Drive while having problems in maintaining wakefulness (Being close to falling asleep)

Figure 1. (a) Risk index of young drivers by country across the risky driving behaviours, and (b) Risk index of older drivers by country across the risky driving behaviours

Conclusions

- The AHP methodology is useful in prioritising risky driving behaviours using expert knowledge. Such information is required for decision making by policy makers worldwide (Oviedo-Trespalacios et al., 2015)
- The risk assessment suggests that driving distracted is one of the most critical issues in road safety today followed by fatigued driving. Specifically, visual-manual mobile phone interactions, such as texting and browsing, were associated with increased crash risk and safety-critical events. This is consistent with the literature (Oviedo-Trespalacios et al., 2016; Dingus et al., 2016).
- More distracting driving interventions are required as young drivers are overrepresented in the risk scores.

Acknowledgement

This research was funded primarily by the Fédération Internationale de l'Automobile (FIA) as part of its 2018 FIA Road Safety Grant Programme – Transformation.

References

Dingus, T. A., Guo, F., Lee, S., Antin, J. F., Perez, M., Buchanan-King, M., & Hankey, J. (2016). Driver crash risk factors and prevalence evaluation using naturalistic driving data. *Proceedings of the National Academy of Sciences*, *113*(10), 2636-2641.

Holgado, D., Maya-Jariego, I., Ramos, I., Palacio, J., Oviedo-Trespalacios, O., Romero-Mendoza, V., & Amar, J. (2014). Impact of child labor on academic performance: Evidence from the program “Edúcame Primero Colombia”. International journal of educational development, 34, 58-66.

Oviedo-Trespalacios, O., & Haworth, N. (2015). Developing a new index for comparing road safety maturity: case study of the ASEAN Community. *Journal of the Australasian College of Road Safety*, *26*(4), 45.

Oviedo-Trespalacios, O., Haque, M. M., King, M., & Washington, S. (2016). Understanding the impacts of mobile phone distraction on driving performance: A systematic review. *Transportation Research Part C: Emerging Technologies, 72*, 360-380. doi: 10.1016/j.trc.2016.10.006

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International journal of services sciences, 1*(1), 83-98.

SAFER-Senior: A situation awareness and escape route identification skills intervention improving the road safety of senior drivers

Bridie Scott-Parker[a,b], Bonnie Huang[a,b]

[a]Adolescent Risk Research Unit, Sunshine Coast Mind and Neuroscience – Thompson Institute;
[b] School of Social Sciences, University of the Sunshine Coast

Abstract

With the ageing of the global population, the overrepresentation of older drivers in road crash statistics has never been more important. A pilot of SAFER-Senior, a revision of SAFER which is accelerates the acquisition of situation awareness skills in young drivers – also overrepresesntated in road crash statistics across the globe – is underway on the Sunshine Coast. An analysis of data collected pre- and post-SAFER-Senior reveals that SAFER-Senior builds situation awareness skills in older drivers.

Background

In 2017, senior adults road users aged 75 years and older comprised 5.7% of the licensed population, but these road users contributed 14.2% of deaths and were involved in 9.7% of all deaths on Queensland roads in 2017 (TMR, 2017, 2019). Clearly there are very real road safety risks associated with ageing and driving, and these arguably arise from a combination of age-related factors. It is important to note, however, that older drivers have been found to make driving errors and to experience lapses in decision making, with such error and lapses contributing to crashes (e.g., Kay et al., 2012). Poor situation awareness has been found to contribute to crashes of young drivers (e.g., McDonald et al., 2015), and, given that older drivers experience overrepresentation in road crashes similar to young drivers and that recent research reveals that the Situation Awareness Fast-tracking including identifying Escape Routes (SAFER) intervention significantly improved the situation awareness skills of young learner drivers and their supervising parents (Scott-Parker et al., 2018), SAFER was revised for application with older drivers (SAFER-Senior). SAFER builds situation awareness in different contexts, including road users (e.g., other vehicles, pedestrians, animals), infrastructure (e.g., roundabouts, roadworks, school zones), and exposure (e.g., weather conditions, rain, dusk, dawn), with SAFER-Senior operationalising a talking-out-loud-while-driving strategy.

Method

One hundred and twenty participants aged 60 years and older (n=60 aged 60-74 years, Young Seniors, n=60 aged >74 years, Senior Seniors) were randomly allocated to Control and SAFER-Senior Intervention groups. Thirty participants from each age cohort received the SAFER-Senior Intervention after all participants completed the baseline simulated drive verbal commentary task ('task'). All participants completed the task 3 months' post baseline. Verbal commentary was transcribed verbatim and coded accordingly to Endsley's perception, comprehension, and projection (Endsley, 1995), and data is available for 100 drivers who completed both tasks.

Results

Intervention participants evidenced a statistically significant increase in the proportion of their verbal commentary pertaining to comprehension (p=.04) while their reduction in the proportion of the verbal commentary pertaining to perception approached statistical significance (p=.08). Intervention participants also evidenced a moderate increase in the proportion of their verbal commentary pertaining to projection – the indicator of optimal safety-critical SAS – while Control participants experienced a decline in the proportion of their commentary pertaining to projection.

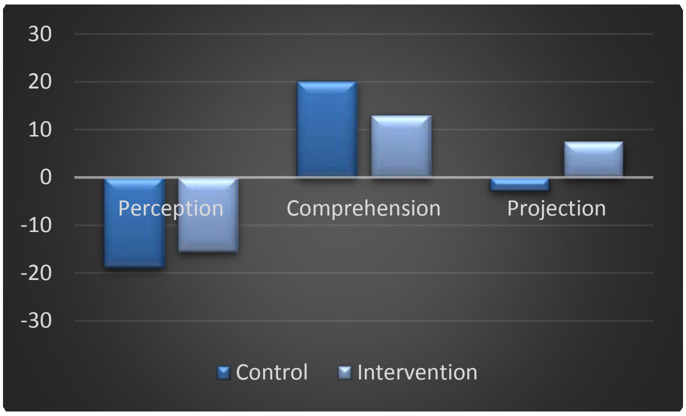


Figure 1: Changes in the average proportion of verbal commentary pertaining to perception, comprehension, and projection levels of situation awareness, from Baseline to Time 2, by study group (n=51 Control; n=49 Intervention)

Intervention and Control Young Seniors experienced a moderate increase in the proportion of their commentary pertaining to projection from Baseline to Time 1 (18.9%, 27.4%; 11.7%, 16.7%, respectively). Intervention Senior Seniors had an increase (5.9%, 12.5%) compared to Control Senior Seniors who had a reduction (24.9%, 14.3%) in the proportion of their commentary pertaining to projection, from Baseline to Time 1, a pattern that was repeated for female and male Intervention and Control participants.

Conclusion

The first longitudinal evaluation of SAFER-Senior suggests that it is an effective intervention in building safety-critical situation awareness skills in drivers aged 60 and older. The retention (and decay) of these skills will be monitored for the next 12 months as four further evaluations at 3-month intervals are completed.

References

Endsley, M. R. (1995). Toward a theory of situation awareness in dynamic systems. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 37*, 32-64.

Kay, L. G., Bundy, A. C., & Cheal, B. (2012). DriveSafe/DriveAware: A primising new off-road test to predict on-road performance. In *Driver behaviour and training: Human factors in road and rail transport*, L. Dorn, G. Matthews, & I. Glendon (Eds), Ashgate, London.

McDonald, C. C., Goodwin, A. H., Pradhan, A. K., Romoser, M. R. E., & Williams, A. F. (2015). A review of hazard anticipation training programs for young drivers. *Journal of Adolescent Health*, *57*, SA15-S23.

TMR. (2017). *Queensland current driver licences as at 30 June 2017*. Available at https://www.tmr.qld.gov.au/Safety/Transport-and-road-statistics/Licensing-statistics

TMR. (2019). *Queensland Weekly Road Toll Report No 1102. Fatalities Year to Date to Sunday 17 February 2019*. Available at https://www.tmr.qld.gov.au/Safety/Transport-and-road-statistics/Road-safety-statistics.aspx

Scott-Parker, B., Wilks, L., & Huang, B. (2018). Situation awareness fast-tracking, including identifying escape routes (SAFER): Evaluation of the impact of SAFER on learner driver situation awareness skills. *Transportation Research Record*, *2672*(33), 1-10.

Should we be talking about addiction when it comes to young drivers and smartphones?

Barry Watson[a], Ioni Lewis[a], Katherine M. White[b], Bonnie Ho[a], Sonali Nandavar[a], Oscar Oviedo-Trespalacios[a], Cassandra Gauld[c], Tim McLaren[d], Craig Newland[d], & Kate O'Donnell[d]

[a] Centre for Accident Research & Road Safety- Qld (CARRS-Q), Queensland University of Technology (QUT), Brisbane, Australia; [b] School of Psychology and Counselling, QUT, Brisbane, Australia, [c] School of Psychology, University of Newcastle, Newcastle, Australia; [d] Australian Automobile Association (AAA), Canberra, Australia

Abstract

A qualitative investigation involving 30 young drivers was undertaken to explore how they perceive their own and their peers' smartphone use, both in general and while driving. A particular aim of the study was to explore whether young people considered it appropriate to describe problematic smartphone use as an 'addiction'. The findings suggest that that illegal smartphone use while driving is perceived to be very widespread. However, while the participants acknowledge that the behavior is highly habitual, they don't tend to see it as 'addictive' in nature. The findings have important implications for the design of education messages and programs.

Background

Young drivers are over-represented in road crashes and driver distraction from smartphone use has been identified as a major contributing factor to such trauma (Oviedo-Trespalacios *et al*, 2016). An ongoing theme in the literature is the contention that some people are 'over-involved' or 'addicted' to their phones, which contributes to problematic use, both in general and while driving (Walsh *et al*, 2008; Billieux *et al*, 2015). However, it is unclear whether young people perceive problematic smartphone use as an 'addiction' and, thus, whether educational initiatives with this focus are likely to resonate with the target group. Consequently, the current study undertook an in-depth investigation of young people's perceptions about the nature and extent of their own and peers' smartphone use and the acceptablity of the term 'addiction' in the driving context.

Method

N = 30 drivers aged 17-25 years (13 males) participated in one of ten focus groups. The only other participation criteria was that they owned a smartphone. A $50 Coles/Myer gift card was provided to those who participated.

To guide the discussions, a semi-structured interview schedule was purposefully developed. Questions explored the nature and extent of participants' smart phone use in general and while driving. Participants' perceptions of the extent to which others' (their actions and beliefs) influence their smart phone use as well as their thoughts about whether they consider their own or others' behaviour an addiction was explored. Participants were asked whether they had ever tried to reduce their phone use at some stage and, if so, why and what strategies they had attempted to use. A professional transcriber transcribed the audio-recorded discussions. Findings were derived through a thematic analysis.

Results

There was general agreement among the participants that smartphone use while driving is very widespread (although knowledge of the relevant road rules was fragmentary). While it was acknowledged that the behavior is highly habitual, the participants didn't tend to see it as addictive in nature because:

- smartphone use serves a practical purpose for many people (eg. communicating with others; entertainment etc);
- the potential consequences do not seem as bad as for addictions like problematic gambling or substance abuse; and
- the behavior is not generally seen as problematic by most people they know.

While participants didn't appear to perceive their own smartphone use as being problematic, some reported taking steps to reduce their phone use, both in general and while driving. Strategies they reported using included deleting social media apps and/or increasing the physical distance between themselves and their smartphones.

In contrast, some participants did report knowing others whose smartphone use was problematic, both in their general life and while driving. In these cases, the participants didn't tend to attribute the other person's problematic use to the smartphone *per se*, but to their high level of engagement with social media.

Conclusion

The findings provide important insights to help inform the development of relevant content for education interventions targeting young adults and the issue of driver distraction from smartphones.

Acknowledgement

This research was funded primarily by the Fédération Internationale de l'Automobile (FIA) as part of its 2018 FIA Road Safety Grant Programme – Transformation.

References

Billieux, J., Philippot, P., Schmid, C., Maurage, P., De Mol, J., & Van der Linden, M. (2015). Is dysfunctional use of the mobile phone a behavioural addiction? confronting symptom-based versus process-based approaches. Clinical Psychology & Psychotherapy, 22(5), 460 -468. doi: 10.1002/cpp.1910

Oviedo-Trespalacios, O., Haque, M. M., King, M., & Washington, S. (2016). Understanding the impacts of mobile phone distraction on driving performance: A systematic review. *Transportation Research Part C: Emerging Technologies, 72*, 360-380. doi: 10.1016/j.trc.2016.10.006

Walsh, S. P., White, K. M., Hyde, M. K., & Watson, B. (2008). Dialling and driving: Factors influencing intentions to use a mobile phone while driving. *Accident Analysis and Prevention*, 40(6), 1893-1900. doi: 10.1016/j.aap.2008.07.005

Identifying the risks associated with automated vehicles across the system lifecycle

Gemma J. M. Read[a], Paul M. Salmon[a], Alison O'Brien[a], & Neville A. Stanton[b]

[a]Centre for Human Factors and Sociotechnical Systems, University of the Sunshine Coast, Maroochydore, QLD,
[b]Transportation Research Group, Civil, Maritime, Environmental Engineering & Science Unit, University of Southampton, Southampton, UK

Abstract

Advanced automated vehicles (AVs) are expected to enter the Australian road transport system imminently. This study aimed to conduct an initial proof of concept study to identify risks across the entire AV system lifecycle. The Networked-Hazard Analysis and Risk Management System method (NET-HARMS), a recently developed approach for systemic risk identification, was applied. The results map out the lifecycle for AVs, and identify a set of task and emergent risks, and concomitant risk control measures. The findings can assist to support road transport stakeholders to understand the systemic risks associated with the introduction of advanced AVs.

Background

While predictions vary, it has been suggested that advanced automated vehicles (AVs), that do not require human driver input into the driving task for at least part of the journey, are expected to enter the Australian road system from around 2020 (NTC, 2018). While automation will create safety and efficiency benefits, it also poses risks (Stanton & Marsden, 1996). For example, skill degradation can leave drivers unprepared to intervene in emergencies, software design failures can lie latent, and little is known about how AVs will interact with other road users (e.g. cyclists, pedestrians). Given that road transport as it stands today is a complex sociotechnical system (Larsson et al., 2010; Salmon et al., 2012; Salmon, Read & Stevens, 2016), it is suggested that systems-based methods can assist in identifying and managing the risks posed by these disruptive technologies.

Governments worldwide have begun to respond to the challenges. In Australia, a safety certification process has been adopted for the regulation of AVs which includes safety assessment criteria covering a range of requirements around design and validation processes, the human–machine interface, interaction with enforcement and emergency services, system upgrades, cybersecurity, training and education (NTC, 2018). The motivation for the current study was to provide further insights on what risks are associated with these various systemic factors, and how risks might combine in unanticipated ways.

Method

The Networked-Hazard Analysis and Risk Management System method (NET-HARMS; Dallat, Salmon & Goode, 2018) was applied. NET-HARMS is a methodology for systemic risk identification. It uses a four-step process:

1. Hierarchical Task Analysis (HTA) is applied to the system of interest. HTA describes the goals, tasks, operations and plans associated with the system.

2. A taxonomy for system risk assessment is applied to sub-tasks of the HTA. Credible risks for each sub-task are documented, along with risk control measures.

3. A task network is created of the sub-tasks from Step 2, defining relationships between sub-tasks (i.e. which are associated with, or dependent on one another).

4. Identification of emergent risks. Emergent risks are additional risks that arise because of interactions between risks identified during Step 2. This involves identifying risks that arise when a task is impacted by a risk that has occurred during a related task. The underlying principle around exploring linked tasks is that risks will interact and, if initial task risks identified are not managed appropriately, additional emergent risks arise.

Results

The HTA contains nine key high-level tasks that are undertaken in the road transport system – including design (of AVs, other vehicles and road infrastructure), testing and approval activities, operations (including incident response and enforcement), maintenance and upgrade (including software upgrade), and management of the road system overall (including setting of strategies, performance reporting and securing funding). Task and emergent risks were identified for sub-goals, along with potential risk control measures.

Conclusions

The findings from this study can support road transport stakeholders to understand the broad set of systemic risks facing the road transport system associated with the introduction of advanced AVs.

References

Dallat, C., Salmon, P. M., Goode, N. 2018. Identifying risks and emergent risks across sociotechnical systems: the NETworked hazard analysis and risk management system (NET-HARMS). *Theoretical Issues in Ergonomics Science, 19*(4), 456-482.

NTC. 2018. *Safety assurance for automated driving systems: Decision regulation impact statement*. Melbounrne: National Transport Commission.

Larsson, P., Dekker, S.W.A., Tingvall, C. 2010. The need for a systems theoryapproach to road safety. *Safety Science, 48*(9), 1167–1174.

Salmon, P.M., McClure, R., Stanton, N.A. 2012. Road transport in drift? Applyingcontemporary systems thinking to road safety. *Safety Science, 50*(9), 1829–1838.

Salmon, P. M. Read, G. J. M., Stevens, N. 2016. Who is in control of road safety? A STAMP control structure analysis of the road transport system in Queensland, Australia. *Accident Analysis & Prevention, 96*, 140-151.

Stanton, N. A., Marsden, P. 1996. From fly-by-wire to drive-by-wire: Safety implications of automation in vehicles. *Safety Science, 24*(1), 35-49.

Western Australian Drivers' Use Of And Attitudes Toward Advanced Driver Assistance Technologies

Matthew Govorko[a], Peter Palamara[a]

[a]Curtin-Monash Accident Research Centre (C-MARC), School of Public Health, Curtin University

Abstract

Drivers' use of and attitudes toward Advanced Driver Assist (ADA) technologies were investigated through a telephone survey involving 301 Western Australian drivers. Overall, drivers appeared to have high rates of use and favourable attitudes toward current ADA technologies. A high proportion of drivers agreed technologies such as Blind Spot Monitoring, Lane Keeping Assist and Autonomous Emergency Braking reduced their chance of crashing and helped them to be a safer driver. However, there were indications drivers had less than favourable attitudes toward some elements of ADA technologies, such as Lane Keeping Assist and Lane Departure Warning producing unnecessary or distracting alerts.

Background

Despite the known effectiveness of various Advanced Driver Assist (ADA) technologies to reduce crash involvement (Cicchino, 2017, 2018a, 2018b), there is evidence to suggest drivers do not always rate these technologies favourably and sometimes opt to disable or downgrade their functionality (Reagan, Cicchino, Kerfoot, & Weast, 2018). Consequently, the primary safety status of the vehicle and the driver's risk of crash involvement may be compromised. Therefore, a primary aim of this study was to investigate Western Australian drivers' knowledge, attitudes toward and use of ADA technologies.

Method

Between December 2018 and January 2019, a telephone survey was conducted involving 301 Western Australian drivers of vehicles with at least one of seven ADA technologies: Radar or Adaptive Cruise Control (ACC), Forward Collision Warning (FCW), Autonomous Emergency Braking (AEB), Lane Departure Warning (LDW), Lane Keeping Assist (LKA), Blind Spot Monitoring (BSM), and/or driver Attention Assist (AA). Information was collected on the vehicle most frequently driven and items were included to assess participants' knowledge, attitudes toward and use of their car's ADA technologies.

Results

Of the 301 drivers, the majority were male (n=180; 59.8%), located in metropolitan WA (n=257; 85.4%), and aged 50-59 years (n=135; 44.9%) or 40-49 years (n=89; 29.6%). The median age of the car most frequently driven was 3 years (range: ≤1 year to 15 years). The fitment of ADA technologies ranged from 19.9% (n=60) for AA to 73.4% (n=221) for FCW (Table 1).

The majority of drivers indicated they always had the ADA system switched on and unchanged from factory settings, ranging from 71.6% for LKA to 97.3% for BSM. Lane Keeping Assist had the highest percentage of drivers who mostly or always drove with the system switched off (13.4%), followed by LDW (10.3%).

Drivers appeared to have a positive attitude toward ADA technologies fitted to their car overall; for example, the majority of drivers thought BSM (94.5%), LDW (77.6%), LKA (76.1%) and FCW (72.4%) helped them to be a safer driver and ACC (87.2%) helped them keep a safe distance from the car in front. A high proportion of drivers agreed BSM can reduce their chances of colliding with another car in an adjacent lane (96.7%), LDW and LKA can reduce their chances of running off the road (86.8% and 86.6%, respectively), and AEB can reduce their chances of having a rear-end crash or colliding with another object (72.4%). However, there were indications that drivers had less than favourable attitudes toward some elements of ADA technologies: 20.9% disagreed FCW can reduce their chances of having a rear-end crash, over one-quarter thought LDW alerts and LKA can be distracting (28.2% and 26.9%, respectively), 29.9% agreed that LKA unnecessarily tried to move their car back into the lane, and 28.2% believed LDW produced false or unnecessary alerts.

Conclusions

Western Australian drivers appear to have high rates of use and favourable attitudes toward current ADA technologies. However, a significant proportion of drivers reported switching off their LKA and LDW thus exposing themselves to a higher risk of run-off road crashes.

Table 1. Driver knowledge regarding fitment of ADA technologies (n=301)

ADA Technology	**Response, n (%)**		
	My car is fitted with this feature	**My car is not fitted with this feature**	**I am unsure if my care is fitted with this feature**
Forward Collision Warning	221 (73.4%)	62 (20.6%)	18 (6.0%)
Autonomous Emergency Braking	141 (46.8%)	112 (37.2%)	48 (15.9%)
Adaptive Cruise Control	196 (65.1%)	83 (27.6%)	22 (7.3%)
Lane Departure Warning	174 (57.8%)	108 (35.9%)	19 (6.3%)
Lane Keeping Assist	67 (22.3%)	204 (67.8%)	30 (10%)
Blind Spot Monitoring	183 (60.8%)	96 (31.9%)	22 (7.3%)
Attention Assist	60 (19.9%)	202 (67.1%)	39 (13%)

References

Cicchino, J. B. (2017). Effectiveness of forward collision warning and autonomous emergency braking systems in reducing front-to-rear crash rates. *Accident Analysis & Prevention, 99*, 142-152.

Cicchino, J. B. (2018a). Effects of blind spot monitoring systems on police-reported lane-change crashes. *Traffic Injury Prevention, 19*(6), 615-622.

Cicchino, J. B. (2018b). Effects of lane departure warning on police-reported crash rates. *Journal of Safety Research, 66*, 61-70.

Reagan, I. J., Cicchino, J. B., Kerfoot, L. B., & Weast, R. A. (2018). Crash avoidance and driver assistance technologies – Are they used? *Transportation Research Part F: Traffic Psychology and Behaviour, 52*, 176-190.

"Car, will you drive my Baby?" - Community attitudes towards autonomous vehicles and associated technologies

Jodi Page-Smith[a], David Young[a] , Julie Young[b] and Jenny Castillo[b]

[a]Transport Accident Commission, [b]Ipsos

Abstract

While Automated Vehicle (AV) research and development can be tracked back to the 1920s, it is only in recent time that significant effort and milestones in technology have led to a belief that automated driving is possible. Driverless cars and new technologies have the potential to positively affect a significant proportion of road trauma (Austroads, 2017). However, adoption of this technology is highly dependent on obtaining the trust and confidence of the general public (Kaur & Rampersand, 2018). This study investigates the changes in community acceptance of AVs and associated technologies since 2014.

Background and Methods

More in-car, and between car and infrastructure technologies are becoming available, with vehicles getting closer to low levels of automation (Austroads, 2017). Since 2010, the TAC has conducted a regular survey of Victorian road users to determine the acceptability of a variety of driving and non-driving behaviours (for example - acceptability of low level speeding, acceptability of selling drugs). In 2014 and again in 2016, the TAC asked participants about their awareness of a number of new and existing vehicle technologies, and participants were also asked their opinion about AVs. In 2018, this research was replicated, with 1,509 participants were recruited via an online panel, with responses weighted back to the Victorian population by location, age and gender. Significance testing was completed and reported where appropriate.

Results

The proportion of drivers who either somewhat agreed or strongly agreed that they would be comfortable to let the car take on some aspects of the driving process is unchanged since 2014 (58%). However, the proportion of people who agreed that they would be comfortable in a car that would completely drive itself increased from 26% in 2014 to 30% in 2018. There was a slight increase in the number of people who thought self-driving cars would be good for older drivers (57% in 2018 compared to 54% in 2016), with older drivers (50%) themselves significantly *less* likely to agree[1].

Respondents were also asked about their attitudes and concerns around self-driving cars. Overall, participants in 2018 generally had less concerns about AVs than in previous years, however, concerns about technology failing remained constant at 74%; with older participants aged 60+ years of age the most concerned about technology failing (79% compared to 68% of 18-50 year old drivers).

[1] This result is statistically significantly different to 95% confidence

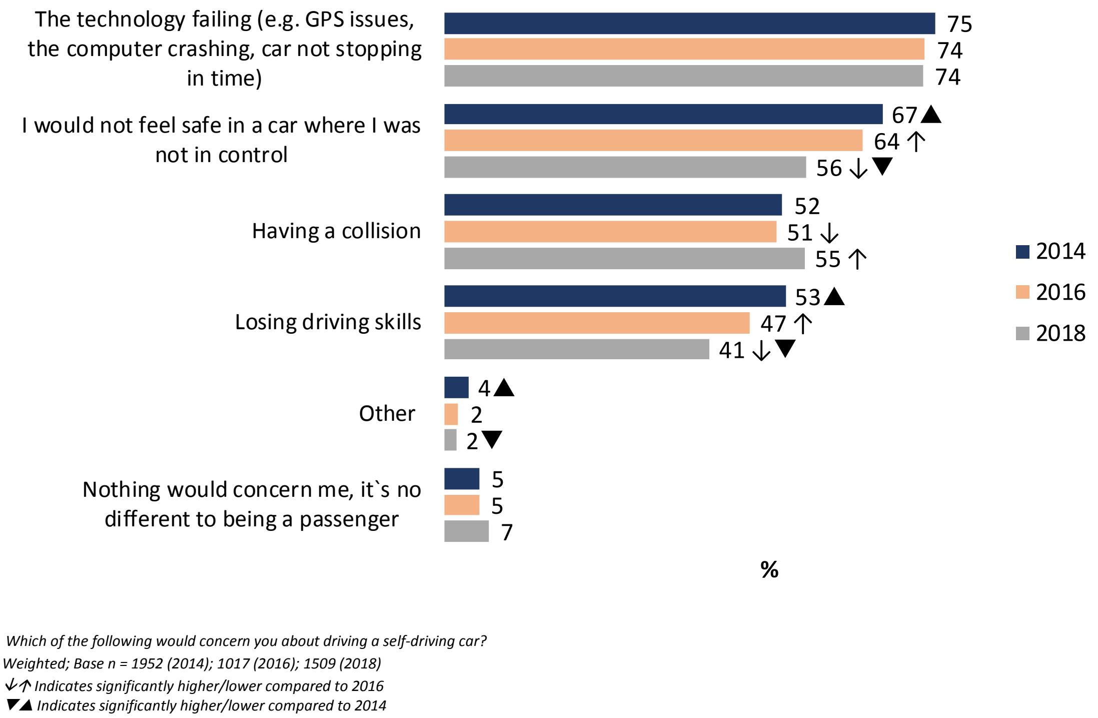


Figure 1: Concerns about self-driving cars – Total (%) – 2014, 2016 and 2018 comparisons

In 2018, participants were asked if they intended to look for a vehicle with a selection of new and upcoming technologies. Results were very consistent from the previous waves; albeit that the strength of the level of agreement increased slightly. Interest in Auto-Emergency Braking has increased from 48% in 2014, to 80% in 2018. Interestingly, while older drivers are least keen on the idea of an AV, they are consistently the most interested in the individual technologies.

Conclusion

Before the community will fully embrace AVs, they need to fully develop complete trust in the technology and confidence in the safety and reliability of all aspects of these systems. Fear of the technology failing is still the highest element of concern of Victorian Drivers. Over the last four years, Victorians have gradually increased their willingness to consider an AV as an option. In addition, their willingness to accept and embrace the individual technologies is still quite high. This indicates that, over time, and as they embrace increasingly more of the advanced vehicle technologies, Victorian drivers may be prepared to contemplate an AV.

References

Austroads (2017), Safety Benefits of Cooperative ITS and Automated Driving in Australia and New Zealand, Publication No: AP-R551-17

Kaur, K., & Rampersand, G. (2018). Trust in driverless cars: Investigating key factors influencing adoption of the driverless car. Journal of Engineering and Technology Management, 28, 87–96.

Barriers to road safety investment for Rural Local Governments

Adam Wilmot[a], Ryszard Gorell[a], Sam Mcleod[a]

[a]GHD, Australia

Abstract

State and federal funded road safety programs enable local governments to address road safety deficiencies on local roads. The framing of these programs is crucial to their successful take-up and implementation, as the criteria for project selection, nomination process and co-funding arrangements can unintentionally create institutional barriers that discourage rural Local Governments from submitting projects for consideration.

Investigation of the above has concluded that these unintended barriers can be addressed through performance, as opposed to crash-history based criteria, supported by targets and predictive models, and addressing the issue of proportionally higher costs faced by smaller local governments.

Background

In Western Australia, Local Governments can apply for funding to address road safety deficiencies on local roads through the State Black Spot Program (Main Roads WA, 2016). Fifty Percent of the total program funding is dedicated to local roads. There are two ways to nominate a project for funding through this program. The first is based on crash history where a location is considered if it meets a certain criteria based on number of crashes occurring during a five year period. The second – which is unique to Western Australia - is based on the results of a Road Safety Audit.

This work considers whether the structure of the program limits the ability of rural Local Governments to submit and implement projects and, if it does, what improvements could be made.

Method

The Program has been reviewed relation to the application of other similar programs. The location, cost and types of projects previously approved have been reviewed. Interviews have been held with key staff in selected rural local governments.

Results

The selection criteria (‘x’ number of crashes over a 5 year period) can leave smaller rural authorities with very few, if any, eligible sites. Whilst it is possible to submit projects based upon Road Safety Audits, local governments have to assess whether the expense is justified as the cost is only recovered if the submission is successful. Once approved, the State contributes two-thirds of the funds for the project while the local government applicant is required to make a one-third contribution.

The above costs are a challenge for rural local governments (especially those with a diminishing population) but can be addressed by linking the proportion of the cost contributed by the Local Government to their revenue base. Predictive models should also be developed to alleviate the need to commission road safety audits.

Changing the selection criteria to reflect the likely impact of the project on road trauma risk (i.e. a performance-based criteria) and the setting of an overall trauma reduction target should also be considered as this could lead to more effective projects.

The ability to prepare funding submissions is also limited by the availability of skilled practitioners. Support could be provided through the development of decision-making tools guiding practitioners to the most appropriate solutions for high risk locations on rural roads.

Conclusion

The existing funding mechanism in Western Australia structurally disadvantages rural local governments seeking to improve safety on their roads. Requirement for crash history (even though relative volumes are low), the high cost and resourcing challenges of Road Safety Audits, and program requirements for co-contributions from local governments with a limited revenue base is constraining efforts to reduce road trauma on high risk rural roads.

The above issues can be addressed through practical measures, which if implemented should encourage, rather than discourage rural Local Governments from submitting and implementing projects under the program.

References

Main Roads Western Australia, 2016. State Black Spot Program Development and Management Guidlines. Perth: Main Roads Western Australia and Western Austrailian Local Government Association.

Riding with children for transport and recreation: Carrier use and safety issues

Julie Hatfield[a], Roslyn G. Poulos[b],

[a]Transport and Road Safety Research Centre, The University of NSW, [b]School of Public Health and Community Medicine, The University of NSW

Abstract

Supporting children to bicycle may protect them against various inactivity-related diseases. Perceived safety may be a barrier to riding with children, particularly for transport. To extend the sparse research investigating adults' experience of relevant safety issues adult riders completed online questionnaires about riding with children for transport (n=66) and recreation (n=18). Questions focused on experience of safety issues associated with different types of child carrier and cycling infrastructure. Results suggest that initiatives to reduce interactions with traffic as well as traffic speed may help to move adults from riding with children for recreation only to riding for transport also.

Background

Supporting children to develop a habit of bicycle riding helps to protect them against a range of diseases associated with inactivity. 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. Perceived safety is likely to exert a strong influence on whether and how parents ride with children. However, there is little research investigating adults' experience of safety issues associated with riding with children. Carrier-use is not recorded in routinely collected crash data. Survey data from our Safer Cycling Study (Hatfield et al, under revision) offered some insights into hazards experienced by adults when riding with children, and suggested that different carrier types are associated with different risks. Tagalongs appeared to be overinvolved in safety-critical events. The present study sought to further explore adults' perceptions of the hazards of riding with children, particularly linked with different carrier types.

Method

Eligible participants were approached at events being hosted by City of Sydney Council for Bike Week (September 2017) and invited to participate in a study "about factors which influence the choice to bike ride with children, and the experience of riding with children".

Eligible participants were required to:

- be at least 18 years old, and
- be the parent/carer of a child who is between 0 and 11 years old, and
- ride a bicycle at least once every 6 months.

Potential participants were provided with a link to an online questionnaire that took 10 -15 mins to complete. Sixty-six riders responded to the questionnaire about riding with children for transport. Respondents were asked about their main reasons for choosing to ride with children for transport, their common destinations, and their preference for particular route characteristics. For each carrier-type a participant reported using, they were asked to list three positive aspects and three negative aspects (for carrying children) and ranked preference for different types of cycling facilities. Respondents described up to three hazards specific to riding with a child, indicated how many hours they had ridden with a child/children for transport in the last 12 months, the age of the children involved, and how many collisions or falls had occurred. Respondents provided details about the most serious of these crashes. Nineteen riders responded to a parallel questionnaire about riding with children for recreation.

Results

Respondents who rode with children *only* for recreation most commonly endorsed "risk of injury to child/ren" as a reason for not also riding with them for transport. Entertainment was the most commonly endorsed reason for riding with children for recreation, while convenience was the most commonly endorsed for riding with children for transport. The most common destination for transport riders was the park, followed by shops and schools.

"High safety" was the top priority for both groups of respondents (transport and recreation; see Figure 1). Transport riders identified specific priorities of "low interaction with motor vehicles", "low speed of motor vehicles", and to a somewhat lesser degree "physical separation from motor vehicles".

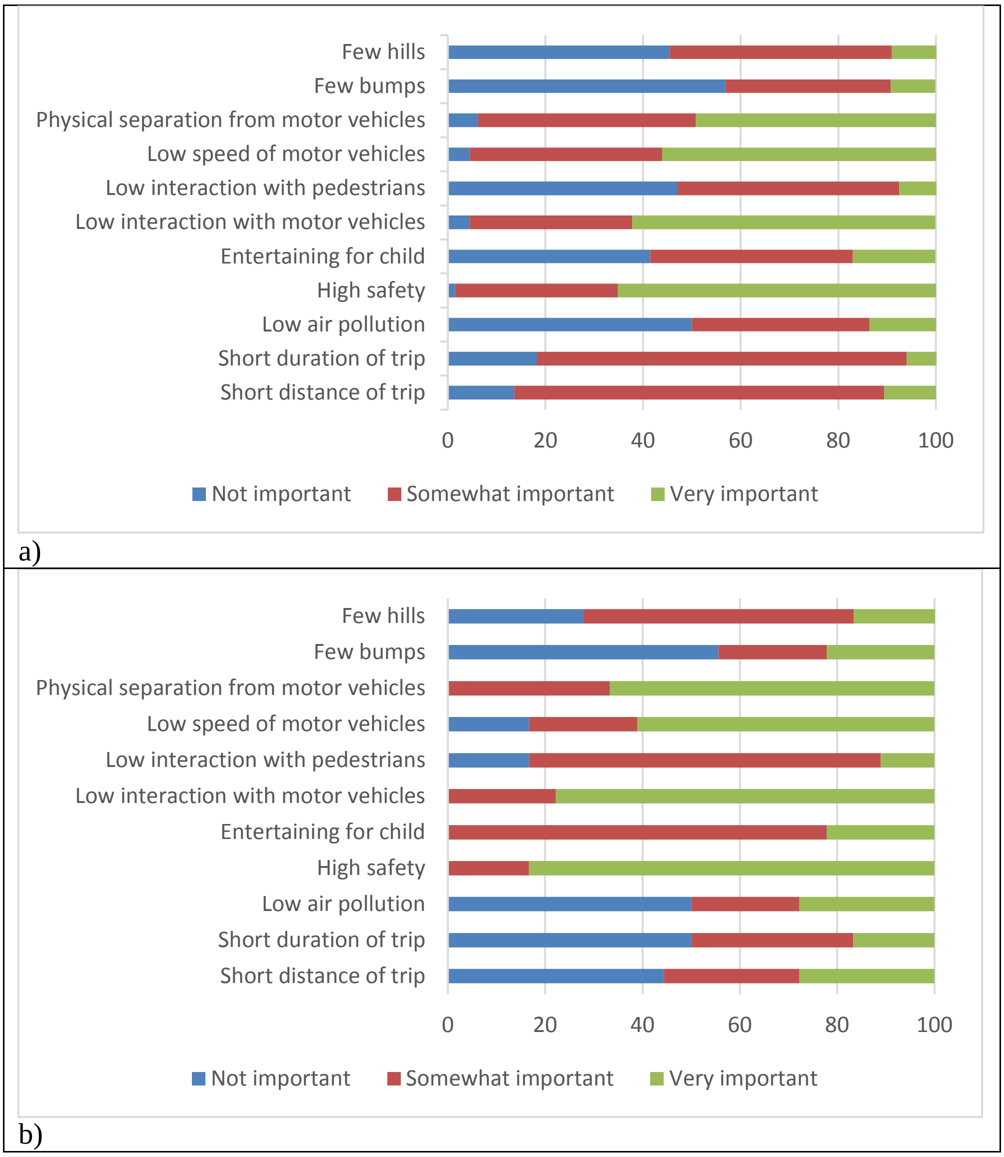


Figure 1: Percentage of respondents reporting each degree of importance of specific factors when choosing where to ride with children for a) transport and b) recreation

For both groups:

- rear-mounted seats were the most common form of carrier, followed by trailers.
- regardless of carrier type, bike-only paths were most preferred, and roads least preferred.

- key safety issues included changed handling due to increased weight, instability associated with child seats, and reduced maneuverability due to increased width and/or length of trailers and tagalongs.

Conclusions

Results suggest that addressing perceived safety (and ideally actual safety) may be important for moving adults from riding with children for recreation *only* to riding with them for transport *also*. Priorities for transport riders suggest the value of reducing interactions with traffic as well as traffic speeds. Cycling-specific infrastructure appears to be preferred to roads by both groups and would ideally serve key local destinations such as parks, shops and schools. Changes to design standards/guidelines for both carriers and facilities could improve safety.

