



Journal of the **Australasian College of Road Safety**

Formerly RoadWise – Australia's First Road Safety Journal



Special Issue: A Safe System – the road safety discussion

Peer-reviewed papers

- Speed - the biggest and most contested road killer
- The Safe System in Practice – a sector-wide training programme
- Promoting a more positive traffic safety culture in Australia: lessons learnt and future directions
- The accuracy of determining speeding directly from mass crash data and using the NSW Centre for Road Safety method
- Mobile phone use and driving: the message is just not getting through

Contributed articles

- Safer speeds: an evaluation of public education materials
- Star safety ratings drive improvements on risky roads

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Cover image

The ACRS conference theme of “Safe Systems: The Road Safety Discussion” highlights the challenge that leading road safety nations have in improving duty of care principles in road safety; and ensuring that any community debate is well informed and based on sound evidence. Image provided by *this big design*.

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behavioural sciences, communication, history, management,
and urban and traffic planning. Interdisciplinary approaches are
particularly welcome.

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unattended.**

From the President



Dear ACRS members,

This edition presents some papers from our Conference in Adelaide late last year as well as information on the ACRS-3M Diamond Award for 2013; and also on our new Fellow, Narelle Hayworth.

At our Adelaide Conference delegates had the opportunity to discuss the many issues around road safety and the media. We often feel frustrated that our messages become distorted when published or presented. Our after dinner speaker, the Hon. Barry