References

Hatfield J, Murphy S, Poulos RG, Rissel C, Flack LK. (under revision). Safety aspects of riding with children: A survey of adult riders. *Accident Analysis and Prevention*

Australia’s second generational approach to roadside drug testing

Assistant Commissioner Michael Keating[a]

[a]Road Policing Command, Queensland Police Service

Abstract

Australia’s current model of roadside drug testing, based on principles of deterrence, is internationally recognised as the largest and most intensive drug driving enforcement program in the world. This paper considers the future direction of roadside drug testing in Australia by drawing upon key findings and recommendations from a report released in October 2018 by the National Drug Driving Working Group – “*Australia’s second generational approach to roadside drug testing*”. The report explores a range of critical issues which impact on Australia’s continued efforts to establish a best practice model for roadside drug testing, including the limitations of current drug testing technology, application and relevance of deterrence theory and testing of medications.

Background

Drug-impaired driving has been identified by the national Transport and Infrastructure Council (the Council) and senior police officials as a priority area within the road safety portfolio. The National Drug Driving Working Group (the Working Group) was established by the Council to collectively work towards the development of a national best practice model for roadside drug testing by utilising the knowledge, experience and resources of state governments and policing agencies. As part of its Terms of Reference, the Working Group is required to consider the following issues: cost-effective options for roadside drug testing; application of deterrence theory for drug driving enforcement; and engagement with industry and manufacturers to encourage the development of enhanced testing products to meet the changing needs of roadside drug testing in Australia. Australian law enforcement agencies use oral fluid testing to detect the presence of methylamphetamine, THC and MDMA in drivers. Most jurisdictions conduct further roadside and laboratory testing to confirm initial positive results.

Issues

Application of deterrence theory

In Australia, roadside drug testing operations have been in operation for at least 10 years with a focus on high visibility and high volume enforcement (Davey et al., 2017). Targeted operations have yielded a significant number of drug drivers but jurisdictions acknowledge the benefits in allocating resources to conduct broader testing with the aim of achieving general deterrence. Despite the dearth of Australian research into deterrence and drug driving, Australian jurisdictions have demonstrated success in roadside drug testing operations by utilising deterrence principles. This is also reflected in jurisdictions’ success with roadside breath testing operations.

Cost and efficiencies of drug testing products

Given the size and extent of Australia’s roadside drug testing program, stakeholders have raised concerns regarding the cost of testing kits and the time taken to conduct analysis. The current timeframes for roadside drug testing include: 1) standard roadside screening test (drug wipe) may take approximately 5 to 10 minutes to complete; 2) further roadside screening test for a positive result may take up to an hour to complete; and 3) laboratory testing to confirm roadside results may take at least 2 weeks (or longer) for a complete analysis. The Working Group identified two technology items that would significantly benefit the growth of the nation’s roadside testing program: 1) a roadside screening test that could be undertaken in less than a minute; and 2) a roadside evidentiary testing device. The development of these products requires jurisdictions to deal more proactively with industry and product manufacturers.

Medications and THC

Medications and the introduction of medicinal marijuana presents a complex issue with regards to drug testing and enforcement. The current method of oral fluid screening used in traditional roadside drug testing cannot be used to test drivers under the influence of medications. The Working Group acknowledged that further debate and consideration of other technological processes for testing may be required to address this issue.

Recommendations

The Working Group made 11 recommendations for consideration by Australian jurisdictions. The recommendations highlighted the following approaches:

a) Reinforce the value of deterrence theory (both general and specific deterrence) as an effective theoretical approach underpinning roadside drug testing programs.
b) Maintain the current approach of oral fluid screening as the most efficient method to test for drug presence.
c) Increase direct engagement with product manufacturers and distributers to pursue the development of a suitable roadside evidentiary testing device and improve jurisdictions' access to information about pricing of drug testing products across jurisdictions.
d) Maintain a watching brief on legislative developments for testing THC and medications and its impact on drug driving.
e) The Working Group to continue working towards the development of a national best practice model of roadside drug testing.

References

Davey, J., Armstrong, K., Freeman, J., Sheldrake, M., (2017). *Roadside Drug Testing Scoping Study: Final Report*. Canberra, Australia: Department of Infrastructure and Regional Development.

Does the Australian Bureau of Statistics Method of Travel to Work data accurately estimate commuter cycling in Australia?

Jake Olivier[a,b], Mahsa Esmaeilikia[a,b], Marilyn Johnson[c,d], Ben Beck[e], Raphael Grzebieta[b,f]

[a]School of Mathematics and Statistics, University of New South Wales, [b]Transport and Road Safety Research Centre, University of New South Wales, [c]Institute of Transport Studies, Faculty of Engineering, Monash University, Victoria, [d]Amy Gillett Foundation, Victoria, [e]Department of Epidemiology and Preventive Medicine, Monash University, Victoria, [f]Victorian Institute of Forensic Medicine, Monash University

Abstract

The Australian Census of Population and Housing includes a responder's Method of Travel to Work for Persons (MTWP) on Census Day. With some exceptions, responders can select multiple modes of transport. In Australia and overseas, this data is used to estimate mode share and the proportion of Australians who utilize various active transport modes. This is especially true for cycling as there are scant data sources for Australian cycling exposure. In this study, we will discuss the often not advertised limitations of this data and provide examples of when it has been misused. When some of these issues are addressed, the MTWP data indicates an inconsistent trend in bicycle travel both by overall count and mode share.

Background

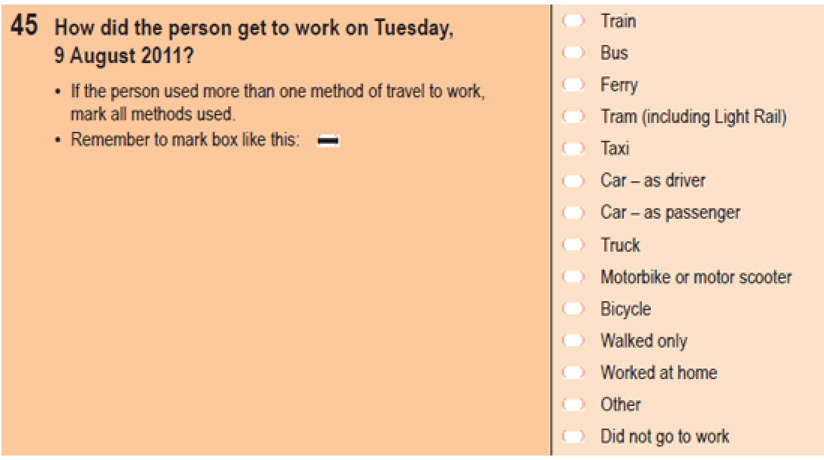
The Australian Bureau of Statistics (ABS) has collected data on the Method of Travel to Work for Persons (MTWP) since 1976 for a single day with observations occurring five years apart (ABS, 2017; Mees & Groenhart, 2012). The Census Day has varied from the end of June prior to the 1991 census and then to early August for all subsequent censuses (see Table 1).

Table 1. Australian Census Day (1976-2011)

Census Year	Census Day	Day of Week
1976	29 June	Tuesday
1981	29 June	Monday
1986	30 June	Monday
1991	6 August	Tuesday
1996	6 August	Tuesday
2001	7 August	Tuesday
2006	8 August	Tuesday
2011	9 August	Tuesday
2016	9 August	Tuesday

For the 2011 census, the question read "How did the person get to work on Tuesday, 9 August 2011." Responders can mark either train, bus, ferry, tram (including light rail), taxi, car – as driver, car – as passenger, truck, motorbike or motor scooter, bicycle, walked only, worked at home, other, or did not go to work. Multiple responses are allowed and recorded in the order written on the form. The responses "did not go to work", "worked at home", and "walked only" are not meant to be part of a multiple response. When this occurs, a single response is recorded with preference in the order they appear on the form. For example, someone responding with "did not go to work" and "walked only" is recorded as "did not go to work".

The MTWP data has been used to describe temporal patterns in Australian capital city commuter travel since 1976 (Mees, Sorupia & Stone, 2007; Mees & Groenhart, 2012). In these reports, cycling to work is considered negligible with the notable exception of Canberra.


45 How did the person get to work on Tuesday, 9 August 2011?

- If the person used more than one method of travel to work, mark all methods used.
- Remember to mark box like this:

- Train
- Bus
- Ferry
- Tram (including Light Rail)
- Taxi
- Car – as driver
- Car – as passenger
- Truck
- Motorbike or motor scooter
- Bicycle
- Walked only
- Worked at home
- Other
- Did not go to work

Figure 1. Question 45 from 2011 Census Household Form

On several occasions, the MTWP bicycle data has been used to advocate for the repeal of bicycle helmet legislation (BHL). Figure 2 includes examples from Wikipedia (2019), online news outlets (Alter, 2014; Rachele, Badland & Rissel, 2017), anti-helmet advocacy websites (Freestyle Cyclists, 2014; Gillham, 2019), and submissions to government inquiries (Clarke, 2015). In each instance, the message conveyed is that bicycle helmet legislation has deterred cycling in Australia.

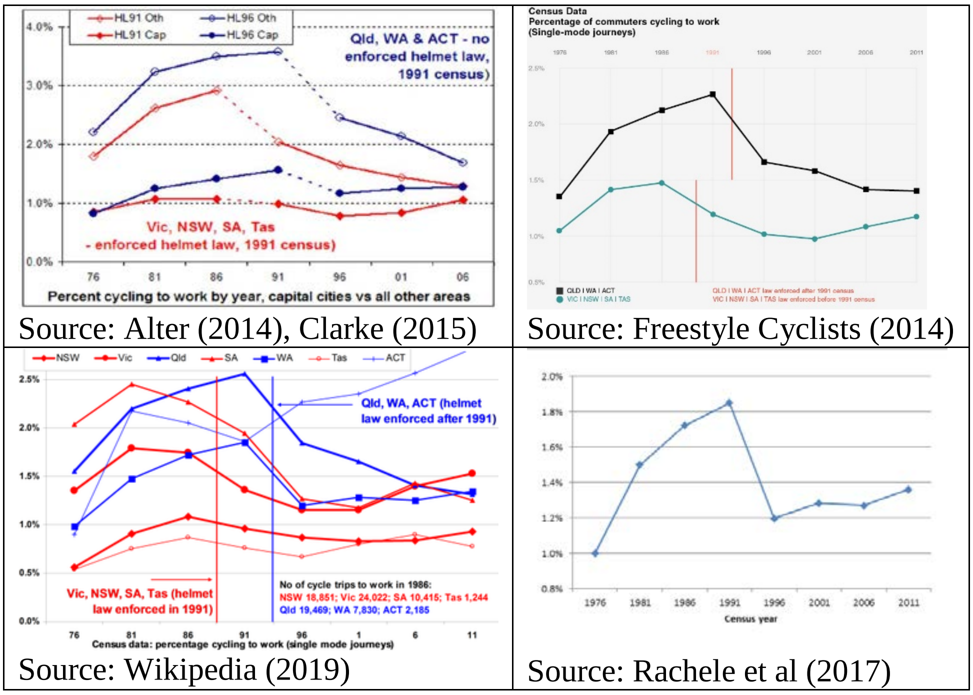


Figure 2. Examples of using MTWP data to advocate for repeal of Australian bicycle helmet legislation

The aim of this study is to highlight the often unreported weaknesses in the MTWP data and to assess the validity the MTWP bicycle data supports the claims bicycle helmet legislation deters cycling.

Weaknesses of MTWP data

Although often presented as yearly aggregated data, the MTWP data is collected for single days with repeated observations 5 years later. That is, from 1976-2016, nine days of data were collected and not 40 years' worth. The Census Day has always occurred in Australian winter when the weather is not always conducive to cycling, especially in southern, populous regions. The change in Census Day from late June to early August makes comparisons between the 1976-1986 and 1991-2016 censuses tenuous. The data collection (single days in winter) make it impossible to account for day of the week, monthly or seasonal variation. Further, the MTWP captures travel to work for adult Australians and, therefore, cannot be an accurate representation of all types of cycling.

Since MTWP allows for multiple response, it is not possible to identify a responder's "main mode" of travel (Olivier, Esmaeilikia & Grzebieta, 2018). For example, a person who rides their bicycle to a train station, travels on the train with their bicycle, and then cycles the remaining distance to work would always be recorded as "train, bicycle". This would be the same response for any trip where train and bicycle travel were combined irrespective of trip distance or time spent in either travel mode (e.g. ride from home to the train station and leave bicycle locked at the station). Some authors focus on those travelling by bicycle only (e.g., Gillham, 2019); however, this approach miscategorises those who combine cycling with other transport modes as non-cyclists.

The 1976 Census did not include a full enumeration or count (ABS, 2005a). Due to budgetary constraints, a full count was performed only on age, sex, marital status and birthplace (ABS, 2005b). For all other questions including MTWP, a 50% sample was processed, and a post-census assessment found undercounting was higher for the 1976 than previous ones. That is, it is unlikely the 1976 MTWP data is an accurate representation of those travelling to work on Census Day.

Travel modes using MTWP data is often represented as a proportion of those travelling to work on Census Day, often called modal share. Note the MTWP cannot be used as a measure of modal share in the strictest sense as not all trips are enumerated. Representing this data as a proportion can also hide temporal patterns. For example, the numbers of cyclists could increase from one Census Day to the next, but the mode share could decrease if increases were larger in other travel modes. In that case, a decline in mode share does not necessarily imply less cycling but could be interpreted as cycling mode share did not keep pace with other travel modes.

MTWP Data

MTWP data has been provided by the Australian Bureau of Statistics for years 1976-2001 while data for 2006 and 2011 was extracted from the ABS website. The 1976 data was excluded since only a 50% sample was counted.

As discussed, it is not possible to identify a responder's "main mode" of travel, while focusing on single mode travel miscategorises those involved in multimode travel. Since the purpose of this study is to assess changes in MTWP data relative to bicycle helmet legislation, transport modes were defined as using a bicycle for any leg of travel (Bicycle), walking only (Walking), the use of a bus, ferry, train or tram for any leg of travel except when a bicycle was used (Public Transport), and the use of a car or truck when neither a bicycle or public transport were used for any leg of travel (Vehicle). The total travellers exclude those who did not go to work, worked at home, or whose mode of travel was unknown.

Results

The MOTW data has been organised by state or territory since helmet laws were enacted at those levels (Esmaeilikia, Grzebieta & Olivier, 2018). The observed counts and mode share (% of total) are given in Figures 3 and 4.

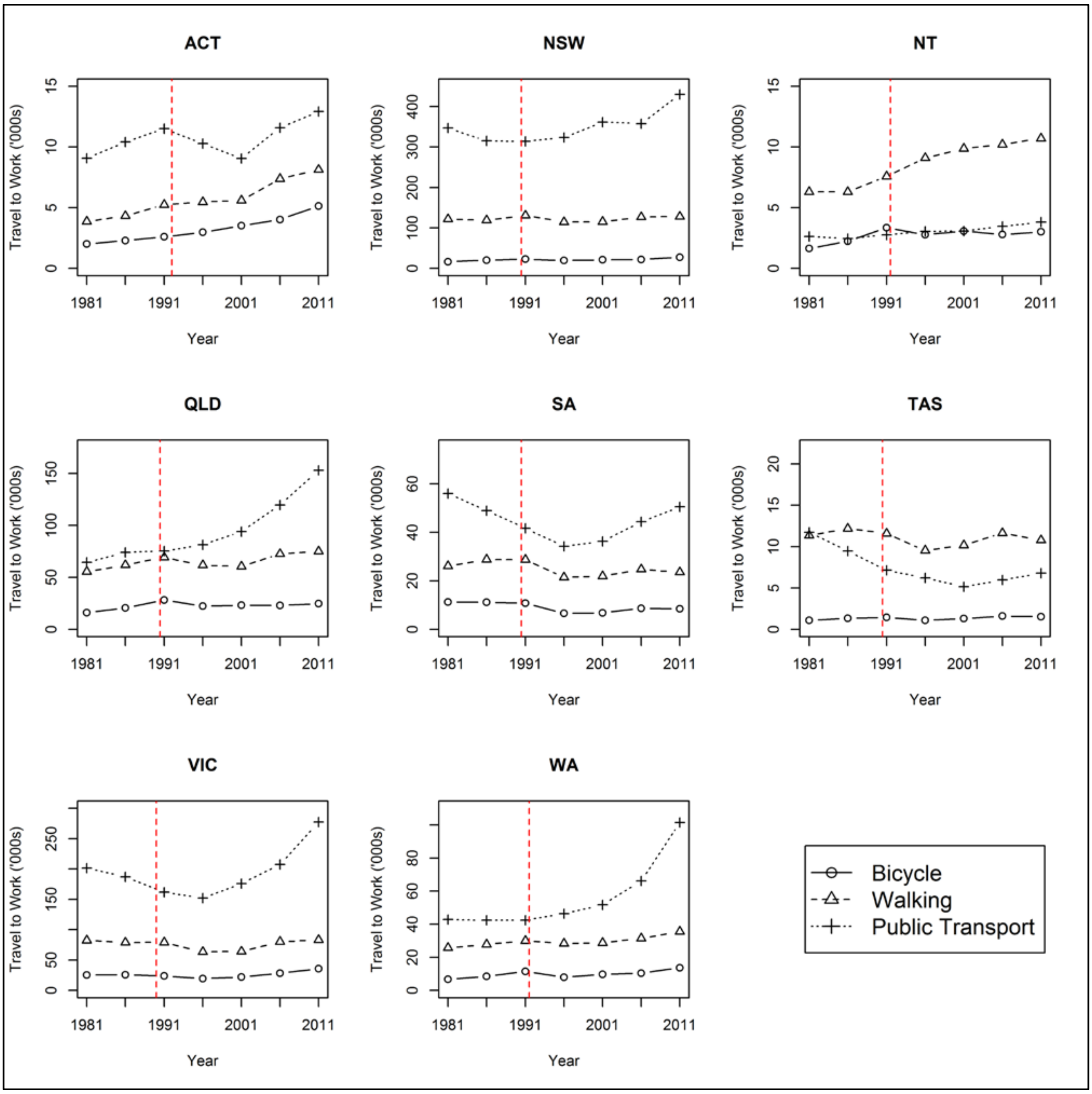


Figure 3. Number of responses to method of travel to work by active transport modes for Australian states and territories on Census Day (1981-2011)

There were increases in the numbers of responders cycling to work for the ACT, NSW, Queensland and Tasmania following BHL, while the counts were similar for South Australia and Victoria. There were observed reductions for the Northern Territory and Western Australia where each of these jurisdictions introduced BHL after the 1991 census date. This could be due to a general reduction in cycling across Australia as reductions were observed from the 1991 to 1996 censuses for all other jurisdictions except the ACT. Additionally, there were large increases in the use of public transportation since the 1996 census for many jurisdictions which could indicate a shifting among active transport modes.

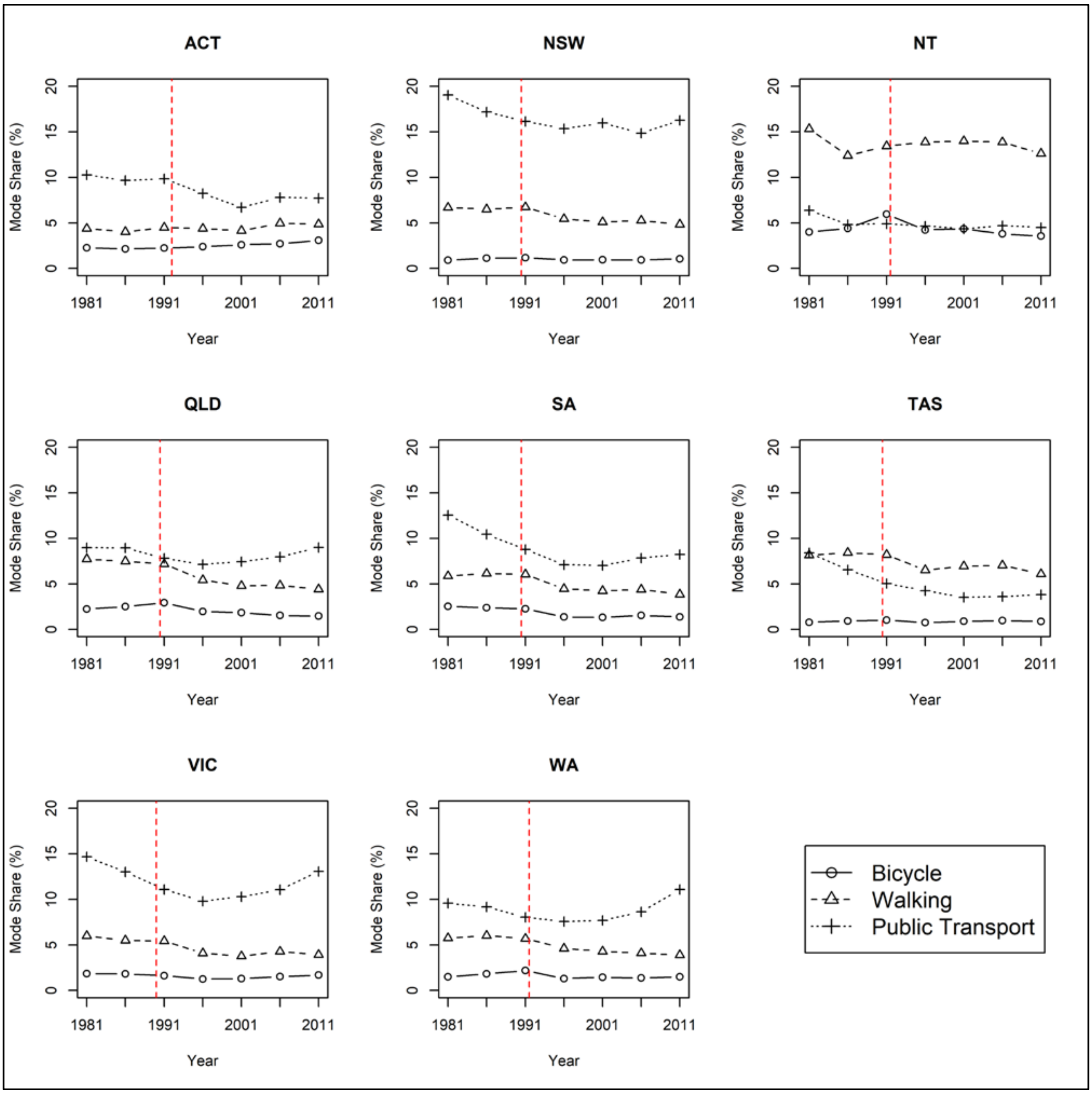


Figure 4. Mode share by active transport modes for Australian states and territories on Census Day (1981-2011)

The mode share for cycling to work shows a similar pattern following helmet legislation across Australia. Overall, the numbers who reported using a bicycle for travel to work prior to any helmet legislation was 92,517 in 1986 which increased to 104,470 in 1991 when most of Australia had helmet legislation. Cycling mode share increased slightly between these years as well from 1.74% to 1.84%.

Conclusions

The Australian Method of Travel to Work for Persons data is often used as an estimate of cycling mode share. The use of this data is problematic for several reasons including: (1) single day observations in winter five years apart, (2) month of data collection changed when bicycle helmet laws were introduced, (3) not possible to identify a primary travel mode, (4) the 1976 data was not a census, and (5) representing the data as a proportion can hide temporal patterns.

When some of these issues are addressed (elimination of 1976 data and all bicycle travel counted), the MTWP data indicates a mixture of increasing and decreasing bicycle travel on Census Days following the introduction of bicycle helmet laws. That is, there is no consistent pattern that is supportive of the claim bicycle helmet laws deter cycling in Australia.

References

Alter, L. (2014). More on why we shouldn't have mandatory helmet laws. Treehugger. Available at: https://www.treehugger.com/bikes/more-why-we-shouldnt-have-mandatory-helmet-laws.html (accessed: 27 February 2019)

Australian Bureau of Statistics. (2005a). The population census – A brief history. Available at: http://www.abs.gov.au/Ausstats/abs@.nsf/Previousproducts/1301.0Feature%20Article92005?opendocument&tabname=Summary&prodno=1301.0&issue=2005&num=&view= (accessed: 20 February 2019)

Australian Bureau of Statistics. (2005b). Annual Report 2004-05. ABS, Canberra.

Australian Bureau of Statistics. (2012). Method of travel to work. Available at: http://www.abs.gov.au/websitedbs/censushome.nsf/home/statementspersonmtwp?opendocument&navpos=430 (accessed: 20 February 2019)

Clarke, C.F. (2015). Evaluation of Australia's bicycle helmet laws. Submission to Australian Senate Inquiry into Personal Choice and Community Impacts. Available at: https://www.aph.gov.au/DocumentStore.ashx?id=2ec5092b-cebb-4368-92f3-55f751ee0483&subId=353785 (accessed: 27 February 2019)

Esmaeilikia, M., Grzebieta, R., Olivier, J. (2018). A systematic review of bicycle helmet laws enacted worldwide. Journal of the Australasian College of Road Safety, 29:30–38

Freestyle Cyclists. (2014). What happened when helmet laws were introduced? Available at: https://www.freestylecyclists.org/modal-share/ (accessed: 1 March 2019)

Gillham, C. (2019) Mandatory bike helmet laws: random facts. Available at: http://www.cycle-helmets.com/helmet_statistics.html (accessed: 27 February 2019)

Mees, P., Sorupia, E., Stone, J. (2007). Travel to work in Australian capital cities, 1976-2006: an analysis of census data. RMIT University.

Mees, P., Groenhart, L. (2012). Transport Policy at the Crossroads: Travel to work in Australian capital cities 1976–2011. RMIT University.

Olivier, J., Esmaeilikia, M., Grzebieta, R. (2018). Bicycle Helmets: Systematic Reviews on Legislation, Effects of Legislation on Cycling Exposure, and Risk Compensation. Swedish Transport Administration. Available at: https://www.trafikverket.se/resa-och-trafik/Trafiksakerhet/Din-sakerhet-pa-vagen/sakerhet_pa_cykel/om_cykelhjalmar/cykelhjalmslag-och-dess-paverkan-pa-cykling/ (accessed: 27 February 2019)

Rachele, J., Badland, H., Rissel, C. (2017) Mandatory bicycle helmet laws in Australia: is it time for a change? Croakey. Available at: https://croakey.org/mandatory-bicycle-helmet-laws-in-australia-is-it-time-for-a-change/ (accessed: 27 February 2019)

Wikipedia. (2018) Casco ciclista en Australia (English: Bicycle helmets in Australia). Available at: https://es.wikipedia.org/wiki/Casco_ciclista_en_Australia (accessed: 27 February 2019)

Community participation in road safety policy development and strategy planning

Teresa Williams

Road Safety Commission, Perth, Australia

Corresponding Author: Teresa Williams, Post Office Box 6348, East Perth WA 6892, teresa.williams@rsc.wa.gov.au, 08 6552 0808

Key Findings

- The scope of a WA whole-of-government approach to citizen engagement requires clarification;
- community participation in activities that has significant influence on decisions is different to the public being involved in decision-making; and
- of the initiatives reviewed, the International Association for Public Participation (IAP2) spectrum levels of *inform* and *consult* were prevalent.

Abstract

Public participation in Western Australian (WA) government policy development and strategy setting is not governed by a particular best practice model. The WA Service Priority Review *Working Together One Public Sector Delivering for WA*, released 2017, identified the need to build a public sector focussed on community needs and to develop a whole of government citizen engagement strategy for WA, including co-designing.

The Road Safety Commission (Commission) employs a diverse range of public participation and engagement initiatives. An initial step in preparing for development and introduction of a whole of government strategy review of the nature of public participation initiatives of the Commission. The review method was an analysis of five initiatives that provide reasonable representation of the Commission's public participation and engagement activities. For the purposes of this review, the International Association for Public Participation spectrum of public participation has been used to classify the activities.

This paper presents a summation of the review to date, communicating the current status and potential future direction of the Commission. Further work is required by the Commission.

Keywords

Community engagement; informing; consulting; involving; co-designing

Introduction

Public participation in Western Australian (WA) government policy development and strategy direction setting is not governed by a particular best practice model. The WA Auditor General's 2007 Report *Having your Say: Public Participation in Government Decision-Making*, noted that community consultation and public participation practices varied within and across agencies. The report recommended that agencies should build upon good practice examples. Whilst reference was made to the International Association for Public Participation (IAP2) model, no recommendation for adoption was made.

More recently the final report of the WA Service Priority Review *Working Together One Public Sector Delivering for WA*, released 2017, identified the need to build a public sector focussed on community needs. The report states that, since 2006 when the State's Citizenship Policy Unit was disbanded, commitment and prioritisation of engagement with the community by government agencies has diminished. It is also noted that whilst some jurisdictions, such as South Australia, Victoria, Tasmania, the Australian Capital Territory and New Zealand, have adopted whole-of-government approaches, no sector-wide approach for community engagement exists in WA. In the blueprint for reform associated with the Review, it is recommended that the quality of engagement with the community must improve to facilitate a more overt focus on community needs. The report discusses a process for co-designing services and identifies the development of a whole-of-government strategy for WA as an action item for the Department of the Premier and Cabinet.

Through the Organisation for Economic Co-operation and Development – International Transport Forum principles, shared responsibility is embedded in the road safety Safe System. As such, the consistency that should be gained from a whole-of-government approach to public participation and engagement in road safety policy development and strategy planning would be beneficial. In addition to the WA Road Safety Commission (Commission) there are ten other State government agencies directly involved in WA's road safety policy, legislative framework and community education. Several other agencies are less directly engaged through funding agreements and service delivery. In anticipation of the introduction of a whole-of-government approach, the current modes of community engagement and public participation used by the Commission should be reviewed.

The Commission has commenced this review to prepare for the introduction of a whole-of-government approach. A search of corporate records has not revealed any similar review by the Commission. This paper presents a summation of the review to date, communicating the current status and potential future direction of the Commission. The objective of this paper is to share what has been learnt from examining the community engagement and public participation approach of the Commission, which includes identifying potential work required to prepare for introduction of a whole-of-government approach. This work will be particularly important if the extent to which citizens participate in decision-making is to increase. This review does not provide an evaluation of the Commission's ability to adopt a whole of government approach.

Methods

For the purpose of reviewing the public participation and engagement activities of the Commission, the IAP2 public participation model has been used as the reference framework. IAP2 and the term "public participation" are used in authoritative reviews, such as the WA Auditor General's 2007 Report *Having your Say: Public Participation in Government Decision-Making* and the Victorian Auditor General 2017 report *Public Participation in Government Decision-Making*. In contrast, the WA Service Priority Review focussed on co-designing for services and favoured the term "citizen engagement". In the Service Priority Review report co-designing is differentiated from engagement methods such as consultation, but neither the characteristics of co-designing nor a spectrum of methodologies are presented for reference or consideration. Most of the publications referred to for this review used the terms community engagement and public participation interchangeably.

The IAP2 framework was considered a valid reference framework for the review as it has frequently been used for guides and frameworks developed by other States. Examples include the New South Wales Information and Privacy Commission 2018 *Charter for Public Participation – a guide to assist agencies and promote citizen engagement*, Victoria's Department of Health and Human Services 2018 *Public participation framework* and *Stakeholder engagement toolkit*, and the South Australian (SA) Government's Premier and Cabinet Circular 2019 *Best practice stakeholder engagement* and SA Department of Environment, Water and Natural Resources 2016 *Guidelines for developing a community engagement strategy*.

The stated intention of IAP2 is to improve the practice of public participation and enable development in understanding, use and effectiveness of approaches to public engagement and participation. The IAP2 spectrum, as shown in Table One, identifies levels of public participation in decision-making. It is important to understand the spectrum presents levels, not stages for participation.

Table 1. The International Association for Public Participation Spectrum

	Increasing impact on the decision ⇨				
	Inform	**Consult**	**Involve**	**Collaborate**	**Empower**
Public participation goal	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To provide the public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. We will seek feedback on drafts and proposals.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will work together with you to formulate solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

A sample of the Commission's public participation and engagement initiatives conducted during 2018 and 2019 were selected for review. The sample included initiatives that had well-defined objectives, different methodologies, and were conducted by different teams; for some external resources were procured. The sample represents the breadth of regular activities of the Commission.

Each of the initiatives reviewed was compared to the IAP2 spectrum levels of: inform; consult; involve; collaborate and empower. This resulted in classification of the initiatives according to the IAP2 spectrum. For the purposes of this review, co-designing of services is considered comparable to collaboration on the IAP2 spectrum.

The extent to which each initiative delivered the goals and promises on the IAP2 spectrum was assessed based on available documentation. One initiative has a multi-year duration and one remains incomplete, so outcomes of these are yet to be determined. These initiatives were classified based on the objectives, planned actions and intended use of the outcomes.

This is not an evaluation of the initiatives *per se*. The quality or effectiveness of the initiatives, or extent to which each has fulfilled the Commission's objectives or citizen expectations, are not included in the scope of this review. This review is limited to identifying the nature of activities with reference to the IAP2 spectrum.

Results

The review of initiatives revealed the following in relation to the level of citizen engagement, such as co-designing of services, signaled by the WA Service Priority Review *Working Together One Public Sector Delivering for WA*.

- The intended scope of a WA whole-of-government approach to citizen engagement needs to be defined so activities intended to be in-scope can be identified.
- Initiatives that have a high level of community engagement and influence, but do not involve the public in decision-making, are difficult to classify using the IAP2 spectrum.
- There is a difference between community participation in activities that may have significant influence on decisions and the involvement of the public in decision-making, which will need to be taken into account in any whole-of-government approach.
- A common language is required to consistently differentiate between community participation that influences decisions and community participation in decision-making.

Of the initiatives reviewed and classified with respect to the IAP2 public participation spectrum:

- two were classified as *consult*, with community input being obtained about alternatives and feedback being provided to the community about how the input influenced decisions;
- two were classified as *inform*, as the community were provided with information and to some extent kept informed; and
- one did not fit sufficiently within the requirements of the spectrum to be classified.

Discussion

This discussion is confined to the sample of five Commission initiatives included in the review. The sample represents different activities carried out in implementing the initiatives. As such, each initiative represents a group of like activities. There may be diversity within the groups of activities that could attract different classifications on the IAP2 spectrum. This diversity is noted when apparent.

The following discussion should be considered in the context of applying to a small sample, including:

- driver attitude and behaviour research;
- community perception of Commission engagement;
- motorcycle rider rules;

- fire and emergency volunteer exemption; and
- road safety leadership.

Within the broader desired outcome of improving road safety and reducing road trauma, each of the initiatives had specific objectives to be achieved. As a result, some of the initiatives included in the sample were found to have distinct stakeholder groups as the focus for the participation or engagement effort whilst others were very broad.

In the absence of any broadly agreed framework for public participation and engagement activities, the teams responsible for the initiatives used different approaches and practice principles. The public policy efforts of the Commission are guided by a documented framework intended to facilitate selection of public participation and engagement methods.

Routinely, the outcome of an initiative is used to determine the extent to which it was successful. Most often, if a policy position was determined or a legislative amendment was developed, these outcomes were used as evidence of success or failure. This approach emphasises the production of outcomes, rather than evaluating the public participation or community engagement process.
This review provides insight into the extent to which the Commission is ready to adopt a whole-of-government approach. Where the Commission may need to explore and adopt new methods as a result of the development and introduction of a whole of government approach will be better understood. Some work has commenced in this area.

Community attitude and behaviour research use for policy development

Activities to inform and raise awareness within the community account for the biggest single budget allocation within the Commission. The Commission's objective for these activities is to improve road safety outcomes and reduce road trauma through raising awareness and improving understanding of road safety issues amongst road users. Similar to other road safety agencies, this effort is guided by evidence.

Through the Commission's community education and awareness raising function, public participation is achieved through a range of attitude and behaviour surveys, workshops and community monitoring mechanisms. The primary objective for these activities is to develop evidence-based communication strategies. These activities provide several benefits, including furnishing the Commission with statistically relevant and reliable data that is used both to evaluate the effectiveness of community education and awareness raising efforts and to provide evidence to inform planning and development of future effort. Initiatives based on these activities have been included in the review because the information gathered enables consideration of community attitudes when developing policy, or when amending or devising legislation.

Driver segmentation

The *WA Driver Segmentation* research undertaken by Kantar Public market and social researchers on behalf of the Commission is included in the review because the results have been used for policy and legislation development and the setting of priorities. This research focusses on community attitudes and self-reported behaviour in relation to distractions (mobile phone use) while driving, speeding, drink driving and use of seatbelts. The research was carried out during 2015 and 2018.

The community engagement in this initiative was a survey of respondents. The 2015 research included a survey of 1,620 respondents and deep dive workshops to further explore attitudes and beliefs. The 2018 research was a 26-minute survey, eliciting 2,116 total responses. Based on WA's population for the respective years, both surveys had high confidence levels and low margins of error. The data was post-weighted to the known population parameters of WA drivers at the analysis stage using data sourced through licencing statistics from the WA Department of Transport. Whilst such details are important, it is the public participation aspect of this work which is relevant to the review.

The IAP2 spectrum is formed on the basis of the "...increasing impact on the decision..."; the decisions being those of the entity conducting the public participation, such as the Commission. Comparable to other research carried out on behalf of the Commission, the *WA Driver Segmentation* research does influence decision-making. The significance of the decisions made can vary. For example, the 2018 research revealed that compared to 2015 there had been no significant improvement in the attitudes and behaviours of hard-core speeders, but the research did find that the proportion of the population reporting that they never exceed speed limits had increased. The research outcomes informed decisions regarding potential amendments to legislation to address high-level speeding and recidivist drivers.

The *WA Driver Segmentation* research influences decision-making, informs the Commission regarding trends in the community, and assists in development of alternatives and solutions. The research has potential for significant influence on decision-making based on information gathered from the public. In comparison to the IAP2 spectrum, active public participation in the decision-making process does not occur. Subject to the extent to which the Commission provides information to the public, such as the problems discovered through the research, the *WA Driver Segmentation* research most closely aligns with *inform.* However, considering its design and purpose, it may be inappropriate to classify this initiative using the IAP2 spectrum.

The *inform* level has the goal of providing information to the public to increase understanding of decision-making and the promise is to keep the public informed. The Commission uses the *Driver Segmentation* research to influence decisions; however, generally the community are not informed about how the results of the *WA Driver Segmentation survey* are used for policy, legislation or the setting of priorities.

With respect to the *WA Driver Segmentation* research, the use of the IAP2 spectrum as the classification framework for the review has highlighted the need for further investigation regarding public participation and any potential whole-of-government approaches. There may be dimensions that distinguish public participation from community engagement, and differentiate deliberative influence on decision-making from participation in decision-making.

Community perception of the Commission's community engagement

With the Government and Public Sector Practice organisation's 2019 *Leaders' Report – Increasing trust through citizen engagement* as background, Kantar Public was engaged by the Commission to collect, analyse and present the public's perception of the Commission and road safety. This work is ongoing; it is discussed as a public participation activity due to the potential for the public to influence decisions about the future direction of the Commission. Public input will directly influence the Commission's development of community engagement for strategic communications, policy and strategy development.

The objective of the initiative is to identify opportunities to establish an action plan for better engagement. Whilst the initiative is ongoing, the work to date is relevant for this review. Essentially, the Commission is obtaining community input that will assist it in moving towards the intended whole-of-government approach for citizen participation and engagement. Kantar Public is using its proprietary *10C Citizen Engagement Framework*. This example also raises the issue of the public's influence on decisions in contrast to being involved in decision-making processes. Subject to the Commission providing information to the public about decisions made, the characteristics of *inform* level of the IAP2 spectrum may be present. The community can express concerns, although they are not presented with alternatives as required for a classification of *consult*.

Targeted stakeholder groups for legislation development

Community participation regularly occurs for policy and legislation development carried out by the Commission. Often, the range of options suitable for consideration by government is limited or largely known to the Commission. The nature and extent of public participation is considered in the context of the issue, the objectives of the government and the available evidence. Each public participation or engagement methodology is specifically developed for the target group and the issues involved. The public policy effort of the Commission is guided by a documented framework.

Road safety issues may be contentious when evidence regarding effective road safety measures does not reconcile with community expectations or beliefs. A divergence between what the community may want and what evidence indicates should be done requires careful management of public expectations in the policy or legislation development process. Some processes, for example road traffic penalty reviews, may not be appropriate for community participation.

Motorcycle rider policy development and potential legislation amendments

The Commission is presently implementing the *Western Australian Strategic Direction for Improving the Safety of Motorcyclists and Moped Riders 2016 – 2020*. Several actions are included in this document, including adoption of National initiatives like the motorcycle protective clothing rating tool. Most WA-specific actions were identified as issues that would benefit from public participation in the development of options or making of decisions about existing options. This policy development project is typical of such work by the Commission.

The public consultation process for the project which was focussed on rules regarding motorcycle rider use of bus lanes, lane filtering and lane splitting (motorcycling rules). A consultation paper was produced to elicit feedback from the community during June and July 2018. Initially 858 responses were received from the public. This sample of respondents was largely made up of motorcycle riders, with 803 out of the 858 respondents holding valid motorcycle rider licences. During September 2018 a supplementary process was conducted to obtain a more balanced sample of respondents. Consequently, an additional 373 respondents who did not hold motorcycle licences contributed to the overall public input of 1,231 responses. Given WA's population, a high confidence level with a low margin of error should have been achieved. However, the bias within the original set of public submissions highlighted the need for the Commission to strengthen consultation methodologies to mitigate the likelihood of such scenarios.

Inviting community participation for this policy development, and any potential legislation development or amendment process, required the Commission to make a commitment to reflect community concerns or aspirations in the decisions made. Motorcycle rider associations and advocates were keenly interested in the outcomes of the public consultation process, with expectations being amplified as a consequence. The general community is supportive of some of the changes, which will assist in meeting the expectations of the motorcycle riders, and not supportive of others. The latter requires the Commission to ensure motorcycle riders are provided with adequate feedback to understand how broad public input has influenced the outcomes.

The characteristics of the *consult* level of the IAP2 spectrum are clearly evident in the consultation process about motorcyle rules. Clear alternatives were provided for consideration, as required by the *consult* public participation goal. The *consult* promise to listen, acknowledge and provide feedback about the influence of public input upon the decision are all identifiable characteristics of this process.

This initiative does not reflect the characteristics of the higher levels on the IAP2 spectrum. The promise of the *involve* level requires public input to be reflected in alternatives developed, whereas in this initiative the alternatives were developed without such public input. Similarly, the public participation goal and promise for *collaborate* includes public participation in the development of alternatives and solutions. These characteristics were not evident. This reinforces the classification of the public consultation process about motorcycle as *consult*.

The classification of *consult* undoubtedly comes as no suprise to those involved in public policy development. Public policy development has customarily involved processes identified as consultation, often with consultation or options papers being produced to elicit public comment. The various public participation reports, frameworks and guides developed and implemented by other jurisdictions and agencies indicate an intention to employ greater innovation in public participation for policy development. The WA Service Priority Review *Working Together One Public Sector Delivering for WA* signals the direction that is likely to be taken with the WA whole-of-government public participation or community engagement approach. It discusses the opportunity for government to "...embed ways to include community viewpoints in decision-making, policy development and service design."

This review is intended to provide insight into the current status of the Commission in relation to implementing such reforms. Based on the status of the Commission, greater public involvement in decision-making will be required to achieve a higher level on the IAP2 spectrum. The public policy consultation process for motorcycle rules demonstrates the need to investigate innovations in public participation and engagement in public policy development in order to be better positioned for implementation of any whole-of-government approach.

Fire and emergency volunteers potential legislation amendment

The need to reconsider an exemption for fire and emergency volunteers from a zero-blood alcohol limit when driving vehicles of 22.5 tonnes or more was identified. This work was very narrowly focussed, did not require the development of additional alternatives or solutions as the exemption was either required or not, and involved a very distinct group within the community. The initiative is representative of similar specific legislative changes that may arise as consequential amendments, discovered as part of another legislative review process or may result from an event that raises concern regarding the adequacy of existing legislation.

The Commission had the ability to identify every fire and emergency volunteer organisation that would be affected by the exemption. Therefore, a very targeted process was developed and conducted early 2019. The process included writing to all affected organisations describing the exemption, its application and how it originated, and inviting written submissions regarding potential repeal of the exemption. To increase certainty of participation, all relevant local governments were also provided with the material and invitation to comment. This approach was taken because, based on anecdotal information, in regional areas most local governments employ some fire and emergency volunteers or there is an ongoing relationship between the local government and the volunteer organisations.

Gaining input from the fire and emergency volunteer organisations and the local governments was intended to inform the Commission's analysis as to whether the zero-blood alcohol limit exemption was required. A follow-up workshop was conducted with respondents to communicate the results of the survey, discuss the Commission's proposal and clarify any matters of concern. The approach demonstrated many of the characteristics of the IAP2 spectrum level *consult.*

Similar to the process for motorcycle rules, participation of the public was clearly defined to provide feedback about specific, limited alternatives. The characteristics required for this initiative to be classified as an IAP2 spectrum level of *involve* or *collaborate*, are not met. Primarily, both these levels require a promise of public input being reflected in the alternatives developed, or in the development of alternatives and solutions. This supports a classification of this public consultation process as *consult*.

Investigation of the most contemporary approaches to public participation and engagement in legislative development and amendment is required. A greater understanding of the opportunities and limitations will inform how existing processes might be modified or redesigned.

Notably, this review has not identified any policy or legislative review initiatives that demonstrate the characteristics of *empower* on the IAP2 spectrum. The nature and extent of decisions that could be delegated to the public as envisaged by the IAP2 level of *empower* would need careful consideration. A decision about the zero-blood alcohol limit exemption for fire and emergency volunteers might be a candidate as it is a matter with a low level of complexity, the breadth of impact within the community is narrow and the potential risks are readily mitigated. However, providing such a narrow scope for public participation may not be in the spirit of what is intended for the *empower* level on the IAP2 spectrum.

Road safety leadership for local government and industry

The Commission hosted the Monash University Accident Research Center (MUARC) to conduct an Executive Road Safety Leadership Programme in WA once during June 2018 and again during June 2019. The objective was to improve the level of road safety knowledge and understanding of leaders within multiple sectors of the community and establish networks for collaboration across sectors. The Commission invited people from various sectors in WA with the intention of engaging individuals and organisations who can influence within the community and their respective sectors to participate. Participants came from various geographical regions of WA and both cohorts had diverse representation including: industry, State and local government, not-for-profit organisations, and tertiary education institutions.

The programme included a road safety leadership challenge that requires organised groups to work together during the programme and for several months afterwards. The challenge concludes with each of the groups presenting their findings and recommendations at a follow-up session, which for the 2018 event was attended by the WA Minister for Road Safety.

The Executive Road Safety Leadership Programme actively engages participants, encouraging high level participation in a road safety activity. However, the participants' engagement is not in a decision-making process. The programme is intended to foster a shift in thinking by the participants and motivate them to be road safety leaders within the community. This includes cultivating their ability to influence and improve road safety strategies and policies within their respective sectors and organisations.

The Executive Road Safety Leadership Programme is recognised by the Commission, participants and stakeholders as highly engaging. The programme enables participants to hone their ability to contribute to improving road safety outcomes within their communities and sectors, and to foster cultural change for WA. Whilst a significant and highly valued activity contributing to the Commission's engagement efforts, the decision-making element in the public participation goals and promises of the IAP2 spectrum indicates that it may not be classifiable as a public participation activity. This activity aims to influence the decisions and actions made in other sectors, for the good of the community.

As noted above, the terms community engagement and public participation are used interchangably in many of the referenced publications. The WA Service Priority Review *Working Together One Public Sector Delivering for WA* used the term engagement and did not articulate any interpretation of this as being different from participation or limited to engagement for decision-making. The Government of SA's Department of Environment, Water and Natural Resources *Guidelines for developing a community engagement strategy* define community engagement as "...any process or interaction used to occupy the attention and efforts of a community, including ... community participation in activities." The Guidelines also provide a definition for community participation in decisions and explains that community participation may be a part of community engagement.

The Executive Road Safety Leadership Programme does not have the characteristic of participation in decision-making. However, as an activity in which the community participates, the broader definition provided in the SA's Department of Environment, Water and Natural Resources *Guidelines for developing a community engagement strategy* could be applicable. In the context of this review, the Executive Road Safety Leadership Programme reinforces the need for the Commission to gain an understanding of any whole-of-government approach for community engagement, in particular the nature of activities that will be included.

Conclusions

The review of initiatives has provided insight into the public participation and engagement activities of the Commission. It has mainly assessed the initiatives as being in the IAP2 public participation levels with lower degrees of impact on decisions resulting from public involvement in the decision-making process.

The review process, including the classification of activities using the IAP2 spectrum, prompts reconsideration of the Commission's public participation activities. Some activities, such as the community perception and monitoring research, may have significant influence on decisions. Such activities elicit information from the community which subsequently influences policy and legislative development and amendment; however, they do not directly involve the community in the decision-making process. On the other hand, the Executive Road Safety Leadership Programme has a high level of community engagement, but does not involve the public in the Commission's decision-making. Ideally, it influences decision making in other sectors. The programme serves an important purpose of educating and joining forces with the community.

Further work will be required by the Commission if it is to proactively adopt any whole-of-government approach for citizen engagement. Compared to the level and nature of citizen engagement discussed in the WA Service Priority Review, the Commission will need to maximise the information and opportunity which should be derived from the research being carried out by Kantar Public using their *10C Citizen Engagement Framework*. In addition, work is required to establish common language and definitions for public participation and community engagement if any whole-of-government approach is to be adopted. Other activities need to be explored by the Commission to achieve the higher levels of public participation in decision making.

Acknowledgements

The author would like to thank Ms Susan Nulsen BASc and MSc (Guelph Canada) for proof-reading. Also, for provision of material regarding the work of their teams in the Road Safety Commission; Ms Melissa Watts and Mr Roger Farley.

Due recognition is given to the International Association for Public Participation (IAP2) as the source and the custodian of the intellectual knowledge of the IAP2 spectrum.

Due recognition is given to Kantar Public as the source and owners of the proprietary tool 10Cs framework.

The Monash University Accident Research Centre is acknowledged as the owners of the intellectual property of the Executive Road Safety Leadership Programme.

References

Government of South Australia Department of Environment, Water and Natural Resources (2016) Guidelines for developing a community engagement strategy. Retrieved from https://www.iap2.org.au/Tenant/C0000004/00000001/files/News/DEWNR%20guidelines%20for%20developing%20comm%20engagement%20strategy%20June%202016.pdf

Government of South Australia Premier and Cabinet Circular (2019) Best Practice Stakeholder Engagement. Retrieved at https://www.dpc.sa.gov.au/resources-and-publications/premier-and-cabinet-circulars/DPC-Circular-Best-Practice-Community-and-Stakeholder-Engagement.pdf

New South Wales Information and Privacy Commission (2018) Charter for Public Participation – a guide to assist agencies and promote citizen engagement. Retrieved at https://www.ipc.nsw.gov.au/sites/default/files/file_manager/Charter_for_Public_Participation_a_guide_to_assist_agencies_and_promote_citizen_engagement_June2018.pdf

Victoria State Government Department of Health and Human Services (2018) Public Participation Framework and Stakeholder Engagement Toolkit. Retrieved at https://dhhs.vic.gov.au/publications/stakeholder-engagement-and-public-participation-framework-and-toolkit

Victoria State Government Office of the Auditor General (2017) Public Participation in Government Decision-Making. Retrieved at https://www.audit.vic.gov.au/sites/default/files/20170510-PP-Decision-Making.pdf

Western Australian Government Department of the Premier and Cabinet (2017) Working Together: One public sector delivering for WA – Service Priority Review Final Report to the Western Australian Government. Retrieved at https://www.dpc.wa.gov.au/ProjectsandSpecialEvents/ServicePriorityReview/Documents/SPR_Report_FINAL-5-Dec.pdf

Western Australian Government Office of the Auditor General (2007) Having Your Say: Public Participation in Government Decision-Making. Retrieved at https://audit.wa.gov.au/media/having-your-say-public-participation-in-government-decision-making/

Older driver resilience levels and self-reported driving-related abilities, perceptions, and practices over five years

Renée M. St. Louis[ab], Sjaan Koppel[a], Lisa J. Molnar[b], Marilyn Di Stefano[c], Peteris Darzins[d], Morris Odell[e], Michel Bédard[f], Nadia Mullen[f], Holly Tuokko[g], Anita Myers[h], Shawn Marshall[i], & Judith L. Charlton[a]

[a]Monash University Accident Research Centre, [b]University of Michigan Transportation Research Institute, [c]La Trobe University, Australia, [d]Eastern Health Clinical School, Monash University, Australia, [e]Victorian Institute of Forensic Medicine, Australia, [f]Lakehead University, Canada, [g]University of Victoria, Canada, [h]University of Waterloo, Canada, [i]Ottawa Hospital Research Institute

Abstract

This study investigated resilience scores for drivers aged 75 years and older at two points in time, approximately five years apart (Time 1: Male: 67.2%; Mean age=81.6 years, SD=3.3, Range=76.0-90.0; Time 2: Male: 67.1%, Mean age=85.3 years, SD=3.0, Range=81.0-94.0). Participants completed a range of self-reported driving-related questionnaires and a resilience scale. Data for a subset of 125 Ozcandrive participants completing the resilience scale at both Time 1 and Time 2 were analysed. Results show a significant increase in resilience across the two time points, and increasing strength of associations between resilience and self-reported driving-related abilities, perceptions, and practices.

Background

Resilience is "the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress" (American Psychological Association, 2019, para. 4). As people age into older adulthood, they are more likely to experience events that may impact their driving, such as age-related cognitive and functional declines, serious illness, or disability. The ability of an individual to bounce back from adversity may influence driving behavior. This study investigated whether resilience of older drivers changes over time, and if relationships between resilience, gender, and self-reported driving-related abilities, perceptions, and practices remain stable or change.

Method

Participants were from the Candrive/Ozcandrive study, a 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, health/functional performance assessments, and self-reported information on driving-related abilities, perceptions, and practices (Marshall et al., 2013). Analyses are presented from a subset of Ozcandrive participants (n=125) from Australia who completed a resilience scale at two time points approximately five years apart, as well as self-reported driving-related measures. Participants were primarily male (67.2%) with a mean age of 81.6 years (SD=3.3, Range=76.0-90.0) at Time 1.

Resilience: measured using the 14-item Resilience Scale. Scores range 14-98, with higher scores indicating higher resilience (Wagnild, 2009).

Driving comfort: measured using the 13-item daytime (DCS-D) and 16-item nighttime (DCS-N) Driving Comfort Scales. Scores range 0-100, with higher scores indicating greater driving comfort (Blanchard, Myers & Porter, 2010; MacDonald, Myers & Blanchard, 2008).

Perceived driving abilities: measured using the 15-item Perceived Driving Abilities (PDA) scale. Scores range 0-45, with higher scores indicating more positive perceptions of driving abilities (Blanchard et al., 2010; MacDonald et al., 2008).

Driving practices: measured using the 14-item Situational Driving Frequency (SDF) and 20-item Situational Driving Avoidance (SDA) scales. SDF scores range 0-56, with higher scores indicating driving more often in challenging situations. SDA scores range 0-19, with higher scores indicating greater avoidance (MacDonald et al., 2008; Myers et al., 2008).

Results

Resilience increased significantly from Time 1 (Median=82.0, IQR=71.5-87.0, Range=52-98) to Time 2 (Median=84.0, IQR=77.0-89.0, Range=38-98; $z=-2.9$, $p<.01$). Females had significantly higher resilience than males at Time 1 (Median: 84.0/81.0, $U=2.3$, $p=.02$) and Time 2 (Median: 86.5/82.0, $U=2.1$, $p=.03$). There was a significant increase in resilience of males over time ($z=-2.9$, $p<.01$), There was no significant increase for females and no differences by age.

Table 1 shows self-reported driving-related measures across five years and correlations with resilience. Although scores of driving comfort and perceptions of driving abilities significantly decreased between Time 1 and Time 2, the strength of association between resilience scores and these measures increased.

Table 1. Self-reported driving measures and correlations with resilience at Times 1 and 2.

Self-reported driving-related measures	Time 1		Time 2		Change between Times 1 & 2	
	Mean (SD) Median (IQR)	Correlation (r_s)	Mean (SD) Median (IQR)	Correlation (r_s)	Wilcoxon Z	p-value
DCS – D (Max = 100)	78.3 (13.9) 80.8 (69.2-86.5)	.16	75.9 (14.9)** 78.8 (67.3-86.5)	.27**	2.4	.02
DCS – N (Max = 100)	70.7 (18.3) 71.9 (57.8-84.4)	.17	66.9 (20.8)** 70.3 (53.1-81.3)	.24**	2.7	.01
PDA (Max = 45)	34.4 (6.2) 36.0 (30.0-39.0)	.29**	32.7 (6.6)** 33.0 (28.0-38.0)	.34**	3.8	<.01
SDF (Max = 56)	33.7 (6.6) 34.0 (30.0-38.0)	.17	31.4 (6.6)** 32.0 (26.0-35.0)	-.02	5.4	<.01
SDA (Max = 19)	5.0 (3.4) 4.0 (2.0-7.0)	-.09	5.4 (4.2)** 5.0 (2.0-8.0)	-.14	-4.7	<.01

**p<.01

Conclusion

These findings suggest a significant and increasingly stronger relationship between older drivers' resilience and driving-related abilities, perceptions and practices over time. Preliminary support for the value of resilience is encouraging given evidence that people have the capacity to increase their resilience. Higher levels of driving comfort and positive perceptions of driving abilities in those with higher resilience may contribute to more confidence in driving, thereby extending safe mobility.

References

American Psychological Association. (2019). The Road to Resilience. Accessed from http://www.apa.org/helpcenter/road-resilience.aspx on February 15, 2019.

Blanchard, R., Myers, A., & Porter, M. (2010). Correspondence between self-reported and objective measures of driving exposure and patterns in older drivers. *Accident Analysis & Prevention, 42*(2), 523–529.

MacDonald, L., Myers, A., & Blanchard, R. (2008). Correspondence among older drivers' perceptions, abilities, and behaviors. *Topics in Geriatric Rehabilitation, 24*(3), 239–252.

Marshall, S.C., Man-Son-Hing, M., Bedard, M., Charlton, J., Gagnon, S., Gelinas, I., Koppel, S., Korner-Bitensky, N., Langford, J., Mazer, B., & Myers, A. (2013). Protocol for Candrive II/Ozcandrive, a multicentre prospective older driver cohort study. *Accident Analysis & Prevention*, *61*, 245-252.

Myers, A., Paradis, J., & Blanchard, R. (2008). Conceptualizing and measuring confidence in older drivers: Development of the Day and Night Driving Comfort Scales. *Archives of Physical Medicine & Rehabilitation, 89*(4), 630–640.

Wagnild, G. (2009). The Resilience Scale User's Guide. Worden, MT: Resilience Center.

The development of an enforcement campaign with the *Towards Zero* framework

Samantha Patterson (Campaign Manager, Public Education, TAC)

Abstract

The Transport Accident Commission (TAC) in partnership with Victoria Police required a new enforcement campaign that fit within the new *Towards Zero* framework. The TAC worked with a creative advertising agency to develop the creative concepts, tested them amongst the community and utilised Victoria Police's valuable enforcement and crash data to inform the media buying strategy and placement. The process resulted in the successful development of a new campaign and positive community and stakeholder outcomes.

Background

The overarching target of Victoria's *Towards Zero Road Safety Strategy and Action Plan*[1] (Towards Zero) is to reduce the number of fatalities on Victorian roads to fewer than 200, and serious injuries by fifteen per cent by 2020.

The risk of being caught by police is one of the strongest motivators for behavioural change in road safety. And enforcement coupled with communications has a far stronger affect than enforcement on its own.

Since the introduction of *Towards Zero* the way the TAC communicates and educates the community has shifted. There is now a particular emphasis on road safety being a shared responsibility and specifically for enforcement, the focus is that it's about protection, not punishment.

Objective

Working in partnership with Victoria Police to develop a campaign targeting – drink driving, speeding and distracted driving. The long term objectives were:

1. Increasing the perception of police presence on the roads
2. Maintaining the support of Victorians who agree that Victoria Police help keep them safe on the roads and minimise the perceptions of "revenue raising", and
3. Decreasing the proportion of people who self-report that they travel above the speed limit, above the BAC limit or hold their mobile phones while driving.

Method

Creative development and testing

The TAC and its creative advertising agency developed four different creative concepts, all aligning with the 'protection' brief. Each concept was tested with the community with the target audience to determine the preferred approach.

This process ensured the concept aligned with the brief, objectives and *Towards* Zero tone and approach. The concept – *Think of us before you drive* – deters risky behaviour before it happens by encouraging people to consider the presence of Victoria Police on the roads each time they drive.

This concept was then used to create the final suite of advertising material such as TV, radio, newspaper, digital and outdoor billboard advertising.

Campaign implementation

TAC's geo-spatial tool was utilised to determine the best locations and times to display the advertising material. The tool, built in partnership with Victoria Police, maps out the locations and times where enforcement and crashes have occurred for key road safety issues. Using this knowledge allowed for the most appropriate messaging to be shown in the right locations. For example outdoor billboard advertising around distracted driving was placed in areas identified as high risk for that behaviour and bespoke digital advertising was designed to specifically target regional areas focusing on the most concerning issue.

Outcome

Following this involved process a new enforcement campaign was successfully developed within the *Towards Zero* framework. Community and stakeholder feedback was positive and steps have been made to help shift community belief that enforcement is primarily about protection, not punishment.

Initial results reveal that the majority (80%) of Victorians agree that the police keep our roads safe and almost eight in ten (78%) agree that seeing police on the roads makes them feel safer and believe that police play an important role in reducing fatal crashes (79%).

References

[1]https://www.towardszero.vic.gov.au/__data/assets/pdf_file/0010/183556/STU_0206_RS_STRATEGY_2016_web.pdf

Are Declines or Delays in Youth Driver Licensing Evident in New South Wales or Queensland?

Teresa Senserrick[a], Victor Siskind[a], Angela Watson[a]

[a] Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology (QUT), Australia

Abstract

Declining driver licensing rates or delays in licensure among youth have been reported in several countries in recent years, including in Europe and North America, as well as in Australia. It has been argued this could be due to tougher graduated licensing systems. The current research aims to explore whether such declines or delays are evident New South Wales and Queensland. The focus is on licensing trends pre and post July 2007 for those aged younger than 25 years versus older, given both states introduced significant licensing reforms at this time, with some exemptions applying from age 25.

Background

Declines or delays in driver licensing among youth have been reported in several countries in recent years. Across Europe and North America, this includes, for example, Canada, Germany, Norway, Sweden, the United Kingdom and the United States (Sivak & Schoettle, 2012; van Dender & Clever, 2013).

In Australia, declines in licensure rates in Victoria (VIC) have also been reported at previous Australasian Road Safety Conferences (Wundersitz, Bailey, Rafferty, Baldock & Smith, 2015; Wundersitz, Bailey & Thompson, 2018) and also earlier for New South Wales (NSW; Raimond & Milthorpe, 2010). In Wundersitz et al (2018), it also was reported that, across 2014-2016 in VIC, females were less likely to be licensed, both in the youngest (18-24 years) and older age groups explored.

Opinions on this phenomena include beliefs there is less interest in licensing among millennials as they are now more interested in staying connected with peers via social media platforms. However, others argue that tougher graduated licensing systems make licensing less appealing or less accessible or, alternatively, that young people delay licensure until such time that onerous requirements (such as 100-120 logbook hours) or restrictions (such as passenger limits) no longer apply.

The current research aims to explore whether declines or delays in obtaining driver licenses are evident among young people in NSW and Queensland (QLD). Trends will be examined over several years, with particular attention to any notable changes at the time that significant graduated licensing reforms were introduced in both states; effective 1 July 2007. The age focus will be similar to the Victorian research, although commencing younger since the minimum age for provisional licensure is 17 years in both NSW and QLD (compared to 18 years in VIC). Analyses also will explore trends by gender.

Data sources and analyses

We plan to explore historical and recently obtained records on annual numbers of new NSW and QLD driver licences by age, gender and licence type (learner, provisional, open) from 2003 to 2017. Trends in licensing rates will be explored by age group based on Australia Bureau of Statistics population statistics. The youngest age group of interest is 17-24 years, the age range that most graduated licensing requirements and restrictions apply (with some variations over time that will be documented in the full paper). Matching the number of years, the next age cohort will be 25-32 years; although age 25 will be of particular interest in relation to easing of licensing restrictions. We will also include older groupings to account for other potential system-wide influences on licensing trends over the study period.

Concluding comment

These analyses will explore potential trends in licensure rates among young males and females of eligible age in NSW and QLD and identify if any substantial changes appear to coincide with changes in the graduated licensing systems in these states. The results will have implications for understanding a potential wider role of graduated licensing system in reducing young driver road trauma, but might also have implications for other modes of travel.

References

Eksler, V., Lasarre, S., Thomas, I., 2008. Regional analysis of road mortality in Europe. Public Health 122, 826–837.

Raimond, T. & Milthorpe, F. (2010). Why are young people driving less? Trends in licence-holding and travel behaviour. In Proceedings of Australasian Transport Research Forum, 29 September – 1 October, Canberra.

Sivak & Schoettle, 2012; Sivak, M. & Schoettle, B. (2012). Recent changes in the age composition of drivers in 15 countries. Traffic Injury Prevention, 13(2), 126-132.

van Dender K., & Clever, M. (2013) Recent Trends in Car Usage in Advanced Economies–Slower Growth Ahead? International Transport Forum Discussion Paper 2013-09. Paris: OECD.

Wundersitz, L., Bailey, T., Rafferty, S., Baldock, M., Smith, R. (2015). Are young adults' choice of travel mode changing? Proceedings of the 2015 Australasian Road Safety Conference 14 - 16 October, Gold Coast, Australia.

Wundersitz, L., Bailey, T., Thompson, J. (2018). Are young adults' licensing rates still declining? Proceedings of the 2018 Australasian Road Safety Conference 3 – 5 October 2018, Sydney, Australia

Safe System for Universities: linking graduate knowledge with industry best-practice

Chris Stokes[a], Wayne Moon[b], Jeremy Woolley[a], Johan Strandroth[b], Niclas Johansson[c]

[a]Centre for Automotive Research, University of Adelaide, [b]Safe System Road Infrastructure Program, VicRoads, [c]New Zealand Transport Agency

Abstract

Safe System represents long-established best-practice in road safety internationally, in Australia and in New Zealand. However, there has been limited success in implementing Safe System policy into practice. While Safe System theory is taught at some Australian universities, there are currently no consistent means of formal education before professionals enter the workforce, leading to a discrepancy between graduate engineer knowledge and industry best-practice. The Safe System for Universities (SS4U) project provides a means for consistent education of Safe System theory at a tertiary level. SS4U is designed for self-learning and a curriculum and material to teach Safe System within existing courses.

Background

The Safe System philosophy, adopted in many countries and underpinning Australian and New Zealand road safety strategy, represents long-established best-practice in road safety. Despite good intentions throughout the industry, there remains a gap between Safe System policy and its implementation at a practical level (Woolley and Crozier 2018). This "implementation failure" is being observed as a gap between the Safe System philosophy that we aspire to and the real-world outcomes that we achieve.

The Safe System is currently industry led with no consistent means of formal education before professionals enter the workforce: there exists a lack of Safe System understanding by those on the coal-face of road industry practice, especially in areas outside of the silo of road safety. While the Safe System is taught as part of road transportation engineering courses within some Australian Universities (pers comm Dr Ashim Debnath and authors), this appears to be the exception to a curriculum in which Safe System theory is largely absent. This lack of formal training is being felt within the road transportation industry as a discrepancy between graduate engineer knowledge and industry best-practice. Furthermore, there are gaps in Safe System knowledge, and we will rely on well-informed future graduates to solve these knowledge gaps.

Safe System for Universities

SS4U is an initiative of the TAC/VicRoads Safe System Road Infrastructure Program (SSRIP) being developed with the expertise of the Centre for Automotive Safety Research, University of Adelaide (CASR), and in collaboration with the New Zealand Transport Agency (NZTA). The SS4U curriculum guideline is being developed as a guideline for the learning and teaching of Safe System philosophy, theory and practice at both an introductory level for first year engineering students, and a more advanced level for students undertaking study in road transportation engineering. Through not currently integrated, SS4U is also being flagged as a learning tool for polytechnical and post-graduate students.

The learning outcomes on which the curriculum guideline content is based were developed in consultation with industry experts, through workshops held at VicRoads and feedback thereafter. The main aspects of the learning outcomes are for students to:

- Recognise/critically analyse the Safe System and its associated objectives
- Recognise/critically analyse the moral and ethical principles that underpin the Safe System
- Demonstrate/critically analyse why and how harm occurs and the need for a Safe System to eliminate harm
- Differentiate between Safe System aligned and non-aligned design and operation of a road transportation system
- Identify and evaluate the functionality of primary and supporting Safe System design and operation solutions
- Explain the purposes and demonstrate the limitations of current design guides and standards
- Apply Safe System tools for identifying problems and evaluating solutions
- Explain the role of a Safe System within a future road transport system
- Identify where and why resistance to the Safe System may arise
- Recognise risk aversion culture and explain the accompanying legal liability issues.

SS4U consists of four modules with educational material being developed for each module. This material consists of concise lecture slides (termed "snippets") and example assessment pieces (Figure 1). It is designed as stand-alone, self-learning-oriented material for implementation into existing courses where additional topic capacity is limited. This format was developed following discussions with senior teaching academics (pers comm Ms Bernadette Foley and Dr Tom Goldfinch).

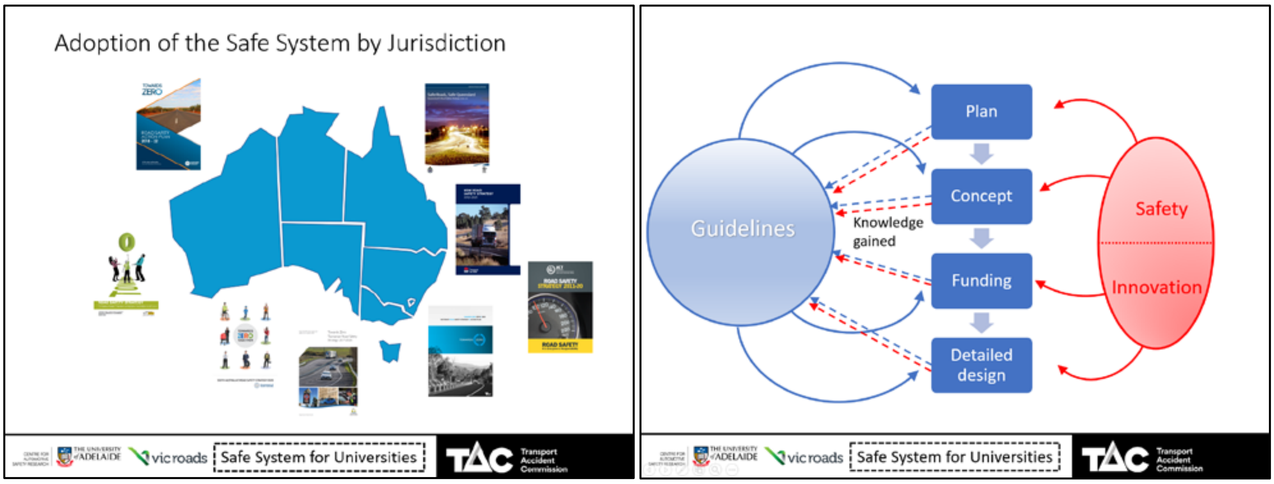


Figure 1. Example snippet material being developed for the Safe System for Universities project

Conclusions

SS4U has been conceived as a means for providing consistent learning and teaching information for undergraduate engineering studies. This, once established, will help to provide all road authorities and industry with the capability and capacity to bring our nations closer to achieving zero harm on our roads.

References

Woolley, J., Crozier, J. (2018). Inquiry into the National Road Safety Strategy 2011-2020. Australia.

Introducing Rural Intersection Advanced Warning Signs in Western Australia: A collaborative forward planning approach

Adam Wilmot[a], Sam McLeod[a], Shanelle McDonald[a], Brendon Wiseman[b], Aimee Wescombe[a]

[a]GHD, [b]Main Roads WA

Abstract

Emergent road safety treatments can pose a number of implementation challenges for road agencies. While there are strong incentives to accelerate the use of new treatments, institutional barriers can also constrain their introduction, and teething problems can temper the perceived success of pilot projects. These challenges have the potential to delay our achievement of zero road death and serious injury.

We profile recent research and policy development to support the introduction of Rural Intersection Activated Warning Signs (RIAWS) in Western Australia. We contrast the significant benefits of this approach against problems which arose during the introduction of other innovative safety treatments.

Background

Rural Intersection Advanced Warning Signs (RIAWS) display a temporary lower legal speed limit on a through road while a vehicle preparing to perform a conflicting movement is detected (Mackie et. al. 2015).

Similar technology has been installed or trailed in Sweden, the United Kingdom, and New Zealand. Examples are now being trialed by some Australian jurisdictions, including in Victoria and in South Australia. Typically, RIAWS are deployed at locations where full reconfiguration of an intersection is not immediately practicable due to cost constraints.

Main Roads has secured funding from the Western Australian Road Safety Commission to deploy up to five systems in regional WA. As part of this, GHD worked with Main Roads to develop *RIAWS Policy Guidelines, RIAWS Concept of Operation* and other supporting documents. This process involved step-wise development of policy and technical documents through consultation with a broad set of Main Roads internal stakeholders.

Method

A literature review of RIAWS and related technologies was conducted. This review obtained both published research, current policies, informal comments and insights, and draft versions of RIAWS related documentation from other jurisdictions. In parallel with the literature review, engagement with stakeholders within Main Roads was conducted by the project team. This included interviews with key regional offices and technical managers, and more formal discussions focused on the review of working documents drafted by the project team.

Discussion

Many concerns about the potential success of RIAWS deployment recurred throughout the engagement. In particular, concerns were raised about driver comprehension and compliance, legal enforceability, system durability and maintainability, behavior and performance, and the potential for RIAWS to be deployed at inappropriate locations at the demand of external stakeholders.

Through review of literature and research, the project team were able to inform and progress these conversations, and relate learnings and policy approaches from other jurisdictions to orient discussions toward how to progress document definition. For instance, criteria established by the NZTA (2015) for site selection were adapted and incorporated into the policy document, revised to suit Western Australian conditions following discussions with key regional staff. The project team were able to adopt an iterative research and engagement approach to ensure the development of the policy addressed internal stakeholder concerns and practical operational needs, through translation of learnings from interstate and overseas. For instance, the project team were able to consider likely signage activation patterns against existing traffic data by drawing on the reviews of RIAWS systems operating in New Zealand.

Main Roads has been able to benefit from understanding the practical challenges encountered during RIAWS installations in other states, such as monitoring and maintenance activities.

In contrast, Vehicle Activated Speed Signs (which display the speed limit when a driver travelling at excessive speed are detected) were deployed at three sites in WA without development of policy and technical documentation. These devises posed a number of unanticipated operational problems, and further roll-out is not supported without approved policy and technical guidance. The experience of this project contrasts starkly with the RIAWS approach.

Conclusion

The proactive and relatively cautious policy development process conducted by Main Roads has identified a number of perceived risks to the successful introduction of RIAWS in Western Australia. Coupling the engagement against a broad desktop research approach was effective in enabling discussions within Main Roads to be informed by the experiences and empirical results obtained in other jurisdictions.

While slower than rapidly installing and trialing equipment, this approach has clear value in maximizing the benefits of installations through early research. In doing so, agencies may draw on the evidence documented in published research, on the potential approaches exemplified in other jurisdictions' draft policies, and on the deep tacit knowledge held across the working units of a large road network authority.

References

Mackie, H., and Scott, R. 2015. Rural Intersection Active Warning System (RIAWS) Trial (Final Report). Auckland: Mackie Research and Consulting Ltd.

NZ Transport Agency. 2015. Specification and Reference Manual for Rural Intersection Active Warning System. (Draft September 2015).

Streamlining the development of effective road safety programmes

Bridget Carden[a]

[a]Abley

Abstract

The Northland Programming Tool was developed for the Northland Transport Alliance and was named as a finalist for the 2019 New Zealand *3M Traffic Safety Innovation Award*. The tool assists practitioners with identifying the appropriate intervention to install on a selected corridor or intersection. It allows these projects to be added to a programme and then assists with the prioritisation of projects within a programme. Prioritisation is done based on the available budget and a user defined metric, such as the highest death and serious injuries savings per kilometer of road network. This paper also explores the opportunities for further developing the tool.

Introduction

The Northland Programming Tool was developed as an enhancement to the The Northland Transportation Alliance Risk Mapping Application[1] (presented at ACRS, 2018). The tool seeks to streamline the development of road safety programmes by collating risk data, integrating guidance and providing comparisons between interventions and projects in an easy to use web-application.

Project development

To build a road safety programme; users first need to populate projects. This is done by reviewing the risk profile on the network to identify a corridor or intersections to investigate further. Once a corridor or intersection has been selected, a list of recommended interventions is then available for the practitioner to review. The interventions are populated based on an automated process which considers road attributes, crash history, speed environment and alignment with guidance[2]. The practitioner is then able to apply their local knowledge to identify which interventions are worthy of consideration.

By entering in cost estimates for these potential interventions, the tool shows the user the relative benefits of each intervention, including the anticipated annual death and serious injury (DSi) savings and benefit cost ratios (BCR)'s. The cumulative benefits and BCR can also be calculated if multiple interventions are proposed e.g. wide centreline and audio tactile profiled edge line markings.

Once a practitioner has selected the intervention(s) for this corridor/intersection, this project can then be added to a programme.

Programme Prioritisation

One other challenge faced by road controlling authorities (RCA's) is that while there are many projects that may have merit in completing, all programmes are constrained by the available funding.

The Northland Programming tool assists practitioners with this by filtering out projects based on the available budget for the programme and a user defined metric for prioritisation. The metrics included in the tool for the NTA include ranking projects based on:

- BCR

[1]Ford et al. (2018)

[2] Guidance incorporated in the tool included the New Zealand Transport Agencies *High Risk Intersection's Guide* and *High Risk Rural Road Guide*

- DSi saved per kilometre of road network
- DSi saved per vehicle kilometres travelled
- DSi saved per dollar spent

Next steps

The Northland Programming tool offers a number of opportunities for further development to better assist road safety programming. At present the tool only incorporates input from New Zealand guidance however, this could be expanded to include Austroads and other sources of international best practice. The tool could also assist with project reviews, by building in an automatic calculation of actual crash reductions vs. projected crash reductions after a project has been completed.

Conversely, the tool could also be amended to assist central/state government funding approvals. In this scenario, the tool would review projects to compare whether the proposed intervention(s) are appropriate in magnitude for the scale of the issue and whether they would likely address the crash risk.

References

Ford, Durdin and Harris (2018) Streamlining road safety risk mapping and intervention programming on local networks: The Northland Transportation Alliance Risk Mapping Application, viewed February 2019, (http://acrs.org.au/files/papers/arsc/2018/JACRS-D-18-00218-Ford.pdf)

NZ Transport Agency (2013). High Risk Intersection Guide, viewed August 2018, (https://www.nzta.govt.nz/assets/resources/high-risk-intersections-guide/docs/high riskintersections-guide.pdf)

NZ Transport Agency (2011). High Risk Rural Roads Guide, viewed August 2018, (https://www.nzta.govt.nz/assets/resources/high-risk-rural-roads-guide/docs/high-risk-ruralroads-guide.pdf)

The power of linked data in understanding differences between serious injury measures

Renee Schuster[a], Paulette Ziekemijjer[a] and Amanda Reynolds[a]

[a]Transport Accident Commission (TAC)

Abstract

A linked dataset comprising TAC Claims, Road Crash Information System (RCIS) and Victoria Police Traffic Incident System (TIS) from 2012-2017 was established to analyse the differences in reported serious injuries. The comparative analysis reveals the extent of injury level miscoding within the current TIS, and scoping differences between the two databases. Analysis continues to uncover further insight into the differences between the reported series'.

Background

The Victorian Road Safety partners are increasingly relying on the power of linked datasets to inform targeted prevention and education. Effort continues to resolve data quality issues to better understand road trauma; particularly serious injuries. Inconsistency in datasets and reporting, including differences between TAC Claims and Victoria Police reported data has been cause for confusion. This analysis closes knowledge gaps and provides insight into discrepancies. It focuses on hospital admissions within 7 days of an accident as a serious injury measure.

TAC, Victoria Police and VicRoads are collaborating to provide consistency in reporting of road trauma levels and trends where possible. A major project, The TIS Serious Injury Automation Project (TIS SIA Project), is currently underway which aims to automatically validate and correct existing hospital admission status within Victoria Police TIS using client hospital stay information held by the TAC. A new and improved measure of injury level will emerge from this project; the TAC validated TIS injury level. Once the TIS SIA Project is implemented this measure of injury level will be available within TIS and subsequently within VicRoads RCIS. The new series will be superior to the previously used RCIS and TAC validated RCIS series', given that TIS incidents with an existing incident severity of both minor and non-injury levels are available for validation and correction.

The TAC has also invested significant effort into improving the linkage process between TIS and TAC. The new process integrates the existing manual linkage process undertaken by TAC claims intake teams, with a sophisticated and automated probabilistic data linkage process using full name, date of birth and accident date fields in both systems. The TIS SIA Project will utilize this new improved linkage table.

Whilst formal project plans continue within the relevant technical and business areas across the agencies, the TAC Road Safety Research, Insights and Evaluation team have been able to build and analyse a TIS/RCIS "future state" dataset by using the improved linkage table established by TAC and mimicking the business rules agreed for the TIS SIA Project.

Method

An analysis of Victoria Police TIS data linked to TAC claims data (where possible) was conducted to better understand the differences in their reported serious injury series'. The agreed business rules for the TIS SIA Project were applied to establish the TAC validated TIS injury level. These rules are as follows:

- Maintain TIS personal injury level code if coded as a fatality or if a link to TAC could not be established.

- Where a link to TAC could be established; records where an inpatient hospital stay had been billed to the TAC and the first inpatient stay was within 7 days, were marked as major or "serious" injury. The remaining linked cases were marked as minor injury.

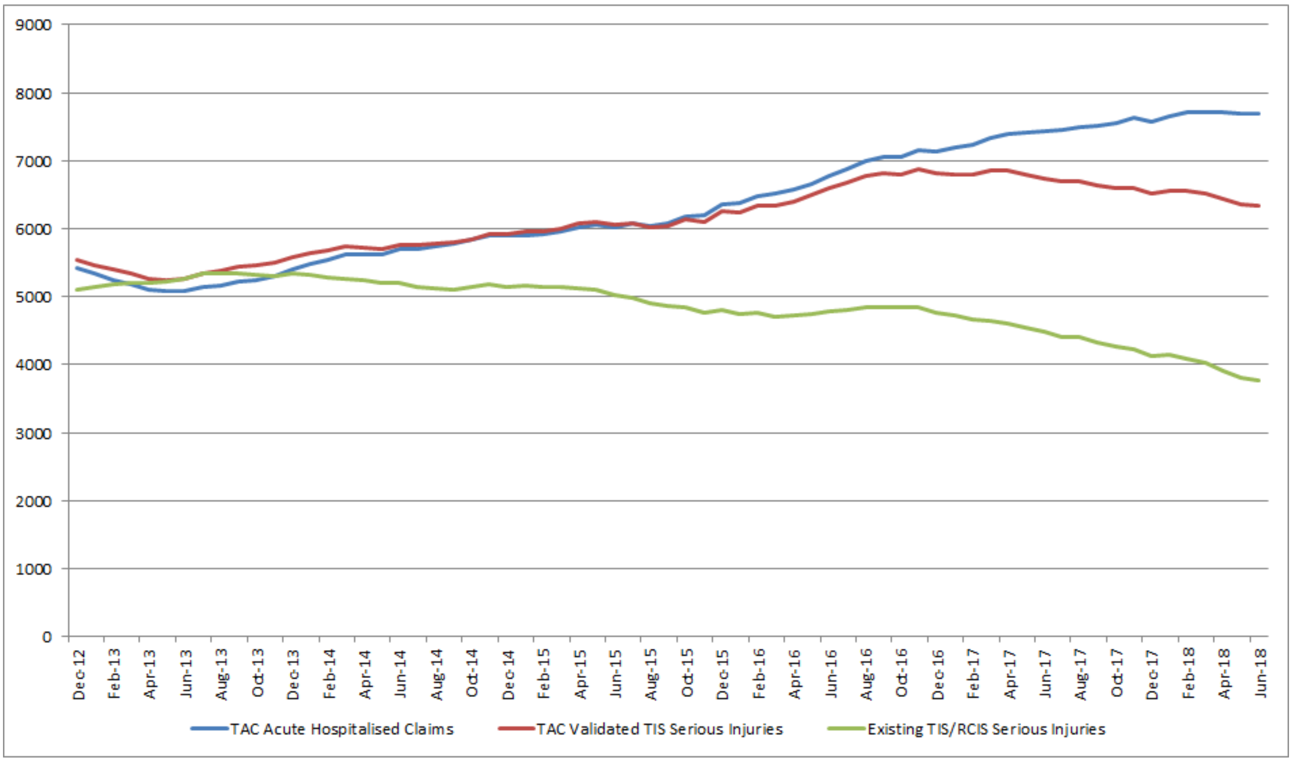
There were 465,844 cases existing in either TIS or TAC for accident dates between 2012-2017[1]. Of the 114,906 TAC claims, 76.4% linked to a record within TIS. Of the 38,171 TAC claims with an inpatient hospital stay within 7 days of accident, 91.8% linked to a record within TIS. Known differences and data quality issues across the two datasets were first explored and are available as the preliminary results below. This includes the exploration of miscoded injury level within the existing Victoria Police TIS and the incidence of off road cases within TAC acute hospitalised claims data. Further analysis will continue to uncover and identify differences between the two series and will be available by September 2019.

Results

Chart 1 compares:

1. TAC Acute Hospitalised Claims; which denotes a hospital admission within 7 days of accident and includes both on and off road incidents.
2. Existing TIS/RCIS Serious Injuries for police reported incidents. This definition involves a hospitalisation and includes on road cases only.
3. TAC Validated TIS Serious Injuries: 2 above, validated and corrected by 1 above where a link can be established.

Chart 1. Serious Injury Comparison



[1] 2018 results will also be available ahead of the September conference.

Table 1. Serious Injury Comparison

Measure			Accident Year					
			2012	2013	2014	2015	2016	2017
	TAC Acute Hospitalised Claims (1+2+3+4+5)		5414	5400	5905	6362	7138	7581
	Police Reported Serious Injuries (TIS Current State) (3+6+7)		5104	5333	5151	4810	4766	4134
	TAC Validated Police Reported Serious Injuries (TIS Future State) (3+4+5+7)		5524	5585	5917	6260	6821	6520
TAC and TIS Comparison								
	TAC Claim Status	**Victoria Police Current TIS Status**						
1	TAC Acute Hospitalised Claim	Not on TIS	294	257	284	342	548	1389
2	TAC Acute Hospitalised Claim	On TIS but outside scope for TIS SI*	361	338	367	359	336	306
3	TAC Acute Hospitalised Claim	On TIS - Major/Serious Injury	3499	3567	3486	3551	3671	3174
4	TAC Acute Hospitalised Claim	On TIS - Minor Injury	1033	1013	1470	1763	2201	2279
5	TAC Acute Hospitalised Claim	On TIS - No Injury or Unknown Injury	227	225	298	347	382	433
6	TAC Claim but TAC says no hospital or not within 7 days	On TIS - Major/Serious Injury	840	986	1002	660	528	326
7	Not on TAC	On TIS - Major/Serious Injury	765	780	663	599	567	634

*Scope differences could include: ABS code (e.g. on road, off road etc.), Incident status code (e.g. final, draft etc.), accident year recorded etc.

Analysis of the linked file highlights the extent of miscoding in the current TIS (lines 4, 5 and 6 in Table 1). Once implemented, the TIS SIA Project will significantly improve the data quality of the reported injury level within TIS. Despite data quality improvement arising from this project, it is clear that the gap between TAC Hospitalised claims data and TAC Validated TIS data continues to grow. Some of these differences can be explained from scoping differences, but others still need to be explored.

Conclusions

The linked provides valuable insights into differences in reported serious injury series across the Road Safety partners. Known and valid differences will always exist between the databases and work continues to learn more about further differences.

The impact of 'Do not disturb while driving' and 'Android Auto' on mobile phone use while driving: A mixed-methods approach

Oscar Oviedo-Trespalacios, Verity Truelove, & Mark King

Centre for Accident Research and Road Safety- Queensland (CARRS-Q), Queensland University of Technology (QUT), Brisbane, Australia,

Abstract

Mobile phone distracted driving is a huge concern as this behaviour is constantly evolving and is a major contributor to road trauma rates. Banning hand-held phone use while driving does not always work and can result in the more dangerous behaviour of concealed phone use while driving. Therefore, utilising technology reduce risk is an important area to explore. This study used a mixed methods design to explore drivers' perceptions, as well as the effectiveness and usability, of applications designed to prevent mobile phone distracted driving.

Background

As mobile phone distracted driving is a largely prevalent behaviour that can result in road trauma, it is necessary to develop countermeasures that are effective in deterring drivers from this behaviour. Currently, in many jurisdictions, bans exist on all hand-held phone functions while driving. However, despite these bans, phone use while driving is on the rise (Huemer et al., 2018). Recently, mobile phone applications designed to reduce distracted driving have been developed in an attempt to further decrease this dangerous behaviour. These applications disable specific phone functions such as text messages, calls and social media while allowing other phone functions such as music and global positioning systems (GPS) (Oviedo-Trespalacios et al., 2019). While these applications have the potential of reducing mobile phone distracted driving, there has been limited research examining the effectiveness of such applications. As such, this study aimed to investigate *i*) the effectiveness and usability of the most popular applications designed to prevent mobile phone distracted driving and *ii*) drivers' perceptions of these applications.

Method

Participants were recruited for an in-vehicle study that included two questionnaires and three dairies. Depending on their mobile phone, participants were asked to use the 'Do not disturb while driving' app for iOS phones or 'Android Auto' app for android phones. The questionnaires asked about phone use while driving behaviour, problematic phone use, attention-related driver errors, susceptibility to driver distraction, and workload. Additionally, the diary entries included information about their experiences using the application while driving.

Results

In total, 40 participants completed the study. Participants were aged between 18 and 56 years and consisted of 24 females. On average, participants drove 13.56 hours during the study. The results of the questionnaire are presented in Figure 1.

For the qualitative results, an inductive thematic analysis was used to analyse the data. Positive experiences with the application were related to automatic activation, the application working as it was supposed to and the application allowing the desired music and GPS functions while driving. Meanwhile, negative experiences were associated with manual activation, malfunctions, difficulty in learning how to use the application, and privacy concerns. Participants who experienced difficulties with the application at the beginning of the study reported more positive experiences with the application after using it for a number of days.

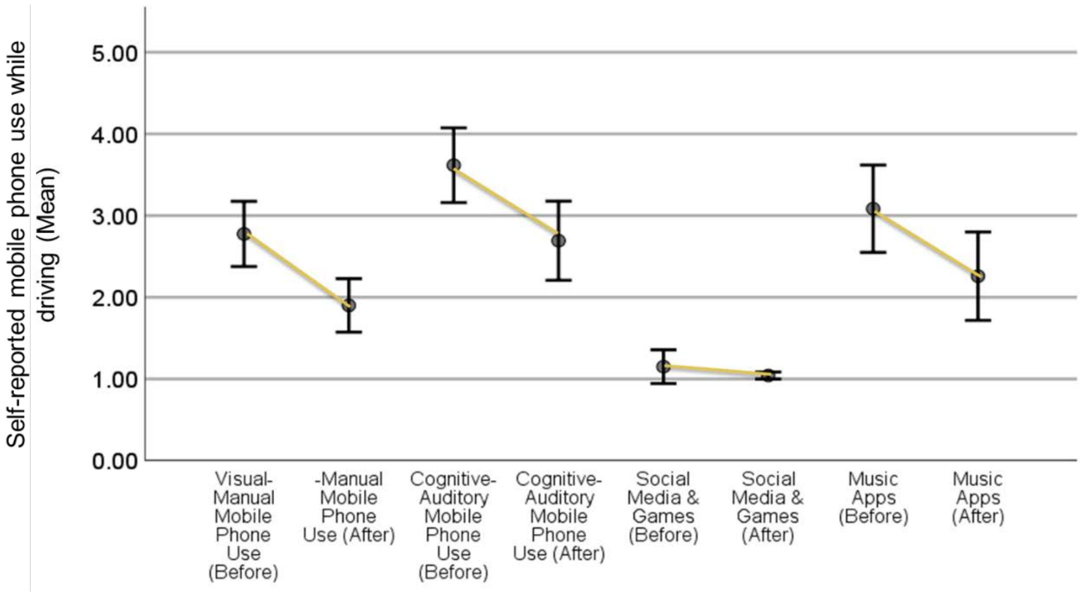


Figure 1. Self-reported mobile phone use before and after using 'Do not disturb while driving' or 'Android Auto'

Conclusion

Overall, the results suggest that applications designed to prevent mobile phone distracted driving can be effective in reducing this behaviour. Particularly, 'Do not disturb while driving' or 'Android Auto' reduce exposure to visual-manual interactions (e.g., texting and browsing) which have been found to increase the risk of crash among motorists (Oviedo-Trespalacios et al., 2016, 2018). However, it was identified via the diary entries that they need further development for participants to use them regularly. As these types of applications are voluntary, improving them is important to encourage their use, with the ultimate aim of reducing the road trauma rate relating to mobile phone distracted driving.

References

Huemer, A. K., Schumacher, M., Mennecke, M., & Vollrath, M. (2018). Systematic review of observational studies on secondary task engagement while driving. Accident Analysis & Prevention, 119, 225-236.

Oviedo-Trespalacios, O., Haque, M. M., King, M., & Washington, S. (2016). Understanding the impacts of mobile phone distraction on driving performance: A systematic review. Transportation research part C: emerging technologies, 72, 360-380.

Oviedo-Trespalacios, O., Haque, M. M., King, M., & Demmel, S. (2018). Driving behaviour while self-regulating mobile phone interactions: A human-machine system approach. Accident Analysis & Prevention, 118, 253-262.

Oviedo-Trespalacios, O., King, M., Vaezipour, A., & Truelove, V. (2019). Can our phones keep us safe? A content analysis of smartphone applications to prevent mobile phone distracted driving. Transportation Research Part F: Traffic Psychology and Behaviour, 60, 657-668.

Driver behavior and intersection crashes

Kate Brameld[a]

[a]Curtin-Monash Accident Research Centre, Curtin University

Abstract

This study explored driver related factors associated with casualty crashes at intersections in Western Australia from 2013-2017. Most casualty crashes occurred at intersections in 50-80 km/h speed limit zones and involved the following crash types: right angle, right turn thru and rear end. Review of the literature suggests that these are likely to be associated with behaviours such as inattention, misjudging gaps in traffic, driving too fast for the conditions, disregarding traffic controls and following too closely. Safe roads, safe speeds and safe vehicles offer substantial promise in preventing intersection crashes in the future.

Background

Intersections are a high risk component of the road network in terms of crash occurrence. Australian and New Zealand data show that around 30% of casualty crashes occur at intersections (Austroads, 2017). To address intersection safety it is necessary to consider their design, speed limit and driver behaviour. Practical guidelines as to how intersections may be modified to minimise the occurrence of severe injuries are in their infancy (Austroads, 2017). The focus of this study was to identify driver behaviours associated with casualty crashes at intersections and to identify appropriate countermeasures to address them.

Method

A retrospective population-based study for the five year period from 1 January 2013 to 31 December 2017 in Western Australia was undertaken using crash data on intersections for which at least one crash was reported which resulted in a casualty crash, ie a death or hospitalisation. Intersections were categorized according to their speed environment, type of control and their location. The nature of crashes were analysed according to intersection category. Driver behaviours associated with intersection crashes and appropriate countermeasures to address them were identified through a literature review.

Results

A total of 1077 casualty crashes were reported at 667 intersections in Western Australia during the period 2013-2017. The majority of casualty crashes occurred at intersections in 50-80 km/h speed limit zones at signalised (32%) and non-signalised (28%) intersections. These were followed by intersections in the higher speed environments (>80 km/h) at non-signalised (23%) and signalised (14%) intersections. The most common crash types were right angle crashes (35%), right turn thru crashes (22%) and rear end crashes (22%). Review of the literature suggests that these are likely to be associated with behaviours such as inattention, misjudging gaps in traffic, driving too fast for the conditions, disregarding traffic controls and following too closely.

Discussion

Safe roads, safe speeds and particularly safe vehicles offer substantial promise in preventing intersection crashes in the future. Technologies such as collision sensing and warning systems, adaptive cruise control, intelligent speed adaptation, and fatigue warning and monitoring systems will help to address many driver errors (Stanton and Salmon, 2009). Cooperative Intelligent Transport Systems (CITS) encompassing Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) wireless communications will also play a large part in preventing collisions that may have previously occurred due to driver error. The design of safer intersections which reduce issues of visibility and gap selection will also contribute to the prevention of collisions as will new traffic signal technologies which are able to alter phasing in response to red light runners (Simpson et al., 2017). Safer speeds will help reduce crash severity and help those who have difficulty with gap selection. Traffic enforcement backed up by high visibility policing is also necessary to address speeding, impaired driving and where possible inattention.

References

Austroads. (2017) Understanding and improving Safe System intersection performance (AP-R556-17). Sydney, NSW: Austroads Ltd.

Stanton NA and Salmon PM. (2009) Human error taxonomies applied to driving: A generic driver error taxonomy and its implications for intelligent transport systems. *Safety Science* 47: 227-237.

Simpson CL, Harrison MW and Troy SA. (2017) Implementation of a Dynamic All-Red Extension at Signalized Intersections in North Carolina Evaluation of Driver Adaptation and Operational Performance. *Transportation Research Record*: 19-27.

Truck drivers on bicycles: insights from the first year of vulnerable road user training for heavy vehicle drivers on major projects

Marilyn Johnson[a,b], Bronwyn Hayden[c], Sonny Copeland[a], Phoebe Dunn[a], Sarah Dalton[a]

[a]Amy Gillett Foundation (AGF), [b]Monash University Institute of Transport Studies, [c]Rail Projects Victoria

Abstract

Sharing Roads Safely is a driver training course focused improving safe interactions between heavy vehicle drivers and vulnerable roads. Based on the best practice program from the United Kingdom (CLOCS), Sharing Roads Safely was adapted for the Australian context by the Amy Gillett Foundation in collaboration with Rail Projects Victoria and in consultation with stakeholders from across the construction and logistics sector. Piloted in September 2018, the program is now being conducted regularly (industry rostered days off) and includes three modules (online, facilitated workshop, walking and cycling (on-road)). This paper details the content of the course and feedback from drivers and insights from the first year of course delivery.

Background

Heavy vehicle activity in Victoria, particularly in areas of inner Melbourne, is increasing to unprecedented levels to support over 40 major transport projects currently being built (Major Transport Infrastructure Authority, 2019). These projects, valued at $38 billion, are estimated to increase heavy vehicle movements by one additional truck movement every three minutes for five years (Ross, 2018). This increase raised concerns about public safety, particularly in the urban areas where there are an increasing number of vulnerable road users that is people walking, cycling and riding motorbikes.

In anticipation of the increase in interactions between heavy vehicles and vulnerable road users, the Victorian State Government formed three working groups to focus on action to improve safety in relation to heavy vehicles safety (Truck Standards), traffic management and planning, and behaviour (Engagement and Behavioural Influence). The program that is the focus of this paper, Sharing Roads Safely, is an outcome from the behaviour working group.

Sharing Roads Safely – developing an Australian program

The Amy Gillett Foundation was commissioned by Rail Projects Victoria (RPV, then MMRA, Melbourne Metro Rail Authority) to develop a comprehensive training program focused on vulnerable road user safety for heavy vehicle drivers. The aim of the program was to ensure that all drivers engaged in Metro Tunnel related projects would have the knowledge, skills and attitude required to recognise, assess, management and reduce the risks that their vehicle may pose to vulnerable road users including pedestrians, cyclists and motorbike riders.

The development of the program was undertaken in several stages. First, was a comparative review of existing courses. This desk-based analysis was completed and included the following courses: Safe Urban Driving (as part of the UK program CLOCS), Victorian Bus and Truck Drivers' Handbook (VicRoads), Safe Heavy Vehicle Driving Behaviours (Sydney Metro) and two existing driver training programs delivered by the AGF to Toll drivers (Sharing the road safely with cyclists and Sharing the road safely with bike and trucks). In addition, one program from New Zealand (Share the Road) was also review in discussion with course delivery providers. The review included the course administration, an overview of all course components and a detailed analysis of the content and activities related to all three vulnerable road user groups.

Following the review, and in consultation with staff from RPV and industry stakeholders, specific adaptations required for an Australian audience were identified including changing to language, terminology (e.g. change ‘Changing streetscapes’ (UK) to ‘Helping our cities grow’) and inclusion of local content (e.g. Australian road rules).

Next, the program content was developed based on three sequential modules. Based on the AGF’s experience delivering driver training to Toll and to expedite the training process, an online component was developed (Module 1). This 20-minute course provided an introduction to the Safe System approach, established the importance of vulnerable road user training and included information and practical advice for key scenarios (e.g. safe passing distance, very vulnerable pedestrians and filtering for motorbike riders). Drivers are required to answer knowledge check questions throughout the course and four final test questions.

Module 2 is a classroom based, facilitator-led workshop. Across two hours the drivers participate in a mix of discussion and interactive activities that covers five topics:

- Introduction and ice-breaker: includes an opportunity to drivers to discuss their experiences on the roads with vulnerable road users
- Helping our cities grow: a short review of the online module and a reminder that everyone has a responsibility for road safety and the course is not about blame, but about making sure that mistakes do not cost people their lives
- Vulnerable road users: discussion about vulnerable road users, very vulnerable road users, how to avoid locations with a high number of vulnerable road users
- Sharing our roads: practical actions and advice about key scenarios when driving involving pedestrians, cyclists and motorbike riders
- Vulnerable road user safety equipment: activity based discussion on key safety equipment being added to trucks during the major projects

In addition, at the request of the industry stakeholders, two original pieces of film were created. These short videos tell the stories of fatality crashes that involve vulnerable road users and a heavy vehicle. In the first video, a truck driver and his supervisor discuss the day he was involved in a fatal crash with a motorbike rider. In the second video, the family member of a cyclist killed in a crash with a truck talks about the circumstances of the crash and the long-term impact of that crash on the cyclist’s family.

Module 3 is an on-bike component that includes a short skills test, then an on-road bike ride along a designated route. This experiential component literally puts a driver in the bicycle seat. Their exposure to the experiences of a cyclist and a pedestrians helps to solidify the online and classroom content. Following the ride, drivers return to the classroom for a debrief and discussion.

Driver experience

All drivers complete a feedback evaluation at the end of the day. To date, the response has been positive. At the end of the training, drivers report that they have a better understanding of issues faced by vulnerable road users (60%) and a third would consider cycling to improve health and fitness.

Safety outcomes

We will continue to monitor the safety outcomes of drivers who attend the course. Evidence from the UK program, has shown a 47 percent reduction in casualty rate after implementing CLOCS (CLOCS, 2018). Over time we will be able to evaluate the safety outcomes for drivers following their participation in *Sharing Roads Safely*.

References

CLOCS Construction Logistics and Community Safety (2018). Accessed 28 February 2018 at https://www.clocs.org.uk/

Major Transport Infrastructure Authority (2019). Victoria's big build. Accessed 28 February 2019 at https://bigbuild.vic.gov.au/about

Ross, Jamie (2018). Raising the bar for public protection. Melbourne Metro Rail Authority.

Te Ara Mua Future Streets – Influences on road user behaviour

Lily Hirsch[a], Hamish Mackie[a], Nick Wilson[a]
Zenobié Cornille[a], Greer Hawley[a]
[a]Mackie Research and Consulting

Abstract

Te Ara Mua – Future Streets is a controlled before-after study of a neighbourhood street retrofit in Auckland, New Zealand. This paper focuses on one aspect of the study – to understand if walking and cycling was made easier and safer. A video coding framework was developed to understand road user behaviour and interactions and was applied to three sites where streets were changed. Across the three sites, there was a shift towards vulnerable user behaviour that is indicative of safer and easier walking and cycling. In addition, lessons for the design of some infrastructure features were identified.

Background

In 2012, Central Māngere – a low socioeconomic suburb in South Auckland – was rated the fourth worst (out of 280 Auckland neighbourhoods) for fatal and serious crash risk (Auckland Transport 2012 unpublished data). In response to this, a neighbourhood-wide retrofit of street infrastructure was undertaken from 2015-2016 entitled Te Ara Mua ("the path ahead shaped by the past") Future Streets (Mackie et al, 2018). Infrastructure changes included the installation of separated cycle lanes, raised zebra crossings, a recreation loop trail, and wider footpaths. As part of a greater research programme, the goal of this paper is to understand if the changes achieved the goal of making walking and cycling easier and safer, and to identify aspects of the infrastructure design that could be further improved.

Method

Video footage was collected in 2014 (pre-intervention) and 2018 (post-intervention) at three sites: a busy collector road (Site A); a car park boarding a recreational area (Site B); and a collector road near a local school (Site C). The original roads and their modifications are presented in Figure 1. Each year, data were collected in March on four days from 7am to 7pm.

Figure 1. Video views of sites A, B, and C pre- and post-intervention

A coding framework (Figure 2) was devised to capture the behaviour of pedestrians and cyclists and to analyse their interactions with other road users (e.g. car, bus, van). The definitions of encounter types were adapted from Kraay (2013), Hunter et al (2012), and Johnson et al (2010). Two people coded the videos and an interrater exercise was conducted to ensure consistent agreement between the coders.

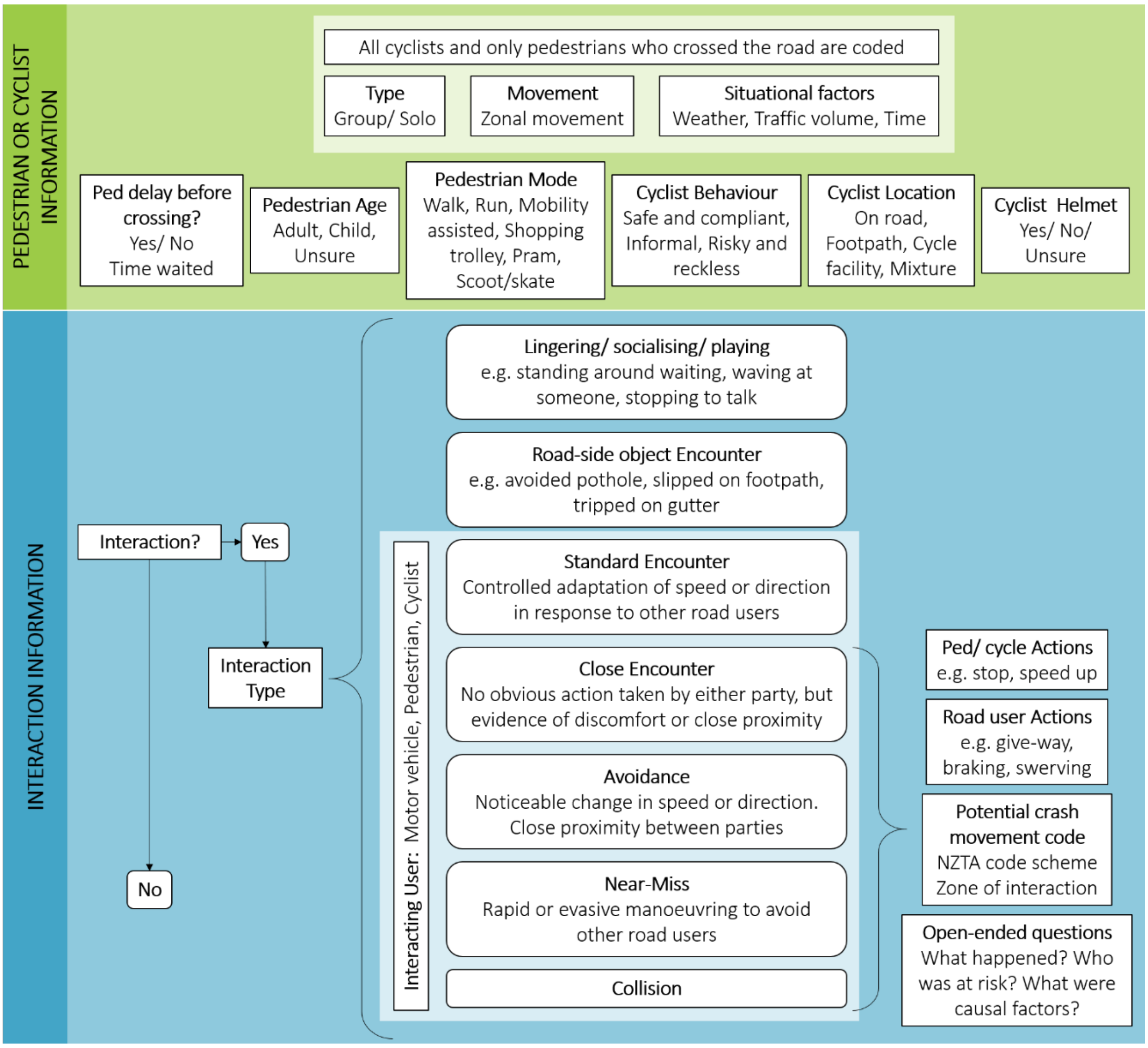


Figure 2. Outline of the coding framework applied to the three sites

Results

It was identified that walking and cycling was easier and safer following the intervention. In addition, infrastructure design improvements have been identified.

Ease

There was evidence across all sites that the changes in infrastructure improved mobility for pedestrians. Wider footpaths afforded more comfortable group walking behaviour as they reduced the number of people walking on the road or in single-file and emphasized social connections. For example, of the total observed pedestrians, proportionally there was a 6.8% increase of group walking at Site B. The introduction of raised zebra crossings improved accessibility for wheel-based pedestrians as the need to navigate a curb was removed. Finally, across all three sites there was a 53.2% decrease in the continuous movement of vehicles - supporting improved pedestrian priority particularly through the introduction of zebra crossings.

Safety

Figure 3 shows the location and frequency of all pedestrian/ vehicle interactions at Site A under both conditions. There is a clear shift in the location of interactions away from high-energy zones (in the general traffic lane) with the potential for more serious outcomes, to slow-moving low-energy zones (side road and start of speed table).

Figure 3. Location and frequency of pedestrian/ vehicle interactions at Site A pre- (left) and post-intervention (right)

For people on bikes, at Sites A and C, there was a shift towards use of the cycle facility, meaning there are proportionally fewer on the road (-19.2% Site A and -10% Site C), thereby reducing the potential for interactions between motor vehicles and people on bikes.

Design lessons

Infrastructure design lessons have emerged through this analysis. At Site A, it is suggested that the addition of more road markings and signage for vehicles may further reduce the frequency and severity of pedestrian/ vehicle interactions at the two new interaction zones (Figure 3). In addition, the data have identified that the raised separations of the cycle lane at Sites A and C may restrict cyclists' ability to make turns, thereby potentially affecting their uptake. Creating more, and wider spaces in the concrete barriers would ameliorate this. These design lessons may be beneficial for future neighbourhood development projects.

Conclusions

This analysis found that the broad goals of Te Ara Mua – Future Streets were successful in that walking and cycling within the community was made easier and safer. In addition, the analysis identified aspects of the new street design that could be improved to better serve pedestrian and cyclist access and safety. These lessons may be applied to a new-wave of neighbourhood projects in Auckland going forwards.

References

Hunter, W. W., Srinivasan, R., & Martell, C. A. (2012). Evaluation of rectangular rapid flash beacon at Pinellas Trail Crossing in Saint Petersburg, Florida. Transportation Research Record, 2314(1), 7-13.

Johnson, M., Charlton, J., Oxley, J., & Newstead, S. (2010, January). Naturalistic cycling study: identifying risk factors for on-road commuter cyclists. In Annals of advances in automotive medicine/annual scientific conference, 54, p.275. Association for the Advancement of Automotive Medicine.

Kraay, J.H., van der Horst, A.R.A., Oppe, S. (1986). Handleiding conflictobservatietechniek DOCTOR (Manual Conflict observation Technique DOCTOR) (Report R.85-53). Leidschendam, The Netherlands: Institue for Road Safey Research SWOV.

Mackie, H., Macmillan, A., Witten, K., Baas, P., Field, A., Smith, M., Hosking, J., King, K., Sosene, L. and Woodward, A. (2018). Te Ara Mua-Future Streets suburban street retrofit: A researcher-community-government co-design process and intervention outcomes. Journal of Transport & Health, 11, pp.209-220.

"My ideas are important too!": Student perceptions of a critical pedagogical transport safety education experience in rural Australia

Janine Ferris[a]

[a]University of Waikato

Abstract

How is a transport safety education program designed to involve school students in producing their own knowledge and empowering students to think critically, perceived by school students themselves? Eleven students aged thirteen and fourteen from rural Australia participated in three transport safety education lessons using a critical pedagogical approach to learning. Through focus groups the students shared their thoughts and feelings about their experiences, and ten clear themes on their values were identified. These themes may help policy makers and program designers understand school students' motivations for learning, and may improve educational outcomes if incorporated into education program design.

Background

There is some existing research which indicates some characteristics of critical pedagogy can play an important role and lead to positive outcomes in the learning intentions and success criteria of transport safety education programs (Assailly, 2015; Dragutinovic & Twisk, 2006; Ferris, 2017; Government of Western Australia, 2009 & 2009-a; Harris, n.d.; Twisk, Vlakveld, Commandeur, Shope, & Kok, 2014). Two of the underlying principles of critical pedagogy highlighted by Kincheloe (2004) are key: that students learn most effectively through producing their own knowledge; and that when students are respected and empowered, they are better positioned to use their expertise for change.

When transport safety education programs are designed, multiple stakeholders including industry and education authorities are consulted, but students themselves are not always considered as a key stakeholder and given input into the content and pedagogy of a program. What can be learned from asking the very people these programs seek to educate? This study aimed to find out how students in rural Australia viewed and responded to what and how they learned during a transport safety education experience using a critical pedagogical approach to learning.

Method

A qualitative mixed research method was used. After observing three lessons with their usual Personal Development, Health and Physical Education (PDHPE) teacher, a participant research method was adopted and the researcher became the teacher, using three transport safety lessons adapted from the TrackSAFE Education Year Eight Health and Physical Education curriculum resources (TrackSAFE Foundation, n.d.). The lessons included student-led learning activities such as the 'Augusto Boal Forum Theatre' technique (Hartwell, 2012) (Figure 1). Following the lessons, students actively participated in focus groups which involved student-centred activities in the spirit of critical pedagogy. Finally, their PDHPE teacher was interviewed for her perspective on the students' perceptions of the lessons. The lessons, focus groups and interview were audio recorded, students were photographed while participating in the lessons and focus groups, and images of their original work were captured. The data was analysed manually by listening to audio recordings, analysing the photographs, and conducting a thematic analysis of students' responses in the lessons and focus groups.

Figure 1. Six students using the Augusto Boal Forum Theatre technique. They created their own thirty second play, and chose to portray a distracted driver hitting a pedestrian. Other students said "Freeze", took the place of a character, restarted the play, and made safer choices to change the ending of the play to a positive outcome where no one was injured.

Results

Having participated in the three lessons, several students were surprised to discover that transport safety education is relevant to them despite their original beliefs to the contrary. Ten themes highlighting the students' values emerged: 'fun'; 'using our own ideas'; 'being ME'; 'solving problems on my own or with my class'; 'actively participating'; 'experiencing'; 'being heard'; 'being respected'; 'opening our minds to new information'; and 'understanding the task and why it is important'.

Conclusions

The eleven students in this study had clear ideas about how they like to learn and how they want to be treated when learning. The ten themes identified indicate these students' preferences for learning align with a critical pedagogical approach. Listening to school students' perspectives and opinions, and gaining their input when making decisions on what and how they learn about transport safety, may lead the way to improved educational outcomes for students.

References

Assailly, J.P. (2015). Road safety education: What works? Patient Education and Counselling. http://dx.doi.org/10.1016/j.pec.2015.10.017

Dragutinovic, N. & Twisk, D. (2006). The effectiveness of road safety education. The Netherlands: SWOV Institute for Road Safety Research. Retrieved from http://www.swov.nl/rapport/r-2006-06.pdf

Ferris, J. (2017, October). *Expanding Young People's Horizons as Leaders of Change in their Community: How Could Critical Pedagogy Improve Australasian Transport Safety Education?* Paper presented at the Australasian Road Safety Conference, Perth, Australia. Retrieved from http://acrs.org.au/files/papers/arsc/2017/Ferris_00194_FP.pdf

Government of Western Australia (2009). 16 Principles for School Road Safety Education. Western Australia: Department of Education, School Drug Education and Road Aware. Retrieved from http://www.sdera.wa.edu.au/about-us/best-practice/

Government of Western Australia (2009-a). Principles for School Road Safety Education: A Research Summary. Western Australia: Department of Education, School Drug Education and Road Aware. Retrieved from http://www.sdera.wa.edu.au/about-us/best-practice/

Harris, A. (n.d.) Effective community & school based road safety for young people: A summary of the research [Fact Sheet]. VicRoads/Transport Accident Commission. Retrieved from http://www.roadsafetyeducation.vic.gov.au/__data/assets/pdf_file/0004/178789/Research_summary.pdf

Hartwell, E. (2012, July 20). *Augusto Boal, Forum Theater, Harvard-2003 (Part 1/5).* Retrieved from http://en.wikipedia.org/wiki/Forum_theatre

Kincheloe, J. L. (2004). Critical Pedagogy Primer. New York, NY, USA: Peter Lang Publishing. Retrieved from http://site.ebrary.com.ezproxy.waikato.ac.nz/lib/waikato/detail.action?docID=10120646

TrackSAFE Foundation (n.d.). Health & Physical Education. Retrieved from https://tracksafeeducation.com.au/teachers/teachers/learning-resource-centre/high-school-resources/year-7-and-8/hpe/

Twisk, D., Vlakveld, W., Commandeur, J. Shope, J. & Kok, G. (2014). Five road safety education programmes for young adolescent pedestrians and cyclists: A multi-programme evaluation in a field setting. Accident Analysis & Prevention, 66, 55-61. http://dx.doi.org.ezproxy.waikato.ac.nz/10.1016/j.aap.2014.01.002

Adding trains and trams to Safety Town: A government and not-for-profit road/rail education partnership leading the way in NSW

Janine Ferris[a]

[a]TrackSAFE Foundation

Abstract

One third of pedestrians hospitalised due to serious injuries at level crossings each year in Australia are young people (Henley & Harrison, 2017), and heavy and light rail infrastructure investments are increasing across NSW. The TrackSAFE Foundation (TrackSAFE) identified opportunities to integrate rail safety education content into the existing evidence-informed road safety education resource 'Safety Town', funded by Transport for NSW (TfNSW) and widely used by schools across NSW. Through a comprehensive program review process, new content was added to help primary students learn about pedestrian and passenger safety near trains, trams, platforms and tracks.

Background

Road safety education is well established and supported in NSW schools through the NSW Joint Planning Committee, Road Safety Education, which includes representatives from the NSW Department of Education, Association of Independent Schools NSW, Catholic Schools NSW, and Kids and Traffic Early Childhood Road Safety Education Program (TfNSW, n.d.). The committee supports the teaching of road safety to students by classroom teachers, and authorises the content included in the curriculum-based programs and resources funded by the Centre for Road Safety, Transport for NSW including 'Safety Town' (TfNSW, n.d.). Safety Town is a road safety education resource for teachers, students and families, including a variety of learning activities for students from Kindergarten to Year Six (TfNSW, n.d.).

TrackSAFE identified an opportunity to strengthen the existing resources, approached the committee and gained approval to develop content to help children learn knowledge and skills about rail safety. Australia wide, 34 percent of the 133 pedestrians hospitalised due to serious injuries at level crossings each year are young people (Henley & Harrison, 2017). In NSW, with more than 9,500 km of track; 3800 level crossings; thousands of students commuting to school via rail each day; and the new Sydney CBD and South East Light Rail project due for completion in 2019, rail safety education is becoming increasingly important to students and teachers in all areas of the state.

While TrackSAFE runs TrackSAFE Education, a stand-alone rail safety education program (TrackSAFE, n.d.), it recognised an opportunity for a new landscape for rail safety education through the development of partnerships with evidence informed road safety education programs. Road safety is taught in NSW schools as a compulsory part of the Personal Development, Health and Physical Education (PDHPE) syllabus from Kindergarten to Year 10 (Neagle & Fegan, 2017), and as such integrating rail safety content into a program teachers already widely use has the potential to increase students' knowledge about safety near trains, trams and tracks in NSW.

Rail safety content additions

The Safety Town resources were reviewed, and TrackSAFE suggested new content or additions to existing content, for example pedestrian safety near trams, trains, tracks, on platforms and at level crossings; and passenger safety on trains and trams. All content was designed in the spirit and tone of the original resources aligning with the underpinning values of the program as well as the K-6 Syllabus outcomes for PDHPE (NSW Government, 2014). A pilot was not carried out as both the Safety Town and TrackSAFE Education resources are already used in the classroom extensively. New content can be viewed at safetytown.com.au.

Discussion

This collaborative partnership between TrackSAFE and TfNSW has fortified the transport safety education experience for NSW primary school students, in an environment where multiple transport modes are increasingly popular for point-to-point trips and active transport is encouraged for health. The changes to the Safety Town resources have the potential to increase the knowledge of NSW primary students in how to stay safe as a pedestrian or passenger around trains, trams and tracks.

References

Henley, G. & Harrison, J.E. (2017). Serious unintentional injury involving a railway train or tram, Australia, 2009–10 to 2013–14. (Injury Research and Statistics Series no. 101. Cat. no. INJCAT 177). Canberra: Australian Institute of Health and Welfare. Retrieved from https://www.aihw.gov.au/getmedia/9e17d1a7-f602-4bae-9be6-69741d88a03e/20437-train-tram-injuries.pdf.aspx?inline=true

Neagle, D. & Fegan, M. (2017, October). *Safety Town – A Collaborative Approach to Road Safety Education in NSW Schools.* Paper presented at the Australasian Road Safety Conference, Perth, Australia. Retrieved from http://acrs.org.au/files/papers/arsc/2017/Neagle_00137_EA.pdf

NSW Government (2014). Personal Development Health and Physical Education (PDHPE) K–6 Syllabus: Education Standards Authority. Retrieved from https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/pdhpe/pdhpe-k-6-syllabus

TrackSAFE Foundation (n.d.). TrackSAFE Education: Learning Resource Centre. Retrieved from https://tracksafeeducation.com.au/teachers/teachers/learning-resource-centre/

Transport for NSW (n.d.) About us: Road Safety Education. Retrieved from https://www.safetytown.com.au/about-us/

Behaviour, Law and Design: an interdisciplinary approach to improving intuitive road design, the road rules and cyclist safety

Marilyn Johnson[a,b], Robbie Napper[c], Vanessa Johnston[d]

[a] Monash University Institute of Transport Studies, [b] Amy Gillett Foundation, [c] Monash University Art, Design and Architecture (MADA), [d] Monash University, Faculty of Law

Abstract

There is a high level of confusion and misunderstanding on the roads about the negotiation between drivers and cyclists when a cyclist is continuing straight and driver is turning left. This study builds on existing knowledge to go beyond problem identification to investigate potential solutions. The innovative, interdisciplinary team combines behavioural research with law and design to investigate and evaluate potential improvements in the road rules and road design. The study includes on-road trial of new left turn intersection design in Melbourne in Q2, 2019 with a pre- and post-study (roadside observations) and a review of the road rules to identify opportunities for amendment or clarification.

Background

It has been well established that there is confusion and misunderstanding among both drivers and cyclists about the left turn negotiation – that is a cyclist continuing straight and a driver turning left. A survey in Victoria (n=10,444 including drivers and cyclists) reported this interaction as one of the scenarios with the least clarity (Tierney, 2015). Observational studies of Melbourne commuter cyclists by Nicholls et al (2018) has provided an in-depth understanding of how drivers and cyclists behave on the road in this scenario.

This study moves beyond problem identification to explore and evaluate potential solutions. Support from an internal grant at Monash University provided the opportunity for collaboration between law, behavioural research and design to identify opportunities to simply and clarify the road rules and develop and test new initiative road designs on road in Melbourne, Victoria. The study identified three key issues that need to be addressed:

1. There is (observed) inconsistency in behaviours by drivers and cyclists across different infrastructure types which leads to conflict and potential crashes
2. Safer behaviours, particularly by drivers, are technically illegal. Regulatory expertise is required to determine the role of the road rules in improving clarity
3. Road design has a greater role to play to improve the intuitiveness of the road and the expectations of cyclists and drivers.

Method

This study is being conducted in two concurrent stages. One stage is a review of the road rules (led by VJ) was conducted to identify the key road rule, the legislative history, current operation of relevant road rule sand exceptions and opportunities to change the road rules to improve cyclist safety in the left-turn negotiation. The other stage combines innovative design (led by RN) and behavioural research (led by MJ).

Results

Road rules

The review of the road rules, including the legislative history, has identified that the key road rule in the left-turn negotiation is Road Rule r 141, which states:

> 141
>
> (1) A driver (except the rider of a bicycle) must not overtake a vehicle to the left of the vehicle unless –
> a) …
> b) …
> c) the vehicle is stationary and it is safe to overtake to the left of the vehicle.

However, there is also an exception to the rule that states:

> 141
>
> (2) The rider of a bicycle must not ride past, or overtake, to the left of a vehicle that is **turning** left and is giving a left change of direction signal.

Lack of clarity about the definition of turning left (i.e. does this require continuous movement, does this include periods when the motor vehicle is stationary) places the onus of interpretation on the road users to determine what constitutes a turning motor vehicle. Variation in subjective interpretation may reduce the predictability and consistency of road user behaviour. Suggested amendments are currently being reviewed and will be included in the final version of this abstract.

Road design

The development and testing of new road designs stage is currently underway and scheduled to be completed in Q2, 2019. Progress to date includes a workshop with stakeholders from government (state and local) to discuss exploratory road design (with Lego) and identify potential sites for on-road testing. After a review of Australian and international best practice designs, the team have worked through iterations of potential intersection designs. Discussions with 3M have identified the incorporation of new technology to be included in the on-road tests. These designs will be evaluated in a before-and-after study (observational) to determine changes in predictability and consistency of behaviour by drivers and cyclists which are being used as proxy indicators of safety.

Conclusion

This study is currently underway and the findings will be included in the final version of the abstract and at the conference. This interdisciplinary study has provided a new approach to considering the interaction between cyclists and drivers that takes into account a range of system factors that goes well beyond the behaviour of individual road users. Considering the parameters and impact of the road rules during the development of new road design and then testing this on the road to understand actual behaviours, is leading to new insights that are likely to help to improve clarity for all road user and improve safety outcomes for cyclists.

References

Nicholls, H., Rose, G., Carlisle, R., Johnson, M. (2018) Cyclists and left turning drivers: a study of infrastructure and behaviour. Transportation Research Board 97th Annual MeetingTransportation Research Board. Issue: 18-03892

Tierney, P. Review of Victorian cycling related road rules and legislation. March 2015. Accessed 25 February 2019 at www.ReviewOfVictorianCyclingRelatedRoadRulesLegislationMarch2015%20(5).pdf

A Safe Systems Response: Protecting Motorcyclists along the Oxley Highway

Monica Sirol, John Alexander, Joshua Buckham, Penny Sutton[a], Melvin Eveleigh, Joseph Le[b]

[a]NSW Roads and Maritime Services, [b]NSW Centre for Road Safety

Abstract

The Oxley Highway is popular among motorcyclists from all over Australia as it has many tight and demanding corners which require a lot of concentration. However, over a 44 kilometre section between Wauchope and Walcha, there have been 60 crashes since 2012. Of those, 58 have been on curves and 43 have been motorcyclists. There have been 25 serious injury crashes and 6 fatal crashes. All 6 fatal crashes have been a motorcyclist.

In response to the high crash rate involving motorcyclists, the Centre for Road Safety (CRS) and Roads and Maritime Services (RMS) worked collaboratively to engage local motorcycle groups and key stakeholders to introduce a Safe Systems package to improve safety along this popular riding route.

Background

In 2015 RMS in collaboration with the CRS completed a Route Safety Review of the Oxley Highway. The review found that a 44 km section of the Oxley Highway between Walcha and Wauchope recorded a significantly high crash rate, with 43 motorcyclist crashes over 5 years resulting in 6 motorcyclist fatalities.

Approach

The review identified the need for a number of improvements, including upgrading the infrastructure in conjunction with an evaluation of the existing speed zones.

A Safe System approach was adopted, taking a holistic view of the road transport system and the interactions among the key components of that system – the road users, roads and roadsides, vehicles and travel speeds. This is in recognition that all component of the system have a role to play in helping to keep road users safe.

Developing a Package of Treatments

In consultation with local motorcycle groups and key stakeholders, a Safe Systems package was developed to reduce the likelihood and severity of crashes along this route. This included:

(1) Safer Roads

An infrastructure package of consistent delineation, shoulder sealing, safety barrier with motorcycle underrun and crash warning signage will be installed along the whole length of the 44km section. The proposed infrastructure measures will be installed to coincide with planned Asset works along the route.

(2) Safer Speeds

The speed limit along this length of road was reduced from 100 km/h to 80km/h.

(3) Safer People

Behavioural campaign material was prepared along the length of the road a 'Roads We Ride' video was launched for the Oxley Highway (https://www.youtube.com/watch?v=iiz_r5rE3dg).

Using Deep Learning to Detect Driver Distraction in the Australian Naturalistic Driving Study (ANDS) Video Data - Preliminary Results

Mohammed Elhenawy[a], Kristie Young[b], Andry Rakotonirainy[a], Raphael Grzebieta[c,d], Ann Williamson[c]

[a] Centre for Accident Research and Road Safety – Queensland (CARRSQ), Queensland University of Technology, Australia, [b] Monash University Accident Research Centre, Monash University, Australia, [c] Transport and Road Safety (TARS) Research Centre, University of New South Wales (UNSW) Sydney, Australia, [d] Victorian Institute of Forensic Medicine, Monash University, Australia

Abstract

This paper reports preliminary results of investigating the use of machine learning techniques to label distraction related events from video data collected from the Australian Naturalistic Driving Study (ANDS). This offline automatic labeling is designed to replace manual coding and accelerate the data reduction process with the view to save effort and money. We adopted the well-known pre-trained deep learning network Alex to label ANDS video data. The pre-trained network was used as a starting point after modifying the fully connected and classification layers. Then the modified model was retrained using ANDS data. The re-trained network achieved promising results despite low video quality.

Method

Convolutional Neural Networks (CNNs) are deep learning algorithms that are powerful for image classification. During the training, CNN learns the weights of the different layers to yield the best features and the least classification error. Training a CNN from scratch needs a large number of high quality images and long training time to facilitate transfer learning. Transfer learning exploits knowledge gained from solving one problem and applying it to a different but related problemas a shortcut to save time. We used the pre-trained model approach for transfer learning where we choose a pre-trained model (Alex network[1]). Then we modified the fully connected and classification layer to suit the driver distraction task. Finally, we tuned/re-trained the model using ANDS video data. We have chosen transfer learning because it offers the following benefits[2]:

1- Higher classification accuracy before tuning the pre-trained model
2- Higher rate of classification improvement during the training process
3- Higher final classification accuracy at the end of the training process

Results

This paper used six trips of the data collected as part of the ANDS. The videos of six trips were captured from different drivers. The video data were collected using a continuous multi–camera video recording system that captures the driver's face, forward and rear views, and a view of driver interaction with the dashboard and other systems at a rate of 15 Hz [3]. In this early stage of developing the classification model, we focus only on the videos which capture the interaction of the driver with the dashboard and other systems. The videos of five trips were converted into images/frames and were visually inspected to label each image as distracted or non-distracted [4]. The low quality images were removed from the training dataset. We re-trained Alex network using 7449 images extracted from five trips. The video of the sixth trip was processed in the same way as the training data and the resulting 2179 images were used to test the re-trained model. The test result is an indicator of how close the CNN model is to the manual coding.

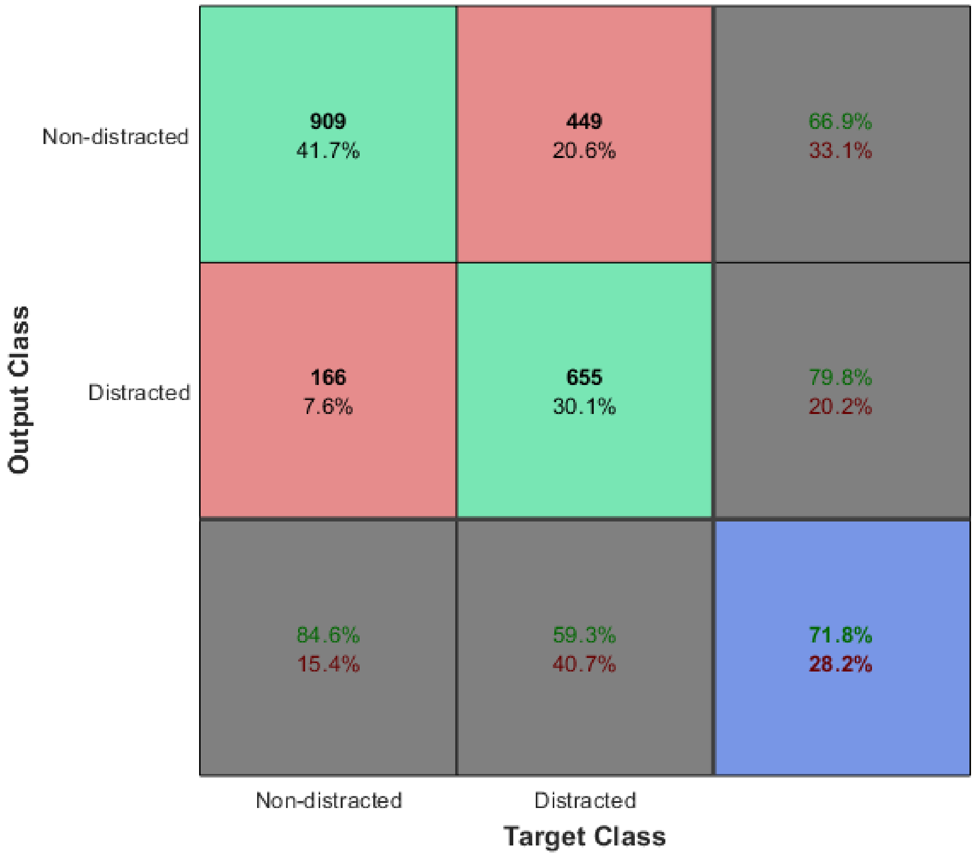


Figure 1. The confusion matrix plot of the re-trained Alex network where target class is the ground truth and output class is the predicted class

The results of testing the re-trained Alex network is shown in Figure 1. As shown in the figure, the accuracy, sensitivity, and specificity are 71.8%, 59.3% and 84.6%, respectively. These measures are promising and suggest that the approach is worth pursuing. The next steps to improve the automatic labeling will include adding much more data for training. Moreover, other models that incorporate the temporal correlation between frames will be used.

Conclusion

Automatic data reduction of video collected from ANDS is very important for downstream analysis due to the sheer size of collected data. Automatic reduction of video data will save effort, money/time and discover new knowledge. However, automatic analysis is challenging because of the data quality and quantity needed for building a good model. The preliminary results using CNN and transfer learning are very promising and our ongoing work to improve the classification model includes; adding more trips to the training dataset and test dataset and adapting recurrent neural network models which take advantage of the temporal correlation between frames to improve classification accuracy.

Acknowledgements

The ANDS study was funded by the Australian Federal Government’s Australian Research Council (ARC) under the infrastructure LIEF scheme (grant No. LE130100050) and research Linkage scheme (grant No. LP130100270) that were awarded to the Transport and Road Safety (TARS) Research Centre at the University of New South Wales (UNSW) in partnership with Monash University Accident Research Centre (MUARC), the Centre for Accident Research and Road Safety – Queensland (CARRSQ) at Queensland University of Technology (QUT), the Centre for Automotive Safety Research (CASR) at the University of Adelaide, the Centre for Road Safety, Transport for NSW (TfNSW), NSW’s State Insurance Regulatory Authority, Victoria’s Transport Accident

Commission, the Victorian State regulator VicRoads, South Australia's Motor Accidents Commission, the National Roads and Motorists Association (NRMA) in NSW, Seeing Machines, the Office of Road Safety, Government of Western Australia, and the Hyundai Motor Company. Supply of equipment and assistance with ANDS data was provided by The Virginia Tech Transportation Institute (VTTI) under the leadership of Prof. Jon Antin.

The Authors acknowledge the contribution of Prof Judith Charlton from MUARC, Prof. Narelle Haworth and Prof Teresa Senserrick from CARRSQ, Dr Jeremy Woolley from CASR to the project. The Authors would like to thank Jan Eusibo and Rainer Zeller from Transport and Road Safety (TARS) Research Centre at the University of New South Wales (UNSW) for their role in managing and operationalising the Australian study and the Sydney site. The contribution of the support staff Jess Hancock from TARS UNSW at the Sydney site and Yik-Xiang Hue, Andrew Lyberopolous and Samantha Bailey from MUARC at the Melbourne site is also gratefully acknowledged. The valuable contribution from John Wall and Ben Barnes from the Centre for Road Safety TfNSW in operationalising the Sydney installation site and the assistance from Hee Loong Wong from Hyundai Motor Company in providing the ANDS service vehicles for both the Sydney and Melbourne sites is also gratefully acknowledged. We thank Dr Karen Stephan for her statistical advice.

The Authors would also like to thank the ANDS participants. Without their contribution to the study, this publication would not have been possible.

Dr Kristie Young's contribution to this paper was funded by an ARC Discovery Early Career Researcher Award (DE160100372).

References

1. Krizhevsky, A., I. Sutskever, and G.E. Hinton. *Imagenet classification with deep convolutional neural networks*. in *Advances in neural information processing systems*. 2012.
2. Emilio Soria, O., et al., eds. *Handbook of Research on Machine Learning Applications and Trends: Algorithms, Methods, and Techniques*. 2010, IGI Global: Hershey, PA, USA. 1-852.
3. Williamson, A., et al. *The australian naturalistic driving study: From beginnings to launch*. in *Proceedings of the 2015 Australasian Road Safety Conference*. 2015.
4. Young, K.L.O., R., Koppel, S., Charlton, J., Grzebieta, R., Williamson, A., Haworth, N., Woolley, J., & Senserrick, T., *What are Australian drivers doing behind the wheel? An overview of secondary task data from the ANDS.* Journal of the Australasian College of Road Safety, 2019.

A systematic review on close-following or short headways: Preliminary findings

Raaj Kishore Biswas[a], Jake Olivier[b], Teresa Senserrick[c], Ann Williamson[a], Rena Friswell[a]

[a]Transport and Road Safety Research (TARS) Centre, University of New South Wales, [b]School of Mathematics and Statistics, University of New South Wales, [c]Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Queensland University of Technology – QUT

Abstract

Rear-end crashes account for the highest number of crashes among all crash types. An important component in understanding rear-end crashes is close-following tendency of drivers. However, headway is not consistently defined or measured in the research literature. In order to consolidate common headway definitions, a systematic review was conducted to summarize the definitions of headways and methods of measurement. Over half of the reviewed articles did not clearly define headway, which includes contextualizing reference points of headway measure (e.g., bumper/axle/rear) and explaining the accuracy of setups used to measure headway.

Background

The safety of car-following is an important segment in making the traffic system safe. Close following and unsafe headway lead to rear end crashes leading to long term injuries, such as head and spinal cord injuries, "whiplash" neck injuries and memory loss (Nekovee & Bie, 2013). Short distances between two vehicles are sometimes the result of aggressive driving or "tailgating", which most often lead to rear end crashes resulting to disabilities or injuries or, in worst-case scenarios, fatalities (Fiorani, Mariani, Minin, & Montanari 2008).

In order to consolidate common headway definitions, and to make recommendations on best uses and reporting of driver behavior, the objective of this study is to conduct a systematic review to summarize research articles that reported or methodological approaches related to headways.

Method

Two study authors searched four research databases (EMBASE, COMPENDEX, SCOPUS and MEDLINE) for peer-reviewed literature with the key terms being vehicl*, headway* and tailgat*, where studies prior to 1980 were excluded. From an initial 3552 documents, duplicate articles, non-English language documents and abstracts that did not match the search criteria were excluded. Primarily, abstracts where headway was considered either as a predictor or as an outcome variable were retained. Studies for light vehicle drivers in moving traffic flows on roads or in simulator studies that reported headways, and similar review, methodology and theoretical papers were retained.

After inspection of these 973 abstracts, with headway definitions and evaluated driver performance or driving behavior, 153 unique articles were chosen for full text review (Figure 1). Finally, 89 articles were considered fit for inclusion and they were added for qualitative synthesis.

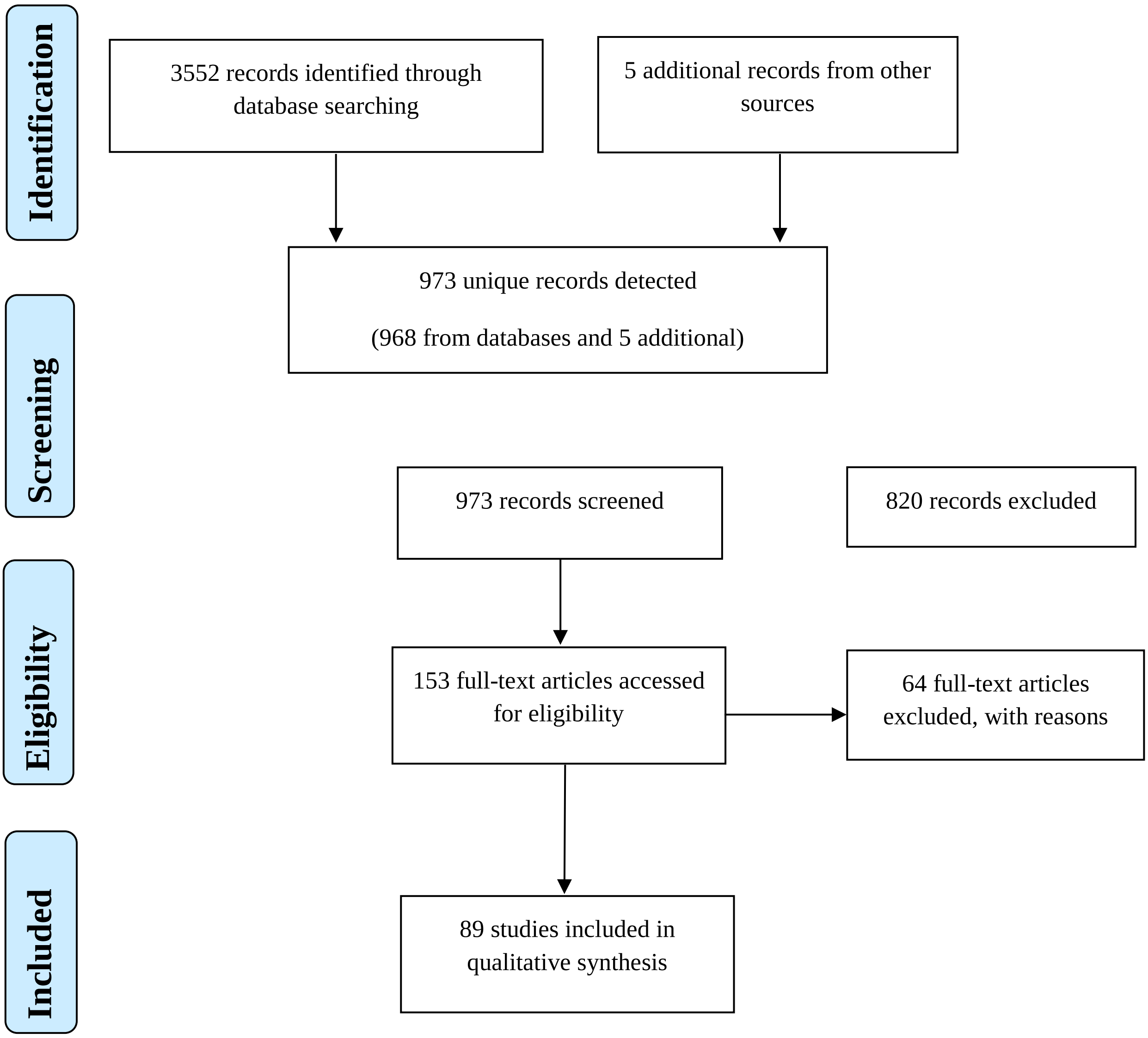


Figure 1: PRISMA Flowchart for the systematic review of unsafe headways.

Results and Conclusions

For specifying the time/distance reference points (e.g., bumper/axle/rear) of headway, studies used either texts or figures. Studies measured headway in different ways. First, studies measure headway in terms of time or distance making it difficult to compare them unless distance headway is defined in terms of the speed of the vehicle at the time. Second, even across studies looking at headway distance, measures differ. Studies can measure, for example, from the bumper of the lead car to the bumper of the following car (Taieb-Maimon and Shinar, 2001; Ding et al., 2017), from the axle of the lead car to the axle of the following (Mitra and Utsav, 2011) or from a range of other points (He et al., 2014).

Based on the empirical measurements for headways from the reviewed studies that focused driving behaviors, they were categorized into four types studies: simulation, roadside external features, on-road features and on-vehicle instruments. Table 1 shows that among the included 94 studies in the review, 23 (43%) of them characterized headway clearly using distance reference points (e.g., bumper/axle/rear) and explained the measuring method.

Table 1: Distribution of articles for various types of headway measurement

Measurement for headway	Number of articles	Headway defined (Percentage)
Empirical simulation	34	12 (35%)
Roadside external features	20	11 (55%)*
On-road features	16	10 (63%)
On-vehicle features	24	9 (38%)
Total	94**	23 (43%)

*One study measured headways manually using a stopwatch by an observer watching from a road bridge crossing (Postans and Wilson, 1983). **Some studies used multiple techniques, which were counted multiple time. Also, 3 studies were reviews, which were not counted here. Thus, the total went beyond the PRISMA Flowchart total of 89 studies (Figure 1)

Three recommendations could be made from reviewed articles. Firstly, definition of headway should include the reference points (e.g., bumper/axle/rear) of measurement. These could be greatly helped by using comprehensive mathematical definitions and/or pictorial depictions. Secondly, it should be mentioned and explained why vehicle length was included/excluded as part of the headway definition. Fourthly, the accuracy level of measuring devices used for headway quantification with their version number should be mentioned to inform the readers on the precision of findings.

References

Ding, N., Zhu, S., Wang, H., & Jiao, N. (2017). Effects of edge rate of the designed line markings on the following time headway. Scientia Iranica. Transaction A, Civil Engineering, 24(4), 1770.

Fiorani, M., Mariani, M., Minin, L., & Montanari, R. (2008, April). Monitoring time-headway in car-following task. In CHI'08 Extended Abstracts on Human Factors in Computing Systems (pp. 2143-2146). ACM.

He, J., Chaparro, A., Nguyen, B., Burge, R. J., Crandall, J., Chaparro, B., ... & Cao, S. (2014). Texting while driving: Is speech-based text entry less risky than handheld text entry?. Accident Analysis & Prevention, 72, 287-295.

Mitra, S., & Utsav, K. (2011). Car following under reduced visibility. Advances in Transportation Studies, (Special Issue 2011).

Nekovee, M., & Bie, J. (2013). Rear-end collision: causes and avoidance techniques. In Wireless Vehicular Networks for Car Collision Avoidance (pp. 99-119). Springer, New York, NY.

Taieb-Maimon, M., & Shinar, D. (2001). Minimum and comfortable driving headways: Reality versus perception. Human factors, 43(1), 159-172.

A Human Machine Interface for the Ipswich Connected Vehicle Pilot

Ronald Schroeter[a], Andy Bond[b], Katharine Mosley[c], Michael Pascale[a]

[a]Centre for Accident Research & Road Safety - Qld (CARRS-Q), Queensland University of Technology,
[b]Queensland University of Technology, [c]Queensland Department of Transport and Main Roads

Abstract

The Queensland Department of Transport and Main Roads (TMR) with support from Queensland University of Technology (QUT) and iMOVE Cooperative Research Centre is undertaking a pilot of Cooperative Intelligent Transport System (C-ITS) technologies (the Ipswich Connected Vehicle Pilot). The pilot comprises a field operational test involving 500 public participants with C-ITS technologies retrofitted to their vehicles. A human-machine interface (HMI) will provide the driver with advisory information and warnings relating to eight C-ITS safety use-cases. This extended abstract describes the design of the HMI based on pilot needs and relevant human factors guidelines and standards.

Background

A core objective of TMR's Ipswich Connected Vehicle Pilot is to validate the safety benefits of C-ITS. C-ITS enables vehicles to 'talk' to other connected vehicles, roadside infrastructure and traffic management centre systems to share relevant, advisory safety-related warnings (use-cases) for drivers (e.g. hazard ahead). Those warnings are conveyed to the driver through a human-machine interface (HMI), a small screen mounted on the vehicle dashboard.

A Safe System

The key underlying principle in the design of HMI warnings is the safe operation of individuals' vehicles. The goal of these warnings is to alert the driver to potentially unsafe conditions well in advance, without distracting them from the driving task manually or visually.

To address manual distraction, no physical interaction with the HMI is required while the car is in motion. Functions that require input, such as participant selection (Figure 1), can only be completed between "ignition on" and the vehicle moving.

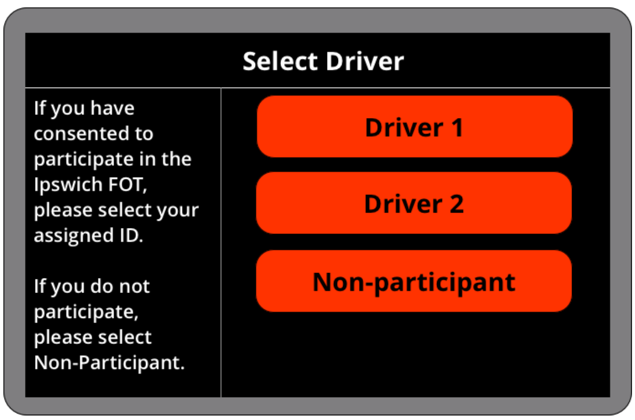


Figure 1. Example participant selection screen. Required for the safety analysis.

To minimise visual distraction and off-road glances, the screen is dash-mounted within 15 degrees of the forward field of view (J. L. Campbell et al., 2016, December), and follows simple, minimalist and consistent design principles for all use-case warnings, as described below.

Warning escalation framework

Warnings are only given if drivers are at a safety risk based on their current speed as they approach a hazardous situation. Risk is assessed using variables in the C-ITS data (e.g. current speed, distance to/ target speed at the hazard, safe braking deceleration).

Three urgency levels (low- 10 to 20 seconds, medium- three to 10 seconds, and high- less than three seconds) have been selected based on existing guidelines (ITC, 2011; SAE, 2002). Urgency is calculated using the driver's "Time to Action", or the time it will take to initiate safe deceleration to a target speed. This calculation follows a simple, deterministic, and consistent algorithm that also considers warning priority, based on criticality from a road-safety perspective (ISO, 2004).

Images and audio

The HMI warnings comprise of a combination of visual (dominant colours and large symbols for rapid processing (Ells & Dewar, 1979)) and audio (for high-level only (Campbell et al., 2007)) to strike a balance between nuisance-alerting and consistently/continuously providing information. Intuitive stimuli for the escalation framework (shape and colour, Figure 2) and use-cases (icons and labels, Figure 3) were generated based on a sample of representative participants' (n=50) responses to a brief survey.

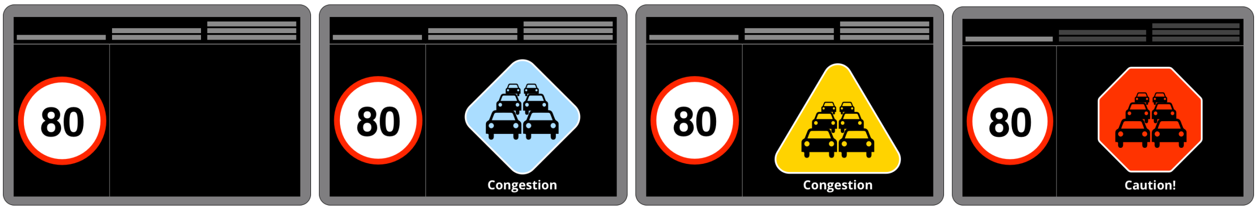


Figure 2. Example escalation of the "Congestion" warning. From left to right: no warning (blank), low-level warning (blue diamond), medium-level warning (yellow triangle) and high-level warning (red octagon).

Figure 3. Medium-level use-case icons and labels that were favoured by survey participants.

Conclusion

The ICVP HMI has been designed in accordance with best practice human factors and safety principles. Usability testing will be conducted to confirm the HMI, once developed, works as intended in real-world conditions.

References

Campbell, J. L., Brown, J. L., Graving, J. S., Richard, C. M., Lichty, M. G., Sanquist, T., & Morgan, J. L. (2016, December). Human factors design guidance for driver-vehicle interfaces (No. Report No. DOT HS 812 360). Washington, DC: National Highway Traffic Safety Administration.

Campbell, J. L., Richard, C. M., Brown, J. L., & McCallum, M. (2007). Crash warning system interfaces: human factors insights and lessons learned. DOT HS, 810, 697.

ITC - Economic Commission for Europe - Inland Transport Committee. (2011). Guidelines on establishing requirements for high-priority warning signals (No. ECE/TRANS/WP.29/2011/90). United Nations.

Ells, J. G., & Dewar, R. E. (1979). Rapid Comprehension of Verbal and Symbolic Traffic Sign Messages. Human Factors, 21(2), 161–168.

ISO. (2004). Road vehicles. Ergonomic aspects of transport information and control systems. Procedure for determining priority of messages presented to drivers (No. ISO 16951:2004 ED 1). ISO.

SAE - Safety and Human Factors Standards Steering Committee. (2002). ITS in-vehicle message priority (No. J2395). Warrendale, PA: SAE International. doi:10.4271/j2395_200202

Flashing Lights for Assistance Vehicles – Is Red Best?

Joel Tucker, Dr Ian Jeffreys

The Royal Automobile Club of Queensland

Abstract

It is widely believed that vehicle-mounted lights are effective in making vehicles more visible/conspicuous to other road users. For roadside workers, conspicuity is their first, and often only, line of defense. Following numerous near misses and impact incidents involving vehicles operating on high-speed (>80km/h speed limit) roads, RACQ trialed red flashing warning lights with the existing yellow flashing warning lights, comparing traffic speed and passing behavior.

Background

RACQ conducted this trial using RACQ tow trucks, Traffic Response Units and Roadside Assistance vehicles. This trial was permitted by the Queensland Department of Transport and Main Roads and the National Heavy Vehicle Regulator.

The objective was to compare vehicle passing speeds and lane change behavior when passing vehicles displaying flashing red and yellow lights, or flashing yellow lights alone. No prior public education about the lights' meaning was undertaken.

Method

RACQ research staff accompanied roadside staff at 70 incidents (e.g., disabled vehicle, traffic crash, debris on road) between November 2017 and February 2018.

Using an LTI-20/20 Ultralyte LIDAR Device with an attached Contour 2+ High Definition Digital Video Camera, speed data and passing distance behavior was captured for 7,493 passing vehicle movements.

While appropriate safety measures where undertaken by research staff, staff remained as inconspicuous as possible to minimize distraction. Staff complied with all directions of the Traffic Response Operator and Queensland Police Service officers.

A Linear Regression model was used to analyse passing speed, and a Multinomial Logistic Regression for passing distance. Several other factors were considered, including congestion, police presence, and speed limit reductions, among many others.

Results

The model suggested that fitment of flashing red lights did not reduce passing vehicle speeds, instead suggesting that passing speeds increased slightly when red flashing lights were fitted. This result was statistically significant. The analysis identified that other factors influenced passing behaviour.

The model also suggested that the following factors lead to a reduction in passing speed:

- Congestion – a reduction of 22.3km/h
- More than one disabled vehicle – 13.1km/h
- Site blocked by vegetation or infrastructure – 11.5km/h
- Police presence – 7.4km/h

- Vehicle stopped in lane – 8.2km/h
- Current speed limit lower than normal – 2.9km/h
- Fluid or debris on road – 4km/h
- Wide shoulder – 7.3km/h
- Road has a crest – 6.7km/h

The quality of the model was measured using standard measure of R-squared. The model returned an R-squared of 0.626, this suggests that 63% of the variation in passing speed is explained by the model.

Lane changing behaviour (move over) was analyzed using a Multinomial Logistic Regression model. The model used returned a Pseudo R-squared of 0.158, which suggests only 16% of the variation in behavior is explained by the model. As it was a weak model, it could not be used.

Conclusion

Red lights alone, did not provide a reduction in passing speeds, instead showing a slight increase.

Given that red flashing lights do not reduce passing motorists' speed, the RACQ's focus will be placed on improving passing distance behavior, as limited vehicle/engineering-based solutions are available.

Prioritising harm elimination: The effect of benefit-cost metrics and planning timeframes on perceived benefits

Chris Stokes, Jeremy Woolley, Mario Mongiardini

Centre for Automotive Safety Research, University of Adelaide

Abstract

Benefit-cost analysis is extensively used to justify and prioritise road infrastructure investment but its reliance, when applied to road safety initiatives, can be counter-productive. Due to their substantial costs, primary Safe System-aligned treatments that virtually eliminate harm often come with low benefit-cost ratios (BCRs) and it can take many decades for their benefits to mature. The aim of this study is to compare the benefits of high-BCR supporting treatments and low-BCR primary treatments over both short- and long-term planning timeframes. The results show that primary treatments provide greater long-term benefits but require adequate investment for these benefits to be realised.

Background

Benefit-cost analysis (BCA) is extensively used to justify and prioritise road infrastructure investment (Hauer, 2011). When applied to road safety initiatives, the reliance on high benefit-cost ratio (BCR) treatments can be counter-productive (Elvik, 2001). Safe System-aligned treatments are those that are the most capable of reducing harm on the road system. Primary treatments are able to virtually eliminate harm and supporting treatments can achieve large reductions in harm. BCA can be used to prioritise supporting road safety treatments, which have high-BCRs and reduce but do not eliminate FSIs, over low-BCR primary treatments that prioritise harm elimination.

Due to the often-substantial costs of primary treatments, their benefits over a network-wide basis can take many decades to mature. Supporting treatments, on the other hand, mature in their benefits comparatively quickly, making them appear as better investments when looked through the lens of conventional 10-20 year planning timeframes. However, supporting treatments will ultimately result in a certain reduction of FSIs but are ultimately not as well-aligned to the objective of harm elimination.

The aim of this study is to compare the benefits of high-BCR supporting treatments and low-BCR primary treatments that have strong alignment with a harm elimination objective, over both short- and long-term planning timeframes.

Method

A model was developed to estimate the accumulation of FSI casualties, for a section of a road network over extended periods of time, for different road infrastructure investment scenarios.

Case study

The model, considering two treatment scenarios, was applied to South Australia's state-managed, two-lane/two-way rural road network.

The "supporting" scenario consisted of shoulder sealing and the addition of edgeline and centerline audio tactile line marking. The "primary" scenario consisted of treatments well-aligned to the Safe System: Continuous roadside and median wire rope safety barriers.

Two investment levels were considered: Low ($50 million per year) and high ($200 million per year).

Two planning timeframes were considered: short-term (20 years) and long-term (50 years).

Treatment rollout was prioritised by road volume, from highest to lowest volume. The maximum value of each investment level was assumed to be spent each year until all roads were treated.

Data

Road length and volume data, and road crash data was collected for the case study roads through the Department of Planning, Transport and Infrastructure in South Australia.

Crash modification factors (CMFs) were used to estimate the effectiveness of each treatment type. The aggregated CMFs (considering all lane-departure crash types) are 0.23 for the primary scenario and 0.71 for the supporting scenario.

Treatment (installation and periodic replacement) costs were estimated from various sources. Net present value was estimated using a discount rate of 3%.

Results

Benefit-cost ratio (BCR) and cumulative fatal and serious injury (FSI) savings are provided in Table 1. The supporting scenario's BCR remains higher than the BCR of the Safe primary scenario irrespective of the planning timeframe.

Table 1. BCR and cumulative FSI savings after 20 and 50 years for each treatment scenario and investment level

Treatment scenario	Cumulative number of FSI casualties saved					
	20-year timeframe			50-year timeframe		
	BCR	Number of FSIs saved		BCR	Number of FSIs saved	
		Low investment	High investment		Low investment	High investment
Supporting	3.4	553	849	4.0	1,696	2,249
Primary	1.0	355	988	1.1	1,313	3,220

For both the 20-year and 50-year timeframes, the primary scenario resulted in greater FSI savings under the high investment level (Figure 1); this difference was substantial for the 50-year timeframe.

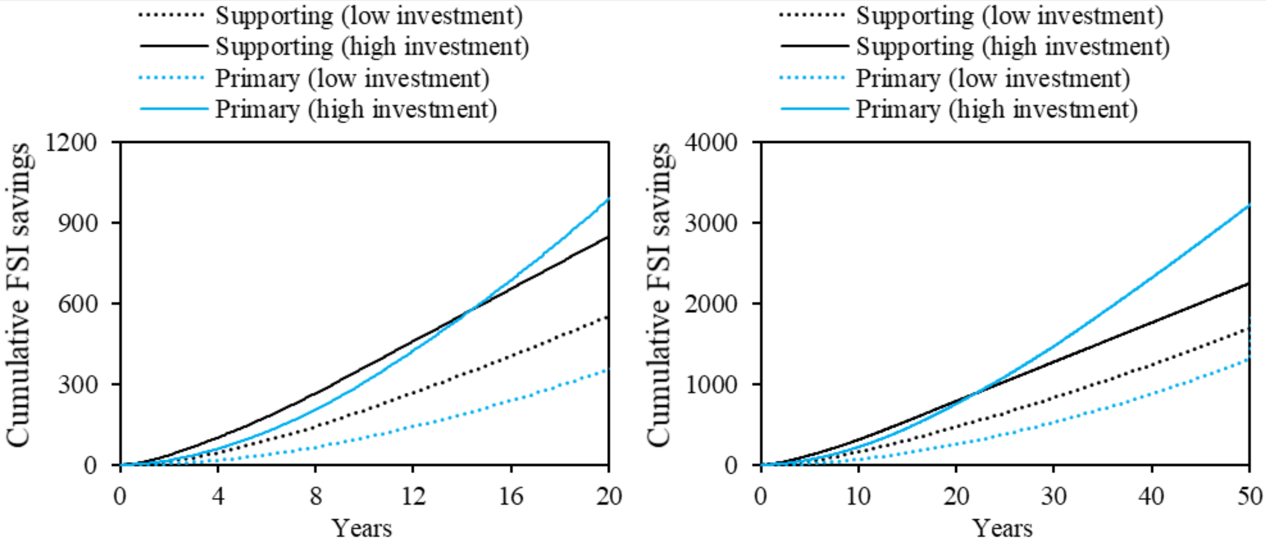


Figure 1. Cumulative FSI saved over time for each treatment scenario and investment level over 20 years (left) and 50 years (right)

Discussion

Using benefit-cost analysis, the supporting scenario could appear more attractive due to its higher BCR. The primary scenario is overshadowed in terms of BCR because of its substantially larger financial outlay.

Under a 50-year timeframe, the benefit of the primary scenario can be clearly observed. Despite the longer lead-time for treatment saturation over the network, FSI savings are substantially higher due to the greater emphasis on harm elimination of its primary treatments.

Conclusions

This study highlights two key messages. Firstly, despite the attractiveness of higher BCR treatments, substantially greater long-term FSI savings can be made with lower BCR treatments that place a greater emphasis on harm elimination. However, longer planning timeframes are required to observe such benefits.

Secondly, where there is a heavy reliance on safe roads for achieving the Safe System objective of harm elimination, adequate investment with an emphasis on harm elimination treatments is required if this objective is to be realised. Without this emphasis on primary Safe System-aligned treatments, harm elimination targets will not be realised, irrespective of the level of investment.

References

Elvik, R., 2001. Cost-benefit analysis of road safety measures: applicability and contraversies. Accident Analysis and Prevention 33, 9-17.

Hauer, E., 2011. Computing what the public wants: Some issues in road safety cost-benefit analysis. Accident Analysis and Prevention 43, 151-164.

Understanding the Role of Inattentional Blindness in Motorcyclists' LBFTS Crashes

Prasannah Prabhakharan[a], Jeremy Chung[a]

[a]Research Centre for Integrated Transport Innovation, School of Civil and Environmental Engineering, University of New South Wales, Sydney, Australia

Abstract

There is a growing body of evidence which suggests that the psychological mechanism which leads to a 'Look-But-Fail-To-See' (LBFTS) crash, where a driver looks but fails to perceive and act appropriately, could be through Inattentional Blindness (IB). IB occurs when attention is directed to particular objects or tasks, leading to failures to perceive an unexpected object, even if it appears in the middle of the visual scene (Mack & Rock, 1998). Extending on previous work by Prabhakharan & Chapman (2016), the present study aimed to further examine how 'attentional sets', might play a role in LBFTS crashes with motorcyclists.

Background, Method, Results and Conclusions

Background: Vulnerable road users, which includes pedestrians, cyclists and motorcyclists, make up 54% of all road fatalities worldwide (WHO, 2018). Of these, motorcyclists have the highest fatality rates amongst all road user groups. A common crash type with motorcyclists is a 'Look-But-Fail-To-See' (LBFTS) crash, where a driver makes appropriate head and eye movements, but fails to perceive and subsequently act appropriately towards another vehicle (Brown, 2002).

More recently a psychological phenomenon known as Inattentional Blindness (IB) has been used to explain why this crash type might occur (Prabhakharan & Chapman, 2016; Pammer, Sabadas, & Lentern, 2018). It has been suggested that one of the strategies the brain employs to deal with the vast quantity of information that is required to be processed, is to selectively 'set' attention to look for particular object types in the environment (Pammer et al, 2018, Most, Scholl, Clifford, & Simons, 2005). Whilst, this notion has been demonstrated using static images, the present study aimed to validate and extend upon this idea using a simulated video of a driving scene.

Method: As seen in Table 1, a between subjects' design was employed with three groups. Participants took part in a computer-based IB task where they watched a 30 second video of a simulated driving scene where they pull up to an x-junction with vehicles travelling in the perpendicular direction. Their task was to simply count either white cars (Groups 1 and 2) or blue cars (Group 3) that travelled past. In all of the clips, the same number of vehicles travelled past the observers' view. In addition, in all clips, a blue motorcyclist on a blue motorcycle traveled towards the observer from the opposite intersection, before proceeding to turn left. Following the clip, participants were asked a series of questions including whether they noticed a motorcyclist.

Table 1. study design

Group	Vehicles	Task
Group 1	Black and White Cars + Blue Motorcyclist	"Count White Cars"
Group 2	Red, Green, Blue and White Cars + Blue Motorcyclist	"Count White Cars"
Group 3	Red, Green, Blue and White Cars + Blue Motorcyclist	"Count Blue Cars"

Results: Results revealed that across conditions, there was a significant inattentional blindness effect demonstrated towards the motorcyclist, with only 21.4% of participants freely recalling seeing the motorcyclist. When cued with possible vehicles that may have been present, recall of the motorcyclist increased to 32.1%. Interestingly, 12.5% mistook the motorcyclist for a bicyclist, with this increasing to 21.4% when prompted. Alarmingly, 25% of participants recalled, when prompted, seeing objects that did not appear in the clip (e.g. sports car, van). Results also suggest significant group differences can be attributed to an interplay between attention and visual scanning patterns.

Conclusion: The results of the study are consistent with previous findings in this area (Prabhakharan & Chapman, 2016; Pammer et al., 2018), and further support the notion of Inattentional Blindness as a major contributing factor in LBFTS crashes with motorcyclists.

References

Brown, I. D. (2002). A review of the 'looked but failed to see' accident causation factor. In Behavioural research in road safety: Eleventh seminar.

Mack, A., & Rock, I. (1998). Inattentional blindness. MIT press.

Most, S. B., Scholl, B. J., Clifford, E. R., & Simons, D. J. (2005). What You See Is What You Set: Sustained Inattentional Blindness and the Capture of Awareness. Psychological Review, 112(1), 217-242. doi:10.1037/0033-295X.112.1.217

Pammer, K., Sabadas, S., & Lentern, S. (2018). Allocating Attention to Detect Motorcycles: The Role of Inattentional Blindness. Human Factors: The Journal of Human Factors and Ergonomics Society, 60(1), 5-19. doi:10.1177/0018720817733901

Prabhakharan, P. & Chapman. P. (2016). Motorcyclists in Our Midst': Inattentional Blindness at Traffic Intersections. Paper presented at the International Conference on Traffic and Transport Psychology, Brisbane, Australia.

Education and Training Requirements for Drivers of Automated Vehicles in Australia and New Zealand

Prasannah Prabhakharan[a], Mitchell L. Cunningham[a], Joanne M. Bennett[a], Michael A. Regan[a]

[a] Research Centre for Integrated Transport Innovation, School of Civil and Environmental Engineering, University of New South Wales, Sydney, Australia

Abstract

This paper documents the outcomes of Stage 1 of an Austroads-commissioned research study designed to examine what roles, if any, registration and licensing agencies and other stakeholders in Australia and New Zealand should be undertaking to ensure that licence applicants and licensed drivers are competent in the safe operation of advanced driver assistance systems and emerging automated driving features. The key findings from Stage 1, which involved a review of the literature, web search and consultation with members of the project international Expert Advisory Group, are reported in this paper.

Introduction

New technologies are entering the vehicle market capable of (a) supporting drivers to perform functions performed traditionally by humans (known as Advanced Driver Assistance Systems [ADAS]; SAE, 2018) and (b) automating the performance of some or all of these functions (known as Automated Driving Features [ADF]; SAE, 2018).

With increasing automation, driving tasks performed by drivers will change. Education and training will need to be adapted to facilitate the development of the knowledge, skills and behaviours required to perform these changing tasks (Spulber, 2016).

In 2018, Austroads commissioned UNSW Research Centre for Integrated Transport Innovation (rCITI) to examine what roles registration and licensing (R&L) agencies and other stakeholders in Australia and New Zealand should be undertaking to ensure that drivers are competent in the safe operation of ADAS and ADF. This paper documents the key findings from Stage 1 of the study.

Method

The project involves four stages:

- *Stage 1: Literature review and web search* – to review what ADAS/ADF exist, what skills and knowledge required to operate them, and who is currently providing education, training and assessment in the safe operation of automated vehicles (AV).
- *Stage 2: Stakeholder consultations* – with industry and government in Australia and New Zealand to discuss current strategies to integrate ADAS/ADF in driver education and training
- *Stage 3: Training Needs Analysis* – to systematically determine the knowledge, skills and behaviours required to safely operate ADAS/ADF
- *Stage 4: Assessment of key Issues* – to highlight areas where R&L agency actions may be required to facilitate AV driver education and training.

Findings

The following are some key findings that emerged from Stage 1:

- control of ADAS/ADF vehicles requires a different set of driving skills than that needed now
- consumers knowledge around limitations of ADAS/ADF is poor
- most consumers prefer to receive training through dealerships, at point of sale and delivery
- some dealerships provide consumers with information about ADAS/ADF, but it has been demonstrated to be limited, incomplete and sometimes inaccurate
- whilst descriptions of ADAS/ADF (what they are, how they function and their intended safety benefits) are available on numerous stakeholders' websites, almost no online information relating to the safe and appropriate use of ADAS/ADF was found. This was true for owners/users of *new* and *used* vehicles
- there were few driver testing programs (both locally and internationally) which assessed competency in the use of ADAS/ADF
- Any type of driver knowledge, education and/or training using ADAS/ADF systems prior to driving has been demonstrated to improve driving performance and trust compared to no training at all.

Conclusion

Driver education and training can facilitate the development of new knowledge, skills and behaviours required to drive vehicles equipped with ADAS/ADF. Future stages of the project will determine, whether there is a need for education and training, and if so, what roles R&L agencies and other stakeholders might play in preparing drivers for safe interaction with these vehicle features.

References

Society of Automotive Engineers (SAE) International (2018) J3016: Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles. Warrendale, PA: SAE

Spulber, A. (2016). Impact of automated vehicle technologies on driver skills. Report for Michigan Department of Transportation. Michigan, USA: Centre for Automotive Research

Deployment of WHS Guidance on Vehicles as a Workplace

Shane Stockill[a], Mark Cocker[b], Lisa Foley[c], Christine Henderson[d], Mark Hulme[e], David Bobbermen[f], Martin Small[g]

[a]Workplace Health and Safety Queenland, [b]WorkSafe Tasmania, [c]SafeWork NSW, [d]Comcare, [e]SafeWork SA, [f]Austroads, [a]Martin Small Consulting

Abstract

A national work health and safety (WHS) guide on Vehicles as a Workplace was published work health and safety regulators and Austroads in March 2019. A national forum was run to help launch the guide and a number of other supporting activities have been agreed. This paper will report on this activity, early lessons learned by WHS regulators in rolling out the guide, and a simple evaluation amongst industry participants as they take the guide forward.

Background, Method, and Results

Following endorsement by the Heads of Workplace Safety Authorities, a national work health and safety (WHS) guide on Vehicles as a Workplace was published by Australian WHS regulators and Austroads in March 2019. This is the first comprehensive WHS guidance to date on this topic.

Vehicle use in road traffic is the most significant contributor to work-related traumatic injury in Australia and New Zealand. The guide is for all firms, organisations and individuals who use vehicles on the road for work purposes. It addresses risk management whenever vehicles are used in road traffic for work purposes.

The WHS guide applies road traffic safety knowledge to the recognised aspects of WHS management, addressing:

- Safe as reasonably practicable
- Hierarchy of control
- Identification of hazards and risks

A national forum was run to help launch the guide and lay the platform for deployment of the guide by regulators, stakeholders, and industry. Follow-up activities planned are:

- Preparation of second tier guidance documents targeting specific activities of concern.
- Preparation of case studies and a simple example of how an industry association can use the national WHS guide to support its members.
- Technical support to regulators which have endorsed the guide for staff training and stakeholder awareness raising in relation to this issue.

This paper will report on this activity, and early lessons learned by WHS regulators in rolling out the guide. This will be supported by a simple evaluation amongst industry participants, focusing on their response to the guide, their confidence in taking the guide forward within different organizational settings, and the future support they may need.

References

Small, M, Holgate, J, and Bobbermen, D, 2018. Vehicles as workplace – a new framework for a critical road safety management issue. Extended Abstract, Australasian Road Safety Conference 2018, Sydney.

Targeted speed limit reductions for vulnerable road users – case learnings

Warren Anderson, Tracey Smith[a]

Department of Transport and Main Roads, Queensland

Abstract

In 2018, the Department of Transport and Main Roads undertook two demonstration projects to reduce speed limits in areas of high pedestrian and cyclist activity. The demonstration sites included one state-controlled strip road and one local government-controlled CBD area with above-average rates of casualty crashes. By developing a compelling case for speed limit reductions including crash data, alternative solutions, stakeholder support and road user mix data, lower speed limits for the two demonstration sites were introduced, supported by targeted local communications.

Background, Method, Results and Conclusions

Background

Vulnerable road users are a priority group for road safety in Queensland. In 2017, pedestrians and bicycle riders made up 16 per cent of the road toll, 32 per cent higher than the previous 5 year average.

TMR undertook a project to reduce speed limits in areas of high pedestrian and cyclist activity, consistent with repeated research findings which advocate lower travelling speeds and speed limits set for survivability to address trauma for vulnerable road users. This project aligned with existing policy actions and an election commitment.

The project intent was to demonstrate that speed limit reductions are a low cost and simple way to reduce road trauma when implemented in suitable locations. A parallel requirement of the project was to demonstrate delivery of low cost communications to educate the community about the need for and benefit of the reduction.

Statewide crash analysis and preliminary site investigations found two sites suitable for pursuing lower speed limits, being David Low Way, Coolum (beachfront esplanade) and Cairns CBD (tourism and business center).

In Coolum, the state road authority supported the speed limit reduction on the crash and survey evidence. In Cairns, TMR collaborated with council's road safety and engineering team, establishing a working group of local community and business representatives to gather support for the speed limit reduction recommendation to the Council.

Issues

Key issues associated with achieving approval in Cairns from decision makers and influencers were:

- Awareness – of the crash issue.
- Belief – that reduced speed limits would effect the crash issue.
- Community reaction.
- Misconceptions – about the causes of crashes and road users involved.

Approach

The joint TMR and Council project team, supported by the working group, drew all the facts and issues together to create a narrative that explained: the problem, why it could not be ignored, what the solution was (and was not), and how the solution could be carried out – making it easy and compelling for decision makers to say ‘yes’.

- Facts – Gathered facts regarding site history, case studies, focus groups, detailed crash data analysis, road user intersection counts, travelling speed surveys, observational explanations of behaviour.
- Engagement – Educated while consulting (focus groups), engaged local community representatives, educated while engaging decision makers, listened and responded to decision makers’ individual issues or concerns.
- Alternatives – Investigated alternatives solutions, including ‘do nothing’. Demonstrated why the alternatives are unsuitable or inferior to speed limit reductions.
- Professional help – Engaged communications specialist to lead stakeholder engagement, undertake local focus groups and develop messaging strategies to produce site-specific communications toolkits.

Outcomes

The ultimate outcomes were speed limit reductions in both locations. As the speed limit reductions commenced in December 2018 and February 2019 it is too soon to consider crash outcomes.

Further project to investigate speed limit reductions at another 20 sites.

Key learnings:

- Structure community engagement to maximise likelihood of success.
- Work collaboratively and flexibly with the local road authority.
- Create the narrative so that it’s impossible to do nothing, but easy to say yes.

Hold the Red: innovative technology reducing the risk of crashes at signalized intersections

Connor Broe [a], Warren Anderson [a], Peter Kolesnik [a], Allan Hales [b]

[a] Department of Transport and Main Roads, [b] Queensland Police Service

Abstract

Crashes at signalised intersections caused by motorists disobeying red light signals carry elevated risks of serious injury or fatalities. In an Australian first, the Department of Transport and Main Roads and the Queensland Police Service are conducting a trial of innovative crash-avoidance radar-based technology at several intersections across Queensland which monitors vehicle speeds approaching an intersection, predicts when a vehicle will run a red light and then extends the opposing red lights to prevent vehicles and pedestrians from entering the intersection, lowering the chance of a crash while still issuing infringement notices to the offender.

Background

In Queensland, there are approximately 1,700 signalised intersections. Crashes at signalised intersections caused by motorists disobeying red light signals are especially dangerous as they frequently lead to adjacent direction or T-bone crashes at high speeds with high severity outcomes. From 1 January 2013 to 31 December 2017, crashes at intersections with operating traffic lights were responsible for 11.5% of all serious casualties in Queensland (n=3,887).[1] These casualties were estimated to have cost Queensland approximately $2.35 billion over the five-year period.[2]

The majority of red-light running occurs in the first few seconds after the light has switched to red as drivers are either inattentive or erroneously believe they have enough time to cross before the red. To allow for late entrants to clear the intersection, signalised intersections are programmed with an ‘all- red’ phase during which all the lights are red, which typically lasts for 2-3 seconds.

Hold the Red technology

Hold the Red (HTR) is an intelligent crash avoidance system that is installed into the Traffic Controller Cabinet at signalised intersections using a virtual loop card. The system uses radar to track each vehicle approaching an intersection up to 150m from the stop bar. This range provides the advantage of using radar over other alternatives such as existing induction loops as the radar system can dynamically track the speed of vehicles and predict when a vehicle approaching an intersection will not be able to stop in time. When such a vehicle is detected, HTR instructs the signal controls to extend the all-red phase by an extra 2 seconds. Law-abiding drivers in cross traffic lanes do not enter the intersection, reducing the chances they’ll enter into a potentially hazardous situation. When Speed or Red Light Cameras are operating at the intersection an infringement notice can also be issued to offenders, reinforcing behaviour change while minimising the risk of serious casualties.

[1] Serious casualties = fatalities or hospitalisations as a result of a crash.
[2] Calculated using Transport and Infrastructure Council Willingness To Pay values in 2017 dollars value.

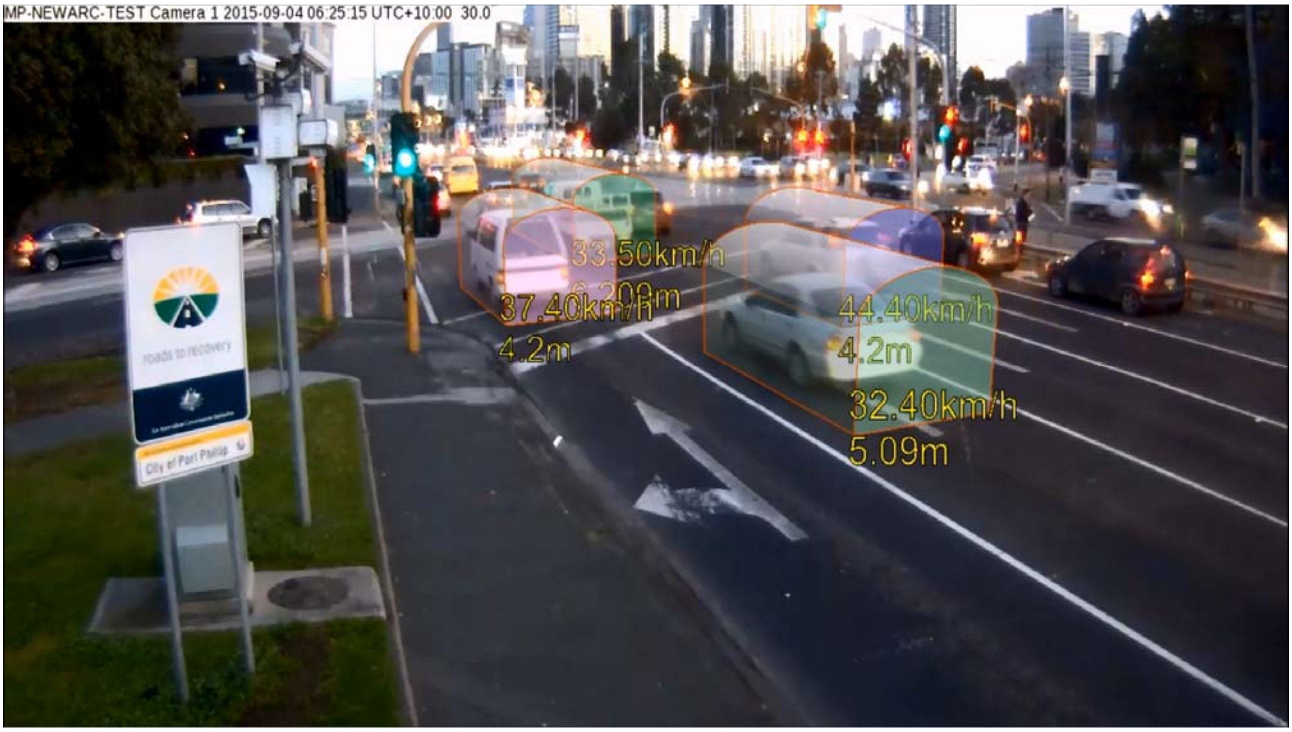


Figure 1. Hold the Red camera view with speed overlay

Queensland Trial

TMR and QPS officers created the HTR project as a joint submission for the TMR Director-General's Innovation Challenge, known as the 'TMR Hack'. In Queensland, HTR is currently being trialled at four intersections. The four sites were chosen from the list of intersections selected for installation of Combined Red Light/Speed (CRLS) cameras in 2018. This list comprised sites with the most significant crash history related to red light running over the preceding five years. Combining the installation of Hold The Red with the CRLS cameras allowed for minimisation of roadworks disruption at the sites. Site assessments were carried out to ensure that HTR technology would be suitable for the configuration of each site. Installation at the four trial sites was carried out between August and October 2018.

Figure 2. Labelled diagram of Hold the Red system in Ashmore, Queensland

The system had activated (extended the all-red phase) 6325 times across the four sites as at 26 May 2019. The highest number of activations on one day at one site was 37 on 21 November 2018.

Detailed trigger information was available and analysed for one month (October 2018). Two sites were excluded due to data irregularities and technical issues. Initial evaluation of this data showed that the system was activated most often between 11AM and 1PM. There are also noticeable decreases around 9AM and 5AM. This behaviour is closely linked to vehicle volume on the road. The proportion of activated cycles to all cycles varied from 1:101 to 1:140. This demonstrates that red light running continues to be a problem at these intersections.

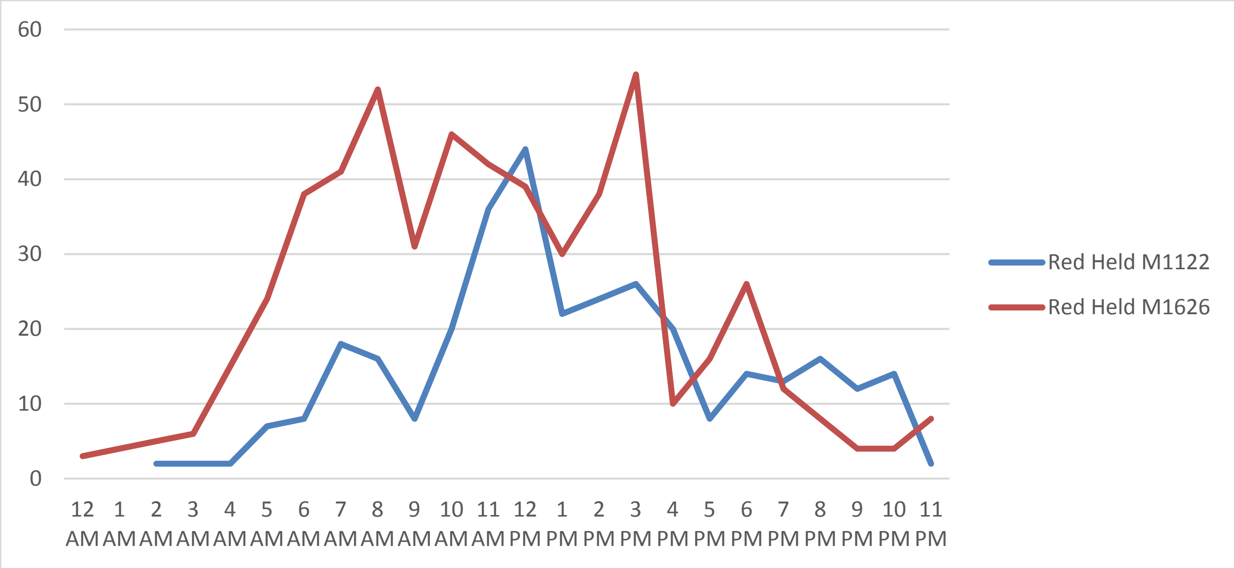


Figure 3. Number of Hold the Red activations by hour of day during October

While these initial numbers are promising and demonstrate the potential of HTR, it is still a work in progress. Not every activation is necessarily accompanied by an event of red light running as the prediction algorithms are fine-tuned. However, the aim of HTR is to prevent crashes at intersections, not to reduce or punish instances of red light running.

To analyse the performance of HTR, CARRS-Q was selected via a procurement process to conduct the independent evaluation of HTR performance. The objectives of the evaluation are to determine if HTR is performing as intended, and to determine the impact HTR has had on safety and traffic flow at the trial intersections. The evaluation is intended to produce an initial report in June 2019, followed by a final report in December 2019. The report will be comprised of:

- Review of the performance of the HTR system, including analysis of the trigger point of the system, in particular any failures to trigger (vehicle continues through red light without opposite red being extended) as well as any false triggers (HTR triggered without any vehicle continuing through the red light).
- Review of road safety benefits of HTR during the trial period.
- Analysis of potential unintended consequences of HTR, for example, disrupted/increased traffic at sites or potential increase in red light running.
- Development of recommendations for future HTR implementation.
- Review of scientific and grey literature regarding HTR systems worldwide.

Results of the initial report will be included in the presentation at Adelaide.

Future plans for Hold the Red include installation at intersections of different types, including at sites without a CRLS Camera, and at sites with existing CRLS cameras (instead of concurrent installation of CRLS and HTR).

Connect the Community - Development of a Public C-ITS Awareness Campaign

Clare Murray [a]

[a]Queensland Department of Transport and Main Roads

Abstract

The Queensland Department of Transport and Main Roads (TMR) will deliver the Ipswich Connected Vehicle Pilot, Australia's largest trial of Cooperative Intelligent Transport Systems (C-ITS) technologies from late 2019.

A key objective of this Pilot is to increase the public's awareness and understanding of C-ITS, so as to increase consumer confidence in the technology and increase uptake. To meet this objective, and to raise awareness of the existence of the Pilot, TMR will deliver a public C-ITS awareness campaign.

This paper discusses the methodology and approach of this campaign, and implications for public education and Pilot participant recruitment.

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 largest component of CAVI is the Ipswich Connected Vehicle Pilot. The Pilot will include up to 500 vehicles retrofitted with C-ITS technologies. C-ITS enables vehicles to 'talk' to other connected vehicles, roadside infrastructure and traffic management centre systems to share relevant safety-related messages for drivers. The driver is still in control of the vehicle, and there is no element of vehicle automation.

Currently, there is a lack of awareness and some confusion in the general community about C-ITS, connected vehicles, automated vehicles, and connected and automated vehicles (CAVs) with most people defaulting to their limited knowledge of fully autonomous or driverless vehicles.

Research results from a 2017 TMR survey showed that around a quarter of southeast Queensland motorists (28%) surveyed were aware of cooperative vehicles. Despite not being commercially available, one in ten (7%) responded they had experienced a cooperative/connected vehicle, supporting the result that motorists are confused about what these vehicles are. Focus group research conducted in 2018, supported these findings.

Method

In 2019, TMR will be developing and delivering a C-ITS public awareness campaign. This campaign aims to address the lack of awareness and understanding of what connected vehicles are, how C-ITS technologies work, the benefits (safety, mobility, and environmental), and likely timeframe for deployment to overcome barriers to participation and acceptance of C-ITS technologies when introduced more broadly to Queensland's road network.

The campaign is being designed to also assist in laying the ground work for the call for Pilot participants by providing information direct to the Ipswich community. With greater understanding, it is more likely participants would be more accepting of the changes to their vehicles and roadside infrastructure experienced during the Pilot

The campaign is expected to run for twelve weeks, and will include a mix of digital and printed assets, including vox pops, infographics, social media quizzes, static images, myth busting content and brand videos. The assets are being developed in a way that maximizes their use amongst road users and internal TMR staff.

Paid social media coming from the TMR Facebook page will be the primary channel of the campaign, allowing for tightly targeted activity to the primary audience residing in and around Ipswich, as well as paid activity allowing access to people across southeast Queensland and the rest of the State.

Social media communication assets will be served sequentially, so as users see a particular asset or message a number of times, they will be moved into the next set to be served the next message in sequence, thereby building understanding over time. This digital strategy allows for testing of different messaging to see which one performs best, and the ability to boost that activity ensuring the best performance against set targets.

Conclusions

Developing a suite of creative assets covering a variety of messages is expected to deliver diverse content frequently, and generate understanding and confidence amongst the target audience. The variety of messaging is also expected to increase the audience's knowledge and understanding of C-ITS. This presentation will provide both campaign strategy and development information

Gamification, coding and crossing the road: Innovation in school road safety education in Queensland

Nicole Downing[a], Deborah Evans[a], Darren Mulholland[a]

[a]Queensland Department of Transport and Main Roads, Brisbane, Queensland – AUSTRALIA

Abstract

The Queensland Department of Transport and Main Roads (TMR) aims to drive culture change in road safety, including through whole-of-life education. Schools are an essential channel. In Queensland, road safety is an optional part of the curriculum. In 2015, TMR reviewed its resource offering and determined a new approach was needed. The new online program *Journi* was designed to address customer needs through at least three innovative approaches: gamification to promote engagement; links to new curriculum requirements for digital technologies; and provision of practical tools for teachers. TMR is monitoring Journi and planning an evaluation. Results will inform further development.

Background

Under the *Queensland Road Safety Strategy 2015-21*, culture change is one of the four principles guiding efforts to reduce serious road trauma (TMR, 2015). In support of this, the Queensland Department of Transport and Main Roads (TMR) is adopting a whole-of-life approach to road safety education. Schools are an essential channel, providing a context to reach young people with repeated messages and equip them to be safe and responsible road users as they mature.

TMR has previously developed curriculum-linked materials to enable Queensland teachers to integrate road safety messages into class time. However, unlike in some other Australian states and territories, road safety is not a mandatory part of the curriculum taught in Queensland (ACARA, 2018). In 2015, TMR reviewed its resources and determined a new, customer-focused approach was needed to drive take-up in the absence of a mandatory requirement.

Development of Journi

Market research was conducted with Queensland teachers to identify factors influencing take-up. Among the most important factors identified were: robust curriculum links, engaging and motivating assessment tasks and support for delivering new curriculum requirements for digital technologies.

The result was the online program *Journi*. Queensland teachers and students can log in to the Journi website to complete activities and assessment, linked to the curriculum. Student activities include designing a survey and infographic and coding a digital game or quiz, alongside quizzes, games and videos featuring Queensland experts in statistics, games design and surgery.

Journi was designed to address these customer needs through at least three innovative approaches. First, Journi uses gamification. A novel concept in education, gamification is theorised to promote engagement by allowing learners freedom to experiment and fail, try on identities and apply effort and reflection in way that works for them (Klopfer et al., 2009). In Journi, gamification aims to encourage long-term and repeated engagement with the program and hence exposure to the road safety messages.

Second, Journi targets Science, Technology, Engineering and Maths (STEM). Most road safety curriculum resources link to Health and Physical Education (HPE), whereas Journi links to the Digital

Technologies as well as HPE. Coding is a new area for many teachers and there is demand for easy to use resources, offering another ‘hook’ to encourage Journi take-up.

Third, Journi provides in-depth support for teachers. Journi has a dedicated section for teachers where they may access detailed links to content descriptions and achievement standards, lesson plans, printable resources and a dashboard to mark assessment.

Conclusion & next steps

With schools under pressure to teach a range of life skills, programs must be educationally rigorous while being engaging and accessible. In Journi, TMR aims to realise the benefits of a digital, interactive platform to meet customer needs.

TMR is currently monitoring Journi take-up. It is further considering options to evaluate usability and technical issues experienced by users. Results will inform further development, including development of content for other year levels.

References

Australian Curriculum, Assessment and Reporting Authority (ACARA). (2018). The Australian Curriculum: Health and Physical Education (F–10). Sydney: ACARA. Available at: https://www.australiancurriculum.edu.au/f-10-curriculum/health-and-physical-education/. Accessed 29 January 2019.

Department of Transport and Main Roads (TMR). (2015). Queensland Road Safety Strategy 2015-21. Brisbane, Queensland: TMR.

Klopfer, Eric, Osterweil, Scot and Salen, Katie. (2009). Moving learning games forward: obstacles, opportunities and openness. Cambridge, Massachusetts: The Education Arcade, Massachusetts Institute of Technology.

School Drug Education and Road Aware (SDERA). (2009). Getting it together: a whole school approach to road safety education. Padbury, Western Australia: SDERA, Government of Western Australia.

World Health Organisation (WHO). (1986). Ottawa Charter for health promotion. Geneva: WHO.

World Health Organisation (WHO). (2006). What is the evidence on school health promotion in improving health or preventable disease and, specifically, what is the effectiveness of the health promoting schools approach?. Copenhagen: WHO Regional Office for Europe’s Health Evidence Network.

Public sector innovation: an ecosystem-based approach to addressing driver distraction

Nicole Downing [a], Stuart Maxwell [b]

[a] Department of Transport and Main Roads, Queensland

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. The Department of Transport and Main Roads (TMR) in Queensland has applied an ecosystem-based approach to this ‘wicked’ policy problem by co-designing solutions with stakeholders who may contribute to drivers’ decision-making to engage in this high-risk behavior.

Background

On average 25 people are killed and 1,235 seriously injured on Queensland roads per year as a result of crashes where driver distraction played a part (TMR, 2018). It has been estimated that mobile phones and other devices may be a factor in an estimated seven per cent of all crashes (BITRE, 2014). Despite the dangers, approximately 70 per cent of Queenslanders admit to using their mobile phone illegally in the car (Footprints 2018).

Understanding the issue

The Department has completed Stage 2 of a multi-stage Driver Distraction Project investigating the causes of mobile phone-related driver distraction and co-designing solutions with stakeholders to address this behavior. This included collaborating with federal, state and territory transport agencies across Australia.

In Stage 1, TMR applied design-thinking methodologies to better understand the influence other factors were playing on drivers’ decision-making. Drivers and subject matter experts were engaged in this process. This revealed that drivers sit at the centre of a complex ‘ecosystem’ of elements that each, to varying degrees, reinforce driver’s risk-reward decision to use a mobile phone or other device while driving. This ecosystem comprises elements including, vehicle and mobile phone manufacturers, insurance and telecommunication providers, infrastructure planners and builders, and regulatory and enforcement agencies.

This suggested a ‘systems approach’ was needed to significantly impact driver behavior.

Tackling driver distraction

In Stage 2 of the project TMR applied a holistic approach that encompassed all the elements of the ecosystem contributing to the problem centered around four separate, yet interrelated, streams of work (see Figure 1):

1. Engage with, and bring together, stakeholders from across the ecosystem
2. Review and develop a new penalty regime
3. Assess the feasibility of technology-based solutions
4. Apply chain of responsibility principles to employers and Original Equipment Manufacturers

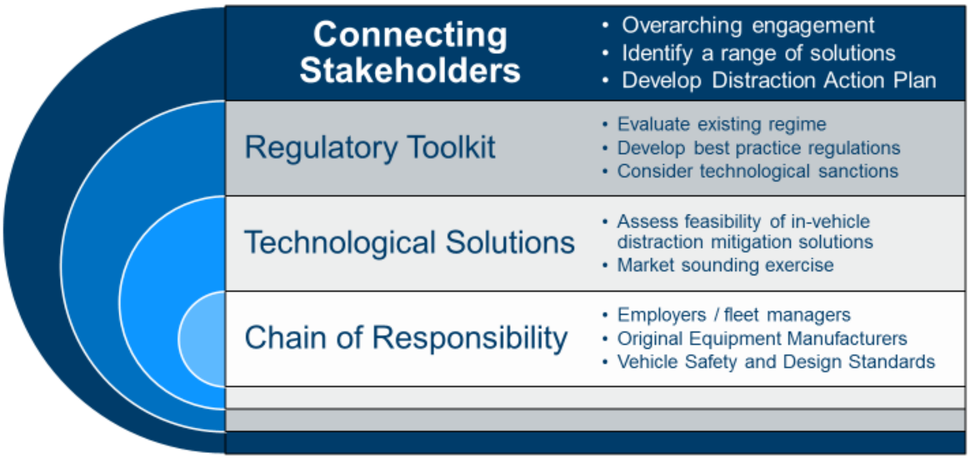


Figure 1. Driver Distraction Project scope – Stage 2

Through Stage 2, TMR adopted the role of *Convener*, by bringing stakeholders in the ecosystem together to share knowledge and resources to solve the challenge of driver distraction. This involved convening solutions-focused stakeholder engagement forums, including industry workshops, technology discovery days and a National Summit.

The key outcome from this stage was an action plan outlining tangible solutions with a roadmap for their implementation. Equally important has been the development of a sense of shared responsibility by stakeholders across the ecosystem.

TMR demonstrated public sector innovation through applying this ecosystem-based approach so that stakeholders now understand their role and can adopt appropriate strategies to overcome the problem posed by driver distraction (Deloitte, 2017).

This approach to a 'wicked' problem has provided valuable insights and lessons learned for policy practitioners to inform future policy direction.

References

Bureau of Infrastructure, Transport and Regional Economics (BITRE). (2014). Research Report 140. Impacts of road trauma and measures to improve outcomes. Canberra, ACT.

Deloitte. (2017). Catalyzing public sector innovation. A report from the Deloitte Center for Government Insights.

Department of Transport and Main Roads (TMR). (2018). Data Analysis Unit. Brisbane, Queensland.

Footprints Market Research. (2018). Driver Behaviour & Attitudes Study. Research undertaken for the Department of Transport and Main Roads and BCM Partnership, Brisbane.

The Australia New Zealand Trauma Registry – Transport-related trauma (20 word limit)

Mark Fitzgerald[a,b,c], Kate Curtis[f,g], Peter Cameron[b,d,e], Teresa Howard[b,c], Emily McKie[e], and Jane Ford[e], on behalf of the Australian Trauma Quality Improvement Program (AusTQIP) Collaboration

[a]Alfred Trauma Service, The Alfred, Melbourne, [b]National Trauma Research Institute, Alfred Health and Monash University, Melbourne, [c]Central Clinical School, Monash University, Melbourne, [d] Emergency and Trauma Centre, The Alfred, Melbourne, [e] School of Public Health and Preventive Medicine, Monash University, Melbourne, [f]Sydney Nursing School, University of Sydney, NSW, [g] George Institute for Global Health, Sydney, NSW.

Abstract

The Australian Automobile Association estimated the cost of road trauma at $30 billion a year[1]. Operating since 2011, the Australian New Zealand Trauma Registry collects trauma data from major trauma centres across Australia, and more recently New Zealand, in order to reflect and act upon emerging trends and demands on the trauma system, and to improve road safety across Australia.

The ATR has data from nearly 30,000 road-transport related severely injured patients, that can contribute to improvements to road safety. The ATR seeks to increase its collaboration with road safety and transport peak bodies to use this data more effectively.

Background and Discussion

Operating since 2012, the ATR (www.atr.org.au) is a key component of the Australian Trauma Quality Improvement Program (AusTQIP). It provides in-hospital trauma data that forms the basis for understanding burden and patterns of severe injury in Australia.

AusTQIP was established in 2011 by the National Trauma Research Institute, Alfred Health and Monash University[2]. It is a collaboration between all Australian major trauma centres and established state and hospital-based trauma registries. AusTQIP currently includes 26 major trauma centres, representing every state/territory in Australia, whose mission is to improve survival, enhance the quality of trauma care, and optimise recovery by shared data and shared knowledge. In 2018, it was joined by New Zealand, representing seven acute-care hospitals.

The ATR collects 67 data-points in accordance with the bi-national Trauma Minimum Dataset for Australia and New Zealand, for severely injured patients (ISS > 12) or death after injury. It collects, analyses and presents national trauma data, which includes how patients were injured, the nature of the injuries sustained, the treatment received and functional outcomes – the full patient journey through the Australian hospital system. There is no other national data collection in Australia that can tell us about the processes of trauma care and patient outcomes.

A subset of the ATR dataset collects road transport information, that when combined with the medical and outcome data, can show road trauma trends and emerging risks. The ATR now has data from 2010 to the June 2018, representing over 65,000 patients, almost half of which are caused by transport-related trauma. Our data shows that one in four in-hospital deaths of trauma patients is caused by road-transport related trauma[3,4]; the numbers remaining stable over the last three years despite targeted campaigns. Over the last three years, the numbers of off-road (non-traffic) accidents have been increasing[4].

ATR data is accessible to all contributors, clinicians, researchers, hospital administration, state and federal governments, peak bodies and the public. Transport-related ATR data is used by the Department of Infrastructure, Regional Development and Cities - Bureau of Infrastructure, Transport and Regional Economics (BITRE), who are provided with bi-national trauma datasets (https://bitre.gov.au/publications/ongoing/severe-injury.aspx.). The Australian Automobile Association is also working with the ATR linking emergency department data and ambulance service crash site geolocations for minor and major on-road injuries that present to an emergency department. It is predicted that this dataset will allow for the identification of more timely trends in on-road crashes, including location, providing an opportunity for proactive solutions to be implemented in order to reduce the burden of on-road trauma on the health care system.

Conclusion

The ATR seeks to increase the use of its data by road safety and road transport companies. In this presentation, we will present transport-related trauma data collected by the ATR in the last eight years; discuss current and past transport-related trauma engagement; identify emerging trends; and demonstrate how this unique data set can be used to improve road safety and reduce the number of severely injured people on our roads.

References

[1]Australian Automobile Association. Benchmarking the performance of the National Road Safety Strategy. 2017 Available from URL: https://www.aaa.asn.au/wpcontent/uploads/2018/03/AAABenchmarking-Report_Q4-2017.pdf

[2]Fitzgerald MC, Curtis K, Cameron PA, Ford JE, Howard TS, Crozier JA, Fitzgerald A, Gruen, RL and Pollard C (2018) ANZ J Surg (In press) doi: 10.1111/ans.14940

[3]Australian Trauma Quality Improvement (AusTQIP) Collaboration (2018). Australian Trauma Registry, Management of the Severely Injured in Australia, 1 July 2015 to 30 June 2016, Alfred Health, Melbourne, Victoria.

[4]Australian Trauma Quality Improvement (AusTQIP) Collaboration (2018). Australian Trauma Registry, Management of the Severely Injured in Australia, 1 July 2016 to 30 June 2017, Alfred Health, Melbourne, Victoria.

Implementing the Queensland Road Safety Policy

Lachlan Moir, Simon Harrison
Queensland Department of Transport and Main Roads

Abstract

In 2018, senior leadership within Queensland's Department of Transport and Main Roads (TMR) signed off the first “Road Safety Policy”. The policy aims to embed Safe System principles in TMRs business and includes two key methods being, 1, to incorporate default treatments in all new projects and 2, to mandate the use of a newly developed Safe System Project Management Control Checklist and utilise the Austroads’ Safe System Assessment Framework throughout all stages of the projects lifecycle from early concept planning to finalisation. The implementation of the Policy included stakeholder engagement prior to final sign-off, workshops with affected areas and the development of fact sheets and frequently asked questions.

Background

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.

The Safe System’s 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 Queensland 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 challenge is to ensure that transport investment which is being driven by other outcomes also prioritises the delivery of safety improvements.

The Policy

The Road Safety Policy aims to incorporate these Safe System principles in the project lifecycle of all projects in all investment programs, through the planning, development, implementation and finalisation phases. There are two main goals of the policy, the first is to incorporate known and accepted best practice treatments in to all projects as the ‘default standard’, 13 of these are included in the Policy; the second is to aid the incorporation of the Safe System principles using a newly developed Safe System Project Management Control Checklist and the Austroads’ Safe System Assessment Framework.

The Road Safety Policy was signed off by TMR’s leadership in August 2018 and went into immediate effect. Achieving the sign off by senior leadership required extensive consultation across the department.

Challenges and resolution

Since coming into effect, the Safer Roads team (the policy owners) have faced many challenges in implementing the intent of the policy. The common theme in the feedback received on the policy was around the intent of the default treatments and how they should be implemented.

To overcome these challenges and ensure the intent of the policy is met, the Safer Roads team have been conducting workshops with other teams that implement the policy as well as developing fact sheets which explain the reasoning behind the default treatments. The fact sheets are living documents which are updated in response to questions received or from further consultation with technical experts.

The Safer Roads team is also undertaking specialist Safe System Assessment training to better be able to assist the department with their obligations under the policy.

Ensuring that the Road Safety Policy is implemented effectively assists TMR in meeting its goals under the Queensland Road Safety Strategy 2015–21.

References

Transport and Main Roads (2018), Road Safety Policy

Queensland Government (2015), Safer Roads, Safer Queensland: Queensland's Road Safety Strategy 2015-21

Queensland Government (2017), Safer Roads, Safer Queensland: Queensland's Road Safety Action Plan 2017-19

A Corridor Analysis Approach to Selecting Combined Red-light Speed Camera Sites in Queensland

Patrick McShane [a]

Department of Transport and Main Roads, Queensland

Abstract

During 2018, an enhanced methodology was developed for selecting suitable sites for the placement of combined red-light speed cameras within Queensland. Preliminary evaluations of recent installations suggest that the combined red-light speed cameras can influence crashes at the immediate site and at other signalised intersections along the adjoining road corridor, providing support for previously reported "halo effects". Using this reasoning, the Department of Transport and Main Roads (TMR) revised its site selection methodology to prioritise placement by ranking road corridors in one-kilometre segments on the prevalence of red-light violation type crashes and speed related crashes.

Background

Since 1992 Queensland has maintained a camera enforcement program to reduce the occurrence of crashes involving disobeying red traffic lights. Camera technology has evolved from wet film cameras shared between sites to digital full-time enforcement. More recently, red-light cameras have the combined capability of speed detection. During 2018, combined red-light speed cameras were installed at five new sites and five existing sites were upgraded with the new technology within Queensland. Historically, site specific crash data was used to analyse individual intersections to identify the worst locations for crashes involving disobeying red traffic lights. This was successful with an estimated $1.16 million per year in crash reductions (Newstead, S,V., Budd, L. & Cameron, M. 2018).

Methods

Recent analysis of existing sites showed that red-light cameras can influence crash prevalence at other signalised intersections along the same corridor, providing support for previously reported "halo effects" (Retting, Ferguson & Hakkert, 2003). For example, in January 2017 a new combined red-light speed camera site was activated at the intersection of Morayfield Road and Devereaux Drive, Morayfield. This site is in a one-kilometre corridor of Morayfield Road where there are five signalised intersections. During the three years prior to the site activation, there were 14 crashes involving disobeying a red traffic light. In the 18 months post-activation, there has been one crash involving disobey red traffic lights. Based on this evidence, TMR recently revised its site selection methodology to prioritise placement by ranking road corridors in one-kilometre segments on the prevalence of red-light violation type crashes and speed related crashes.

Results and Conclusions

In agreement with the Queensland Police Service, the enhanced methodology has been utilised in the 2018-19 round of site selections and will be subject to an evaluation to determine its effectiveness on crash prevalence across all sites. The results of the proposed evaluation will potentially inform TMR's long-term approach to enforcement deployment network wide to complement other road safety initiatives.

References

Retting, R., Ferguson, S. & Hakkert, S. (2003). Effects of red light cameras on violations and crashes: A review of the international literature, *Traffic Injury Prevention*, *4*(1), 17-23.

Newstead, S,V., Budd, L. & Cameron, M. (2018). Evaluation of the road safety benefits of the Queensland Detected Offence Program (CDOP) in 2016: *Red Light Speed Cameras*, 31-35.

Online Brief Intervention for Queensland's first-time drink driving offenders

Tanya Smyth[a], Sussan Osmond[a], Nicole Downing[a], Mary Sheehan[b], Meryan Tozer[b], Barry Watson[b], Hollie Wilson[b], Xiang Zhao[b]

[a]Department of Transport and Main Roads – Queensland; [b]Queensland University of Technology (QUT), Centre for Accident Research and Road Safety – Queensland (CARRS-Q), Institute of Health and Biomedical Innovation (IHBI)

Abstract

Drink driving is a persistent contributor to fatalities and serious injuries on Queensland's roads, and additional intervention strategies are needed to promote the separation of drinking and driving. Based on public consultation and evidence for the effectiveness of Brief Intervention (BI) for reducing alcohol consumption, Queensland's Department of Transport and Main Roads (TMR) is developing a compulsory online BI for first-time drink driving offenders in Queensland. The introduction of an online BI will complement existing drink driving countermeasures that support positive behaviour change and reduce reoffending.

Introduction

Drink driving is a complex social, economic and public health issue which, despite decades of intervention, remains a major contributor to Queensland's road toll and is responsible for around one in five road fatalities every year (TMR, 2019). Traditionally, drink driving intervention has relied on penalty-based enforcement, as well as public education countermeasures and more recently the use of administrative strategies such as alcohol interlock programs. These approaches have demonstrated varying effects on drink driving (Schults et al., 2001; Willis, Lybrand & Bellamy, 2004), and unfortunately drink driving continues to be associated with a high rate of offender recidivism.

The persistence of drink driving offending and recidivism suggests that a more multifaceted intervention approach, which can also identify high-level alcohol consumers at greater risk for reoffending, may hold further benefits for road safety and public health. Public consultation conducted by TMR in 2017 found community support for introducing a compulsory Brief Intervention (BI) education program for first-time offenders. Recognised as a time-efficient and effective way to change behaviour (Hettema et al., 2014), BIs have achieved positive behaviour change regarding high-risk alcohol use and dependency, as well as reductions in consumption among non-dependent drinkers (Brown et al 2012; Moyer, Finney, Swearingen & Vergun, 2002). Evidence also suggests potential benefits for drink-driving offenders, including young drivers (Brown et al., 2012).

BI approach and structure

To support the separation of drinking from driving, TMR is developing an online mandatory BI for all first-time drink driving offenders. The BI consists of two phases: phase one addresses offenders' knowledge and understanding of the metabolism and effects of alcohol. In this phase offenders examine their beliefs about the behaviour and identify risks of drink driving and consequences for themselves and others. Phase two is aimed at identifying scenarios where individuals may be tempted to drive after drinking and identifying strategies to separate drinking and driving.

To maximise effectiveness, the BI is underpinned by the Theory of Planned Behavior (TPB; Ajzen, 1991) and the Health Action Process Approach (HAPA; Schwarzer, 2008), as well as therapeutic principles of Motivational Interviewing. These approaches emphasise the influence of attitudes on behaviour change and facilitate exploration and resolution of offenders' ambivalence to the target behaviour to increase motivation for change (Hettema, Steele, & Miller, 2005).

The BI guides participants to draw on personal experiences with drinking and driving. Use of personalised information has shown strong effects on alcohol-related cognitions (Cadigan et al., 2015), and it has been demonstrated that there is little difference in effect when delivering this information via computer or in-person. Computer-based interventions are a cost-effective (Rooke et al., 2010) and highly inclusive option for a geographically diverse population, such as in Queensland's remote areas (Austroads, 2015).

The BI addresses specific needs of marginalised cohorts, including women, culturally and linguistically diverse populations and Indigenous Australians through collaboration during development of the BI with target communities. An in-built screening process will also allow identification of those who drink at high levels and referral to options for further assessment. Evaluation of the BI will align with TMR's road safety program evaluation strategy.

Conclusion

Brief intervention is effective in reducing alcohol consumption and shows promise for achieving reductions in the incidence of drink driving by facilitating the separation of drinking and driving. Using an individualised approach that combines therapeutic and adult learning principles, TMR is developing an online BI that will complement existing interventions to reduce drink driving and provide a safer driving environment on Queensland roads.

Transport and Main Roads acknowledges the significant contribution of the Centre for Accident Research and Road Safety – Queensland (CARRS-Q) to this project.

References

Ajzen, I., 1991. The Theory of Planned Behavior. Organizational Behavior and Human Decision Processes, 50(2), 179-211.

Austroads., 2015. Options for rehabilitation in interlock programs. Research Report AP-R484-15. Austroads, Sydney.

Brown, T., Dongier, M., Ouimet, M-C., Tremblay, J., Chanut, F., Legault, L., Ng Ying Kin, N., 2012. The role of demogaphic characteristics and readiness to change in 12-month outcome from two distinct brief interventions for impaired drivers. Journal of Substance Abuse Treatment, 42, 383-391.

Cadigan, J. M., Haeny, A. M., Martens, M. P., Weaver, C. C., Takamatsu, S. K., & Arterberry, B. J., 2015. Personalized drinking feedback: A meta-analysis of in-person versus computer-delivered interventions. Journal of Consulting and Clinical Psychology, 83(2), 430-437.

Moyer A, Finney JW, Swearingen CE, Vergun P. Brief interventions for alcohol problems: a meta-analytic review of controlled investigations in treatment-seeking and non-treatment-seeking populations. Addiction. 2002 Mar;97:279-92.

Hettema, J., Steele, J., & Miller, W. R., 2005. Motivational interviewing. Annual Review of Clinical Psychology, 1(1), 91-111.

Hettema, J. E., Wagner, C. C., Ingersoll, K. S., & Russo, J. M., 2014. Brief interventions and motivational interviewing. In K. J. Sher (Ed.), The Oxford handbook of substance use and substance use disorders (Vol. 2, pp. 513-530). New York: Oxford University Press.

Rooke, S., Thorsteinsson, E., Karpin, A., Copeland, J., & Allsop, D., 2010. Computer-delivered interventions for alcohol and tobacco use: a meta-analysis. Addiction, 105(8), 1381-1390.

Schwarzer, R., 2008. Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. Applied Psychology: An International Review, 57, 1-29.

Shults, R., Elder, R., Sleet, D., Nichols, J., Alao, M., & Carande-Kulis, V. et al., 2001. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. American Journal of Preventive Medicine, 21(4), 66-88.

Transport and Main Roads (TMR). 2017. Results of consultation. Drink Driving Discussion Paper: Targeting high risk drink drivers. Brisbane, Queensland.

Transport and Main Roads (TMR). 2019. Queensland Road Crash Weekly Report. Report No. 1099.

Willis, C., Lybrand, S., & Bellamy, N., 2004. Alcohol ignition interlock programmes for reducing drink driving recidivism. Cochrane Database of Systematic Reviews, 3, 1-26.

The ESRA2 survey:
Comparing Australian road safety performance with European countries

Uta Meesmann[ab], Katrien Torfs[a],

[a]Vias institute, Haachtsesteenweg 1405, 1130 Brussels, Belgium, [b]University of Liège, Urban & Environmental Engineering Department, Local Environment Management & Analysis (LEMA), Quartier Polytech 1, Allée de la Découverte 9, BE-4000 Liège, Belgium

Abstract

ESRA (E-Survey of Road Users' Attitudes) is a joint initiative of research organisations and road safety institutes from 46 countries globally. The overall aim is to provide a solid contribution to a joint monitoring system on road safety attitudes and behaviours for policy measures. The next edition (ESRA3) of this survey will be launched in 2021. This presentation will highlight the Australian results of the current survey in comparison to the results of 20 countries in Europe and other selected countries (benchmark).

Background

ESRA is a joint initiative of road safety institutes, research organisations, and authorities to establish comparable and reliable road safety performance indicators based on opinions and self-declared behaviour of road users.The initiative is coordinated by the Vias institute (Belgium) and funded by the partners' own resources. It covers countries all over the world. Figure 1 provides an overview of the evolution of this project. A first edition of the ESRA survey (ESRA1) was conducted in three waves between 2015-2017[1] (ESRA1; Meesmann, Torfs, Nguyen, & Van den Berghe, 2018; Torfs, Meesmann, Van den Berghe & Trotta, 2016). The current paper focusses on the first wave of the second edition of the ESRA survey, which was conducted in 32 countries in 2018 (ESRA2_2018; Meesmann & Torfs, 2019). The intention is to expend the ESRA2 survey to additional countries in 2019.

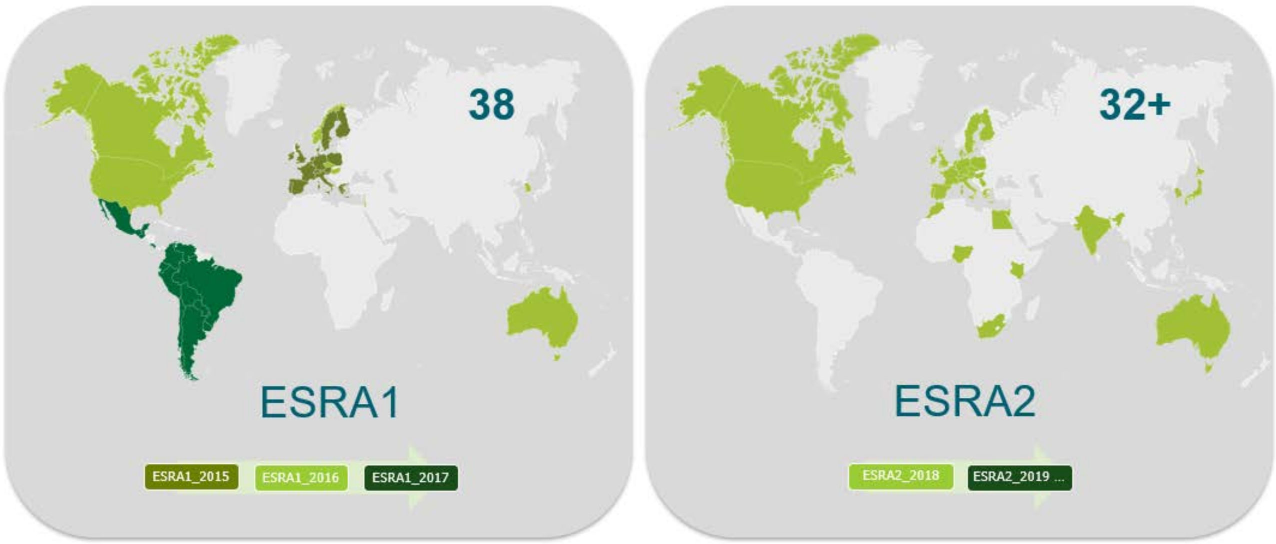


Figure 1: Evolution: Geographic coverage of the different ESRA surveys (2015-2018)

Method

ESRA2 is an extensive online panel survey, using representative samples (N=1,000) of the national adult population in each participating country. A common questionnaire was developed in 42 language versions. The subjects covered in the survey are amongst others: ‘self-declared behaviour’, ‘attitudes and opinions towards unsafe traffic behaviour’, ‘enforcement experiences’, and ‘support for policy measures’. The fieldwork of the ESRA2 survey was conducted in December 2018. In total, the ESRA2 survey covered more than 35,000 respondents from 32 countries across five continents, including 968 respondents from Australia and 23,027 respondents from 20 European countries. (Meesmann, U., & Torfs. K., 2019). Figure 2 shows the geographic coverage of the ESRA2_2018 survey.

Results

This presentation will highlight the Australian results of the current survey in comparison to the results of 20 countries in Europe and some selected other countries (benchmark). The main focus of the current abstract lays on the most striking differences between Australia and the European mean based on the new Australian country fact sheet (Vias institute, 2019). ESRA2 results are consistent with the results of the previous ESRA1 survey (Belgian Road Safety Institute, 2017). The ESRA2 results show again that in all participating countries driving too fast is the most frequently reported unsafe traffic behaviour. The differences with respect to self-declared behaviour and enforcement between Australian and European countries are striking. Comparing the Australian results with the European results (20 countries) reveals that Australians report safer driving behaviour in most aspects which were assessed in the ESRA2 survey (such as fewer speeding offences for all road types, less use of a hand-held mobile phone while driving, and increased seat belt use in the back of a car).

The largest difference between the two regions which has been observed is in the number of reported alcohol checks. In Australia, 47% of the car drivers report having been checked for alcohol in the last 12 months, in Europe this was only 18%. For drugs the difference is smaller: for Australia it is 11%, and for Europe it is 4%. Interestingly the perceived likelihood of getting checked by the police concerning most investigated traffic offences is higher in Australia than in Europe.

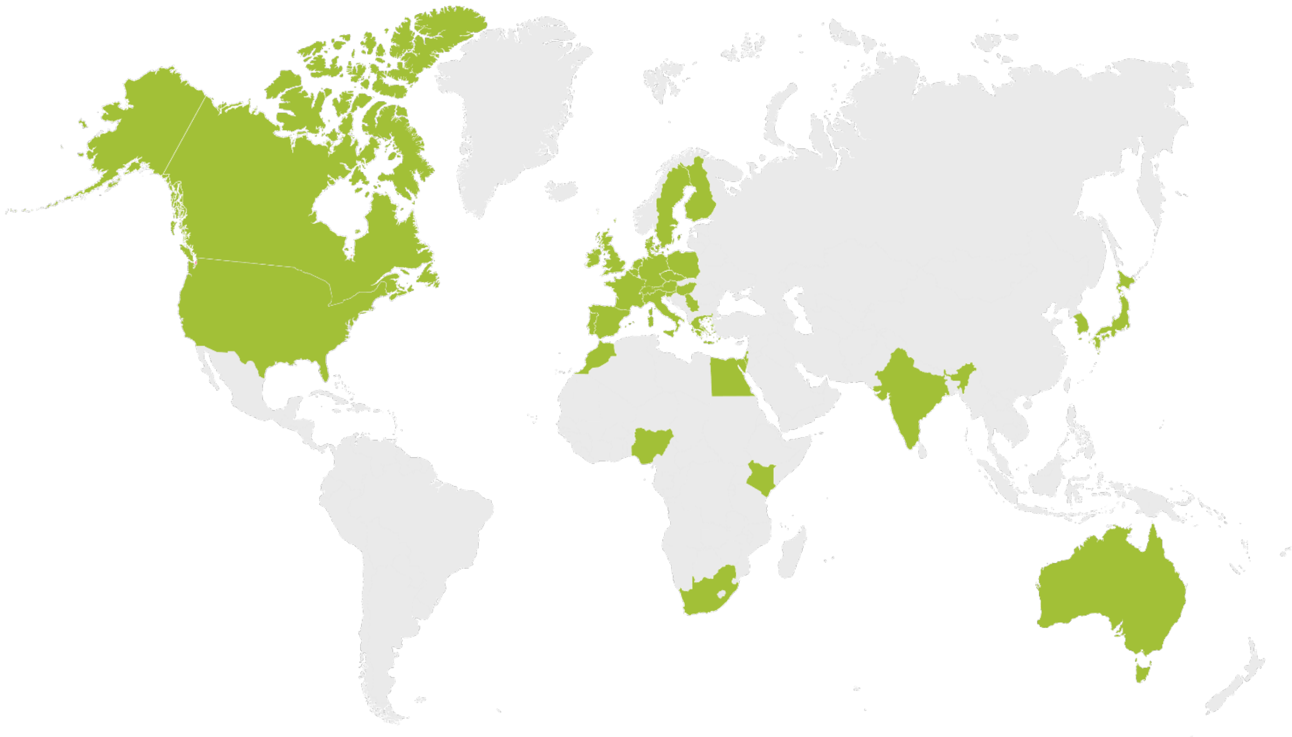


Figure 2: Geographical coverage of the ESRA2 survey

Conclusions

The fast growth of the ESRA initiative shows the feasibility and added value of a joint data collection by a network of road safety organisations. ESRA has become a global initiative which has already conducted surveys in 46 countries across 6 continents (ESRA1, ESRA2). The intention is to repeat the measurements on a triennial basis and to develop a time series of road safety performance indicators. The next edition (ESRA3) will be launched in 2021. More information can be found at: www.esranet.eu.

References

Belgian Road Safety Institute (2017). *Country fact sheet Australia.* ESRA project (E-Survey of Road users' Attitudes). Brussels, Belgium: Belgian Road Safety Institute.

Meesmann, U., & Torfs, K. (2019). *ESRA2 survey methodology. ESRA2 report Nr. 1.* ESRA project (E-Survey of Road users' Attitudes). Brussels, Belgium: Vias institute.

Meesmann, U., Torfs, K., Nguyen, H., & Van den Berghe, W. (2018). Do we care about road safety? Key findings from the ESRA1 project in 38 countries. ESRA project (E-Survey of Road users' Attitudes). Brussels, Belgium: Vias institute.

Torfs, K., Meesmann, U., Van den Berghe, W., Trotta, M. (2016). *ESRA 2015 – The results. Synthesis of the main findings from the ESRA survey in 17 countries.* ESRA project (European Survey of Road users' safety Attitudes). Brussels, Belgium: Belgian Road Safety Institute.

Vias institute (2019). *Country fact sheet Austria. ESRA2_2018 survey* (E-Survey of Road users' Attitudes). Brussels, Belgium: Vias institute.

Risk assessment of rural intersections based on predictive modelling

Chris Jurewicz[a]

[a]Transport Accident Commission, Victoria, Australia

Abstract

Rural intersections present unique road safety issue: they are numerous and typically have low crash counts. Hence, crash history can be a poor predictor of future safety performance. Given that 10% of all Victorian severe crash injuries occur at rural intersections, their effective prioritisation for improvement is a priority.

This paper explores prioritisation of rural intersections based on severe injury estimates using three alternative approaches. The findings show that predictive models based on traffic flow, road hierarchy, intersection type, and maximum speed limit optimise both prioritisation logic and ease of applicability. These findings may be useful in development of future safety infrastructure investment programs.

Background

This paper explores prioritisation of rural intersections based on severe injury estimates using three alternative approaches.

Rural intersections accounted for 10% of all fatal and serious injuries (FSI) in Victoria, based on 2011-16 VicRoads crash data. Hence, this road element is a priority for Safe System treatments. However, rural intersections present a specific road safety issue – prioritisation of sites for potential improvement is difficult using historical crash data. The main issues are:

- Rural intersections are numerous – 7,786 were identified in VicRoads road data registers.
- Many had zero FSI count in the past ten years (21%).
- Where severe crashes were recorded, the FSI counts were low, 1-3 in ten years (48%).

Comparing sites with zero or low count data is difficult. Low crash counts become categorical in nature, with many different intersections in each category (e.g. 1 crash per site). Distribution of such low count data is highly random, and may not be due to some inherent design or operational flaw requiring an improvement. Hence, prioritizing rural intersections based on low crash counts may not be useful for identifying the need for treatments and for funding. A method which reliably identifies treatable risk factors associated with poor safety performance would be more useful.

Safe System infrastructure is delivered via transformative solutions, i.e. such that no future safety treatment is needed to minimise FSIs. If this is not viable, then cost-effective supporting solutions can be planned. It is then assumed that some future improvements will transform the location towards Safe System operation. In this context, VicRoads used the following criteria to develop an appropriate method for prioritising rural intersections for treatment:

1. Rank intersections based on risk of FSI, easily repeatable and updateable.
2. Quickly and easily estimate future FSIs at sites with and without significant high severity crash histories.
3. Understand the scale of existing FSI risk and potential for improvement for each intersection and for each intersection type.

The second and third objectives included a ‘reactive’ vs. ‘proactive’ consideration. Reactive approach models future safety performance mostly on crash history. Proactive approach considers presence and effect of known risk factors.

Methodology

The work presented in this paper builds on previous work undertaken by VicRoads and its consultants to create a data base of all Victorian intersections. Intersection data consisted of intersection type, urban / rural environment, number of legs, and traffic flows on each leg (AADT) where available. The abstract’s objective was to present approaches rather than details of numerical methods. These will be presented in a full paper.

The intersection data was then geographically matched with crash injury data over a 10-year period (2006-2015). This new variable (FSI 10yr Weighted) was based on 2/3 latest five years & 1/3 previous five years. The main aim of this approach was to partially overcome the random variation due to low count numbers. This variable became the historical crash-based measure of severe injury for each intersection.

Different prioritisation approaches were tested against the objectives 1, 2 and 3 as described below.

Results

In general, prioritisation of intersections is based on their level of risk associated with FSI. Sites are prioritised on estimates of equivalent FSIs for a 10 –year period based on model input variables. The three compared methods vary from one which is reactive to crash history only, a hybrid which considers all variables including crash history, and a proactive method which does not require crash history to rank sites.

HRI Method - reactive

The first method tested was based on the approach described in the *High-risk Intersections* (HRI) guideline (New Zealand Transport Agency 2013). The HRI method uses a severity factor to convert recorded all-injury crashes for each site to a 10-year FSI equivalent estimate. The severity factors were based on analysis of all intersection data (urban & rural) and calculated for each speed limit and DCA group. This heuristic model indirectly accounts for speed and crash type, but only at intersections where crashes occurred. The FSI 10-year equivalent values (model) for each intersection were compared with observed values (10-year FSI Weighted) in Figure 1. The data scatter suggests that the model did not fit the historical data well.

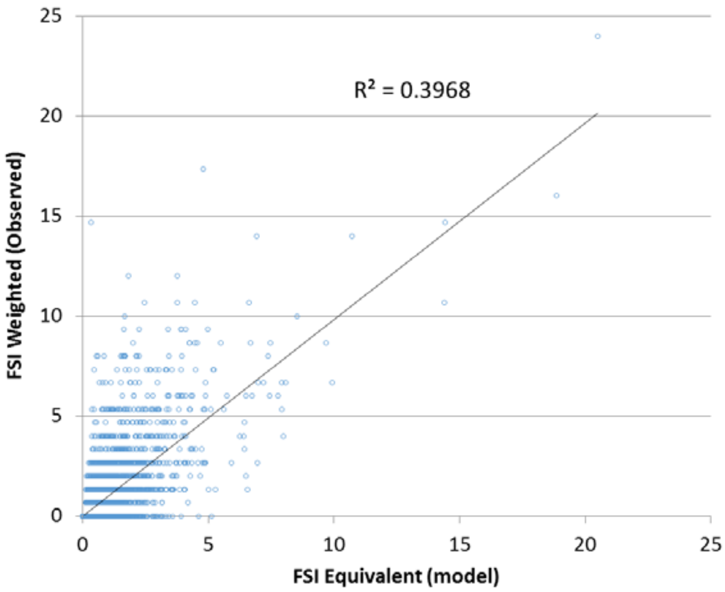


Figure 1. HRI method's FSI Equivalent (model) vs. FSI Weighted (observed) data

Table 1 tests this method against the intersection prioritisation objectives.

Table 1. HRI method vs. prioritisation objectives

Objectives		**Assessment**
1	Rank on FSI Easily repeatable and updateable	Must have casualty crashes recorded or all zero sites will be ranked the same. Can differentiate sites with same number of casualty crashes by crash type mix and by different speed limits. The model is very inaccurate and does not reflect typical performance (poor model fit, Figure 1). Overall, ranking based on the model is logical but not accurate for sites with low crash counts (i.e. the majority). Repeatable and updateable, as the calculation is simple once severity factors are available.
2	Quick and easy estimate of future FSI with and without crash problem.	This method works only for sites with casualty crashes recorded in the past 10 years. This is a limitation.
3	Estimate potential for improvement at each site and intersection type.	Due to the above limitations potential for improvement cannot be inferred from the model variables for intersections with nil or low crash counts. There was no distinction of intersection types.

Neural Network – hybrid reactive / proactive

Using the same data set described in the Methodology, a Neural Network model was developed for sites with recorded crash data in the past 10 years. Neural network is a type of machine learning technique. A model is trained to predict outputs using a large set of input and output data. Neural network techniques have been gaining use in crash frequency and severity estimation in recent years. This type of modelling can outperform conventional GLM and binary logistic models in some applications (e.g. Zang et al. 2016, Li et al. 2018).

Different input data variables were tested for importance in predicting the outcome (10-year FSI Equivalent). The most important predictor was the number of vehicle occupant injuries in the past

10-years. Intersection type did not show as important, nor did any other variables. Traffic flow data and other attributes were missing at many sites which affected their importance as a predictor.

In essence, this was hybrid reactive model as it turned out to be based on crash history, after proactively considering other variables. Still, Figure 2 shows that the model fit was much better for the Neural Network than HRI Method. Table 2 shows that this method suffered from some of the same performance issues as the HRI Method.

Table 2. Neural Network vs. prioritisation objectives

Objectives		**Assessment**
1	Rank on FSI Easily repeatable and updateable	Same logic issues as HRI Method but a better model. It is thus more useful for ranking but not ideal. Repeatable as the online model tool can batch-evaluate new sites. Model update or calibration can be done with new data.
2	Quick and easy estimate of future FSI with and without crash problem.	This method works well only for sites with casualty crashes recorded in the past 10 years. This is a limitation.
3	Estimate potential for improvement at each site and intersection type.	Due to the above limitations potential for improvement cannot be inferred from the model variables. Intersection type was not an important predictor variable, compared with injury history.

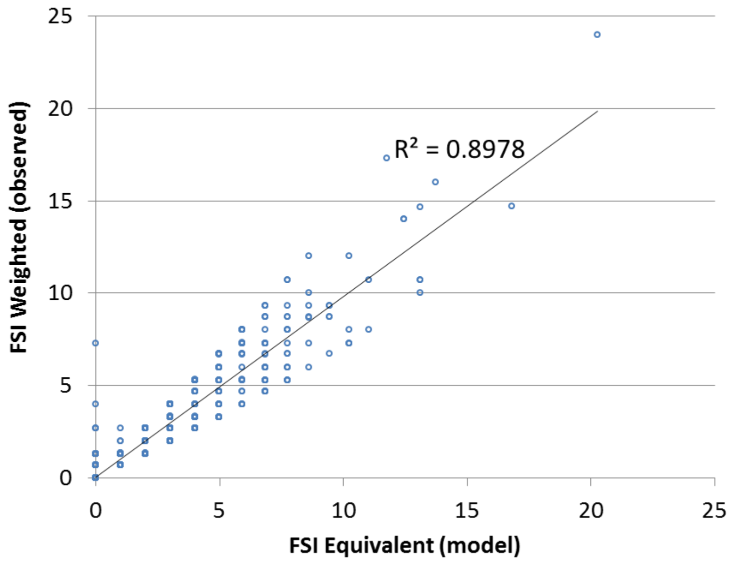


Figure 2. Neural Network FSI Equivalent (model) vs. FSI Weighted (observed) data

Random Forest Ensemble - proactive

A more proactive approach was taken in developing this model: it was based on linking known intersection attributes to their FSI Weighted history performance (10 years). No crash history variable was included to avoid the logical limitations of the previous two methods.

Random Forest Ensemble is a machine learning technique for predictive modelling. It is based on multiple decision trees estimating an outcome from known inputs (e.g. Pham et al 2010, Shi & Abdel-Aty 2015). This technique was selected from several alternative methods applied to the problem, as it produced the best predictive performance when validated against independent data.

The Ensemble identified several important FSI predictors: ‘Sum of AADT’ on all legs, ‘Intersection Type, ‘State/local’ (hierarchy of intersecting roads: state/state, state/local, etc.), and ‘Max Speed Limit’. Figure 3 shows that the model fit was not as good as the previous model, but still good. This is offset by more logical input variables which allow differentiation between sites with the same crash history (or lack of).

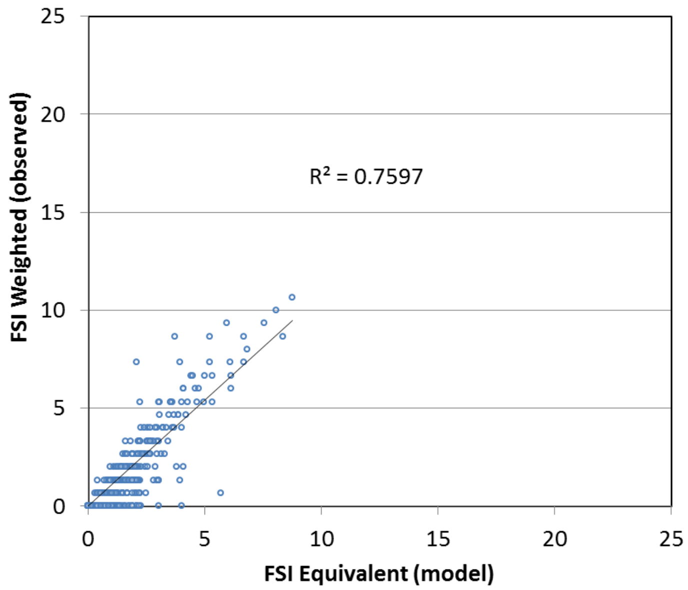


Figure 3. Random Forest Ensemble FSI Equivalent (model) vs. FSI Weighted (observed) data

This approach is consistent with the best practice in predictive risk estimation for intersections, which is typically proactive (e.g. Abdel-Aty & Haleem 2011, Turner et al. 2012). One model limitation was that only intersections with mostly complete attribute data had to be selected from the data set. Thus the model could be biased towards sites with good data (e.g. state/state intersections, subject to past investigations, etc.). Consequently, the model can only estimate FSI Equivalent values lower than 12 per 5 years (99.9% of all sites in the full data set). More complete future data sets will overcome all of these limitations. Table 3 assesses the model vs. the prioritisation objectives.

Table 3. Random Forest Ensemble vs. prioritisation objectives

Objectives		**Assessment**
1	Rank on FSI	All sites will be differentiated and ranked by relevant risk attributes, not crash history. The model is sufficiently accurate to provide confidence in results reflecting typical performance (good model fit, Figure 3). Overall, ranking based on the model would be logical and reasonably accurate.
	Easily repeatable and updateable	Repeatable as the online model tool can batch-evaluate new sites. Model update or calibration can be done with new data.
2	Quick and easy estimate of future FSI with and without crash problem.	Yes, estimates decimal FSI values for all intersections with 10-year FSI Weighted count under 12 (99.9% of sites in the data). Requires AADT data/estimate for all intersection legs, intersection type, basic state/local road hierarchies and the maximum speed limit.
3	Estimate potential for improvement at each site and intersection type.	Given the model uses risk attributes, improvement potential can be estimated, e.g. change from priority intersection type to roundabout.

Discussion and Conclusions

The analysis demonstrated the how logic and applicability objectives for rural intersection prioritisation can be met with reactive (crash-based), hybrid and proactive (predictive) risk measurement approaches. Comparison of prioritised lists of intersections could be part of a future exercise to test for meaningful difference.

Reactive methods based on historical injury crash data could not accurately differentiate between all intersections, although were easier to apply as only crash data was required. These methods also provided limited inputs into future improvement potential of intersections.

The proactive approach, based on predictive estimation of 10-year FSI Equivalent values, showed the best logic and applicability match. It differentiated all sites using inputs of Sum of AADT, intersection type, intersecting road hierarchies and maximum speed limit. This approach allowed prioritising rural intersections with zero and low injury counts. Applicability was somewhat reduced by the requirement for basic data for each intersection. AADT measurement or estimation across the rural road network may be necessary for future prioritisation.

References

New Zealand Transport Agency. (2013). *High-risk intersections guide*. Wellington, New Zealand: New Zealand Transport Agency.

Zeng, Q., Huang, H., Pin, X., Wong S.C. (2016). Modelling nonlinear relationship between crash frequency by severity and contributing factors by neural networks. *Analytic Methods in Accident Research, 10, 12-25.*

Li, Y., Ma, D., Zhu, M., Zeng, Z. & Wang, Y. (2018). Identification of significant factors in fatal-injury highway crashes using genetic algorithm and neural network. *Accident Analysis and Prevention, 111, 354–363.*

Pham, M.H., Bhaskar, A., & Dumont A.G. (2010). Random forest models for identifying motorway Rear-End Crash Risks using disaggregate data. *13th International IEEE Conference on Intelligent Transportation Systems, 19-22 September 2010, Funchal, Portugal.*

Shi, Q., Abdel-Aty, M. (2015) Big Data applications in real-time traffic operation and safety monitoring and improvement on urban expressways. *Transportation Research Part C: Emerging Technologies, Volume 58, Part B, 380-394.*

Abdel-Aty, M. & Haleem, K. (2011). Analyzing angle crashes at unsignalized intersections using machine learning techniques. *Accident Analysis and Prevention, 43, 461–470.*

Turner, S., Singh, R. & Nates, G. (2012). *The next generation of rural road crash prediction models: final report*. Research Report 509. Wellington, New Zealand: New Zealand Transport Agency.

Proposed Amendments to the Australian Design Rules Pertaining to Mandation of Event Data Recorders in Australian Sold Vehicles

Michael Hardiman[a], Dr Jenelle Hardiman[a], Chris Flight[a]

[a]Victoria Police Collision Reconstruction and Mechanical Investigation Unit

Abstract

In 2016, 1295 lives were lost and 32,300 injuries suffered on Australian roads, an annual cost of $33 billion. (Litchfield, 2017) Collisions are analysed by experts to determine causation including driver behaviour, speed, vehicle safety and road design. Criminal prosecutions and coronial investigations rely on collision expert findings. Collision investigation includes analysis of Event Data Recorders (EDR). EDR's have capability of recording pre-crash data including speed, braking and acceleration, Currently, no Australian legislation exists mandating that vehicles be fitted with EDR or that stored data be accessible. Such legislation would enhance collision causation analysis, increasing road safety and reducing road trauma.

Background

The use of EDR data has increased significantly since 2006. Information stored in EDRs can include pre-crash data such as vehicle speed, steering input, braking, acceleration and engine RPM. Figure 1 is an example of available pre-crash data that may be stored in EDR. Stored data also includes speed change (ΔV) up to 300 milliseconds post collision. Such information provides collision analysts the ability to calculate impact speeds and reliably determine causation. Physics allows the EDR data from one vehicle to be used to determine the speed and behaviour of other vehicles involved in the collision that dont have EDR.

Pre-Crash Data -5.0 to -0.5 sec (Event Record 1)

Times (sec)	Accelerator Pedal, % Full (Accelerator Pedal Position)	Service Brake (Brake Switch Circuit State)	Engine RPM (Engine Speed)	Engine Throttle, % Full (Throttle Position)	Speed, Vehicle Indicated (Vehicle Speed) (MPH [km/h])
-5.0	14	Off	1344	27	25 [40]
-4.5	18	Off	1408	33	25 [40]
-4.0	20	Off	1344	32	25 [41]
-3.5	31	Off	1344	44	26 [42]
-3.0	0	On	1728	23	27 [43]
-2.5	0	On	1408	15	27 [43]
-2.0	0	On	1216	15	25 [40]
-1.5	0	On	1088	14	22 [36]
-1.0	0	On	1088	14	19 [31]
-0.5	0	On	1024	14	18 [29]

Figure 1. 5.0 seconds pre-crash data from 2016 Holden Commodore

EDR in Australia

Within Australia, the only commercially available EDR reader is the Bosch Crash Data Retrieval (CDR) tool. In Australia, Bosch CDR supported vehicles are typically limited to Holden, Jeep and Toyota vehicles. In the USA, around 2500 vehicle models are supported by Bosch CDR including Nissan, Mazda, Mercedes Benz and BMW. Australia has less than 200 vehicle models supported by the same technology (Bosch, 2019). Despite being manufacturered by the same company as the

USA counterparts, most vehicles sold in Australia are not supported because there is no legislative requirement. Alternative tools available internationally can successfully retrieve data from Australian sold Hyundai and Kia vehicles. The tool isn't available to law enforcement agencies in Australia.

Australian Design Rules

The Motor Vehicle Standards Act (MVSA) sets national uniform standards for vehicles entering the Australian market, primarily through Australian Design Rules (ADR) and Road Vehicle Certification System (RVCS). The Federal Chamber of Automotive Industries (FCAI) are a group of vehicle manufacturers whose mission is to promote the development and implementation of effective and well designed policy including vehicle design and safety. The FCAI support harmonisation of the ADR's to the United Nations (UN) and the subject of EDR regulation has been raised but given low priority due to development of autonomous vehicle technology (Federal Chamber of Automotive Industries, n.d.).

International Legislation

The enormous value of EDR data in collision investigation and vehicle safety has been recognised internationally. In 2011, Title 49 Part 563 of the Code of Federal Regulations, managed by the National Highway Traffic Safety Administration (NHTSA), was enacted in the USA (NHTSA, 2006). The legislative change mandated that all vehicles sold in the USA that have EDR fitted and are capable of recording data, must have such data avaiable for download to assist collision investigation. The legislation stipulates that data must be in useable format and accessible by commercially available CDR tools. A selection of data available in accordance with Part 563 is shown in Table 1. The European Union (EU) is set to introduce similar rules in the EU from 2021.

Table 1. Part 563 EDR mandated data USA

Data element	**Recording interval time (relative to time zero)**	**Data sample rate (samples per second)**
Delta-V, longitudinal	0 to 250 ms	100
Maximum delta-v, longitudinal	0-300 ms or 0 to end of event	N/A
Time, maximum delta-v	0-300 ms or 0 to end of event	N/A
Speed, vehicle indicated	-5.0 to 0 sec	2
Engine throttle, % full	-5.0 to 0 sec	2
Service brake, on/off	-5.0 to 0 sec	2
Ignition cycle, crash	-1.0 sec	N/A
Safety belt status, driver	At time of download	N/A
Frontal air bag warning lamp, on/off	-1.0 sec	N/A
Multi-event, number of event(s)	Event	N/A
Time from event 1 to 2	As needed	N/A
Complete file recorded (yes, no)	Following other data	N/A

Conclusion

Road trauma is one of the highest ranked public health issues, nationally. Collision investigation is imperative to law enforcement and road safety. EDRs are pivotal in determining why collisions occur. Harmonisation of EDR regulations internationally with parity between Part 563 of the Code of Federal Regulations, USA and the ADR would increase the ability for collision analysts to determine criminal negligence and reduce road trauma, paving the way towards zero.

References

Bosch (2019). "*CDR Vehicle list*" retrived from https://www.boschdiagnostics.com/cdr/sites/cdr/files/CDR_v19.0_Vehicle_Coverage_List_R1_0_0.pdf

Federal Chamber of Automotive Industries (n.d). Retrieved from https://www.fcai.com.au/motor-vehicles-standards-act-and-vehicle-certification/motor-vehicles-standards-act-and-vehicle-certification

Litchfield, F. (2017). *The Cost of Road Crashes in Australia 2016: An Overview of Safety Strategies.* Canberra: The Australian National University.

NHTSA (2006). Retrieved from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/fmvss/EDRFRIA.pdf

Situation awareness and hazard perception deficiencies of young novice drivers, particularly at night

Teal Evans, Rwth Stuckey, Wendy Macdonald

Centre for Ergonomics & Human Factors, School of Psychology & Public Health, La Trobe University

Abstract

Hazard perception performance of novice versus experienced drivers (n=63) was investigated during a PhD research program. Results are reported from thematic analysis of transcripts of participants' commentaries on daytime and night-time road-traffic scenarios in suburban Adelaide. They commentated while being driven around a set route in normal traffic and whenever they detected hazards in each of 14 video clips. They also rated risk and difficulty throughout each clip. Novices (L- and P-platers) demonstrated poorer situation awareness, including lower awareness of hazards associated with poor visibility, particularly in night-time scenarios. Implications for development of improved driver training programs are identified.

Background

It is clear that perceptual and cognitive errors are often implicated in novice driver crashes (McKnight & McKnight, 2003; Wundersitz, 2012), and novices are over-represented in night-time crashes (Williams, 2003; Adams, 2005). However, there has been little research on how night driving conditions affect novices' situation awareness (SA) and hazard perception. Research reported here addresses this issue. Results are interpreted in terms of the information processing model of Wickens and colleagues shown in Figure 1.

Method

Participants were grouped according to age and experience. Their performance was recorded on both day and night versions of the following tasks:

- Provide ongoing oral commentary on the road-traffic situation while being driven along a set route around suburban Adelaide
- Watch video clips (driver's viewpoint) of road-traffic scenarios similar to those encountered during the drive, and:
    - each time a potential hazard is noticed, pause video and describe it, then resume video
    - for each video, position a slider to continuously rate current risk level and, separately from that, driving task difficulty.

SPSS software was used to calculate descriptive statistics for all tasks, and for repeated-measures analyses of variance for mean risk and difficulty ratings with Group as a between-subjects factor and with Time (day, night) and Location of the scenario as repeated factors. NVivo software was used in thematic analyses of commentaries and hazard descriptions (Pidgeon & Henwood, 1997).

Results

Results reported here focus on SA and hazard perception. There were few substantial differences between results of L- and P-platers, so novices (16-20 years; L- or P-plate) are compared with experienced drivers (25-30 years; 5+ years licensed experience).

Novices had poorer SA. They were:

- less aware of situations where visibility was degraded (particularly at night) and less likely to report this as hazardous
- less aware of inconspicuous or potentially hidden hazards.
- less able to 'read the road' accurately and holistically

- less aware of hazards that *might* be ahead
- focused more on vehicle control issues and less on other road users, except when vehicle speed was very low.

In contrast, experienced drivers thought further ahead, with greater focus on predicting potential hazards and what might happen next. Their performance reflected more detailed mental schemata of road-traffic system operating characteristics, beyond what is specified by road rules. They tended to rate risk as higher than novices although the difference was not statistically significant, possibly due to group numbers being small relative to large variation between individuals.

Conclusions

Observed deficiencies in novice drivers' SA and hazard perception skills would be expected to increase their crash risk, particularly at night. Improved training in these skills is needed. To ensure that learners have enough attentional capacity for such learning to occur, they should not be in control of a vehicle during the earlier stages. Training content should take account of the specific skill deficiencies identified in this project, but further research is needed to support course development.

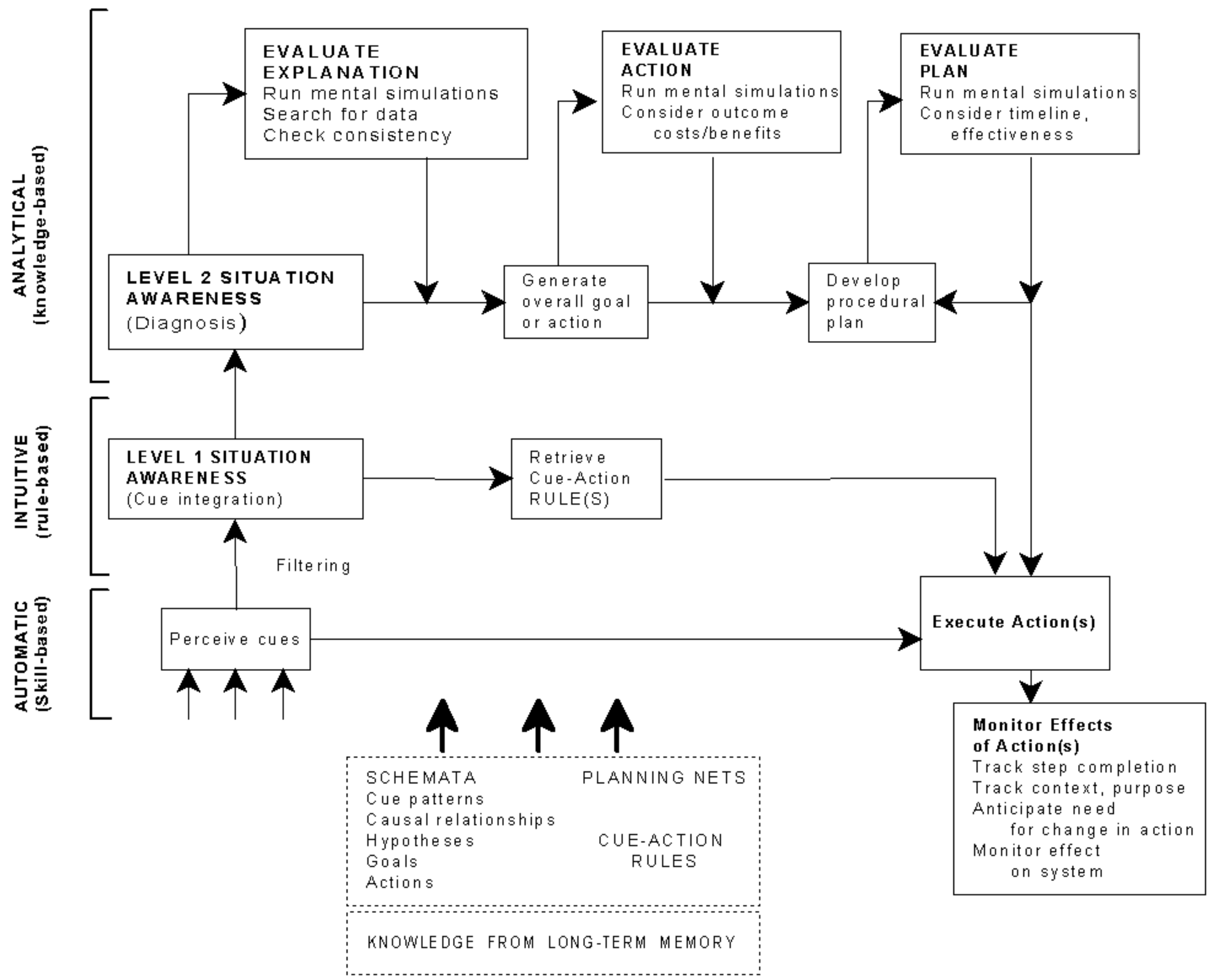


Figure 1. Information-processing model integrating views of naturalistic decision making (from Wickens et al., 1997)

References

Adams, C. (2005). Probationary and non-probationary drivers' nighttime crashes in Western Australia, 1996-2000. *Journal of Safety Research*, 38, (2007) 33-37

McKnight, A. J., & McKnight, A. S. (2003). Young novice drivers: careless or clueless? *Accident Analysis & Prevention*, *35*(6), 921-925.

Pidgeon, N., & Henwood, K. (1997). Using grounded theory in psychological research. In Hayes, N. (Ed.), *Doing Qualitative Analysis in Psychology*. Psychology Press, an imprint of Erlbaum (UK) Taylor & Francis Ltd.

Wickens, C. D., Gordon, S. E., & Liu, Y. (1997). *An Introduction to Human Factors Engineering*. Addison-Wesley Educational Publishers, Inc.

Williams, A. F. (2003). Teenage drivers: patterns of risk. *Journal of safety research*, *34*(1), 5-15.

Wundersitz, L. N. (2012). An analysis of young drivers involved in crashes using in-depth crash investigation data. *Decision making (Total)*, *62*(61.0), 115.

Obesity and age as factors in lethal leg amputation following motorcycle crashes

Siobhan O'Donovan[a], Corinna van den Heuvel[a], Mathew Baldock[c] , Roger W Byard[a,b]

[a]Adelaide Medical School, The University of Adelaide, [b]Forensic Science South Australia, [c]Centre for Automotive Safety Research, The University of Adelaide, Adelaide, South Australia, Australia

Abstract

The autopsy files at Forensic Science South Australia (FSSA) were searched from January 2008 to December 2018 for all cases of motorcycle fatalities with a lower limb amputation. Six cases were identified; five male riders and one female pillion passenger, with age ranging from 48 to 67 years (average 59 years), significantly older than the control group (40.6 years; $p<0.01$). All decedents were overweight with body mass indices (BMI) of 28.7-43.5, average 34.9, significantly greater than the control group (28.8; $p<0.05$). This study has shown that older motorcycle riders with higher BMIs are at greatest risk of lower limb/pelvis amputations.

Background

Amputations are fatal when there is extreme trauma causing damage to major blood vessels or delay in medical attention. Unlike a motor vehicle where the external structure of the vehicle can absorb and disperse impact force, individuals on a motorcycle often expose the upper and lower extremities to concentrated, unprotected impact forces from another vehicle, a fixed object such as a tree, or the road itself, often resulting in ipsilateral injuries (Ball, Rozycki, & Feliciano, 2009; Ross, 1983). Single motorcycle crashes in which a rider has skidded along a road and not come into contact with other objects are less likely to result in an amputation (Craig, Sleet, & Wood, 1983). Motorcycle–motor vehicle collision and motorcycle – fixed object collisions, in which a rider remains on the machine during the impact, increase the susceptibility of the tibia, knee and hip joints to collision forces given the angle of the leg on impact (Craig et al., 1983; Findlay, 1972). These seating postures position the legs of the individual differently depending on the motorcycle model, providing a possible increased risk for amputations (Ma'Arof, 2012).

Method

The autopsy files at FSSA were searched for all cases of motorcycle fatalities in which there had been lower limb amputations in the 11-year period. Amputations were defined as either complete separation of the leg, or part of the leg, from the body. Age and sex of de-identified decedents were recorded, along with the circumstances of the crash, the nature of the injury, the body mass index (BMI) and the cause of death. A control group of 100 cases of motorcycle fatalities were randomly selected from the same autopsy data base to determine the average age, sex and BMI for comparison. Statistical analyses were performed using Pearson's chi squared.

Results

Six cases were identified consisting of five male riders and one female pillion passenger. The ages between 48 to 67 years (average 59 years). All the decedents were overweight with body mass indices (BMI) of 28.7-43.5, average 34.9. Five of the incidents involved a collision between a motorcycle and a motor vehicle resulting in right sided amputation, the remaining case involved a collision with a tree resulting in left sided amputation. The details are summarized in Table 1.

Control cases (n=100) ages were between 17 to 73 years (average 40.6 years; Male:Female 24:1). The average age was significantly lower than the study group ($p<0.01$). The BMI range for the control group was 16.8–56 with an average of 28.8. This was also significantly lower than the study group ($p<0.05$).

Table 1. Characteristics of motorcycle fatalities in which there had been lower limb amputations in South Australia over an 11-year period from January 2008 to December 2018

Case	Age	Sex	Body Mass Index (BMI)	Event	Cause of Death	Leg Injury	Type of Motorcycle	RIPOC[14] (Riding Posture Classification)
1	48	M	39	MC vs. MV	Multiple injuries	Amputation of right foot	Harley Davidson FXSTB (1584cc)	Type 3
2	53	M	31	MC vs. MV	Multiple injuries	Right sided traumatic hemipelvectomy	Honda CBR 1000 RR8 (998cc)	Type 1
3	59	M	36.2	MC vs. MV	Leg amputation; ischaemic heart disease	Amputation of right leg	Suzuki TS 4003 (396cc)	Type 2
4	64	F	43.5	MC vs. MV	Leg amputation	Amputation of right lower leg	Honda Goldwing (1520cc)	Type 2
5	67	M	28.7	MC vs. MV Trailer	Multiple injuries	Amputation of right lower leg	Suzuki DL650 (645cc)	Type 2
6	61	M	31	MC vs. Tree	Blunt Chest trauma	Amputation of lower left leg	Harley Davidson (FLSTC) (1584cc)	Type 2

Conclusions

There is limited data on the risk of amputation for older, obese individuals. It has been noted that older riders are more likely to select larger, heavier model motorcycles (Dischinger, Ryb, Ho & Braver, 2006) as in four of our cases, and those with higher BMIs may opt for bikes for a more comfortable neutral or "cruiser" style seating posture (Ma'Arof, 2012). These seating postures position the legs of the individual differently depending on the motorcycle model, providing a possible increased risk for amputations. This study has shown that motorcycle riders at greatest risk of fatality with lower limb/pelvis amputations are significantly older than the average victim with significantly higher BMIs. Obesity, which increases momentum, may lead to the selection of motorcycles where more comfortable sitting positions result in the legs being more exposed.

References

Ball, C. G., Rozycki, G. S., & Feliciano, D. V. (2009). Upper extremity amputations after motor vehicle rollovers. *J Trauma*, *67*(2), 410-412. doi: 10.1097/TA.0b013e3181adf4eb

Craig, G. R., Sleet, R., & Wood, S. K. (1983). Lower limb injuries in motorcycle accidents. *Injury, 15*(3), 163-166.

Dischinger, P. C., Ryb, G. E., Ho, S. M., & Braver, E. R. (2006). Injury patterns and severity among hospitalized motorcyclists: a comparison of younger and older riders. *Annu Proc Assoc Adv Automot Med*, *50*, 237-249.

Findlay, J. A. (1972). The motor-cycle tibia. *Injury*, *4*(1), 75-78.

Ma'Arof MIN& Ahmad IN (2012). Proposed standard method for motorcycle nonmenclature system. *2012 Southeast Asian Network of Ergonomic Societies Conference (SEANS),* 1-6.

Ross, D. J. (1983). The prevention of leg injuries in motorcycle accidents. *Injury, 15*(2), 75-77.

Connected vehicle solutions for safer roadworks

Jeremy Nassau[a], Elizabeth Waller[a]

[a] Transurban, Australia

Abstract

One of the major anticipated benefits from Connected and Automated Vehicles (CAVs) is improved road safety. Limited access motorways ought to provide a simpler environment for adoption of these vehicles. Despite operating at high speed, there should be fewer complications from factors such as traffic lights, pedestrians, cyclists and oncoming traffic. It will be important to ensure that these vehicles will not only be able to safely drive in typical motorway conditions, but will also able to handle atypical situations such as incidents and roadworks.

To ensure the safety of the 10,000 people currently working on Transurban projects to build new roads and more lanes across the country, as well as their continued safety in a future road environment with CAVs, Transurban is conducting a series of trials and developments focused on work zone safety, together with key partners.

Background

In the long-term, we hope that detailed, real-time data about atypical scenarios such as work zones and incidents could give CAVs enough situational awareness to allow them to safely navigate through these locations, perhaps more safely than human drivers would.

It will be some time before vehicles with these capabilities are driving on our roads in significant numbers. In the meantime, road workers close to live traffic are vulnerable to errant vehicles. Transurban and our partners are exploring solutions that could improve today's safety issues using existing technologies.

Robo-cones and wearables trial

Transurban identified Telstra as a partner with a strong interest and capability in connected vehicle communications, and jointly conducted a proof of concept to test the technical viability of various work zone safety solutions.

Ultimately, our aim is to provide more detailed work zone information to CAVs and given that today's vehicles are driven by people, we considered if and how we could notify drivers who were about to stray into work zones. We quickly concluded this would have limited value, with most work zone incursions or near misses emanating from drivers who appear to be distracted/impaired or even intentionally entering a work zone.

Instead, we conducted a Proof of Concept (POC) to test technologies that could reduce the need for workers to operate close to live traffic and detect if workers were in danger from approaching vehicles and then alert those workers..

The POC confirmed the feasibility of some elements of a work zone safety solution, including

- robotic traffic cones that could be deployed remotely from a safe location, reducing workers' exposure to live traffic
- sensors on traffic cones to detect vehicles entering (or about to enter) a static work zone
- wearable devices to alert workers through sound, light and vibration
- smart rumble strips

Other elements were also explored but considered premature, or required further testing, such as

- definition of a work zone perimeter, and positioning of workers to confirm if they were within the correct zone
- automatic detection of (likely) errant vehicles approaching the work zone from further up the road

Following this POC, selected elements considered most relevant for management of roadworks and incidents on Transurban motorways were developed further and are now undergoing on-road tests and trials. These will be taking place periodically from July to November 2019, with interim results to be shared at the conference.

Automated TMA development

A different form of worker exposure to errant vehicles in roadworks comes from drivers of truck mounted attenuators (TMAs) that provide a collision buffer between the workers and traffic approaching from behind. Although the TMAs are designed to absorb a crash and to protect workers if a vehicle fails to move out of the roadworks lane(s), the TMA driver is still at risk.

To reduce these risks, Transurban is working with the Virginia Department of Transportation (VDOT), Virginia Tech Transportation Institute (VTTI), and DBi Services to develop a TMA that can operate autonomously, removing the need for a driver to sit within the vehicle. Development and testing of the technology will take place over the coming year at VTTI's Blacksburg, Virginia campus, with trials to take place on their Virginia Smart Road closed test-bed research facility.

Conclusion

This presentation will focus on the process undertaken from ideation, concept development, proof of concept testing, pilots and trials, and our associated learnings.

About Transurban

Transurban builds and operates roads in Australia, the USA and Canada. Our vision is to strengthen communities through transport and our road safety strategic framework is underpinned by the safe system approach. Transurban reports on its road safety KPIs, including the rate of injury crashes, and commissions independent research and analysis to inform our operations provide a safe environment for people using our network.

Wildlife Crashes – An Epidemic?

Eric Chalmers

Chair, ACT Chapter, Australasian College of Road Safety

Abstract

This paper summarizes a Workshop held by the ACT Chapter of the Australasian College of Road Safety in July 2019 on the rising level of injuries involving wildlife in the ACT and Region. The workshop brought together a wide range of stakeholders to better understand the growing risk from these crashes; to identify the likely interventions to best reduce the risks; and to connect the people involved so that future work will be better integrated. The workshop was an eye-opener for participants. The issue is growing in complexity and impact; effective interventions are not obvious or easy; and there are many stakeholders involved.

Background, Method, Results and Conclusions

The paper will share the outcomes of a Seminar conducted in Canberra by the ACT Region Chapter of the Australasian College of Road Safety on 24th July.

The issue has some hallmarks of an epidemic – rising injuries and deaths; growing scope of causes (more animals and more types of animals involved); greater exposure of humans, especially vulnerable road users (growing numbers of cyclists and motor bike riders on country roads); reduced awareness (greater distraction for drivers); disjointed research and activity; and limited proven interventions.

The issue was originally raised with the College by the Canberra Hospital Trauma unit who have been observing an increasing number of very serious injuries that are the direct result of animal crashes (almost doubling in 2018). These include injuries from vehicle, motorcycle and cycling crashes in the ACT and nearby NSW region.

Crashes involve Kangaroos and Wombats, but also increasingly Deer and Brumbies, as well as may smaller animals.

The region around the ACT is particularly prone to the danger, as the number of kangaroos in the region is growing quickly, the impact of drought continues; and feral Deer, Brumbies and pigs are an emerging risk. Canberra itself has over 40 nature reserves within the city and a kangaroo population now believed to be greater than the human population.

The issue is complex and dissipated.

- It affects all road users, from drivers, riders to pedestrians, with the more vulnerable users most at risk of serious injury;
- Under-reporting is significant, but its extent is uncertain;
- There are many perspectives and sources of data, from police, to parks and wildlife, RMS, riders, animal rights supporters, and of course the heath system;
- Reporting is variable and we do not know the extent to which other crashes might have involved wildlife as an unreported cause (e.g. by a driver or rider swerving). This also applies to animals already dead on the side of the road as a risk to cyclists and motor bike riders.

The potential solutions are also complex and include treating the cause at source (the animals); changing infrastructure; and affecting driver / rider behaviour. The Seminar concluded with an effective summary of ideas and suggested actions discussed by the participants.

The aim of the Seminar and this presentation is to start the dialogue and to encourage us all to work together. We need to improve data coordination dramatically; talk through the issues, causes and potential interventions; and plan long-term interventions. This in turn will allow Governments and providers to invest in changes that will reduce the risks and mounting injury toll.

The issue also illustrates the importance of looking at road safety as a Systems issue. In this case it is a road issue and driver issue, as well as Health, Environment, animal safety, wellbeing, Police, Emergency Services, etc.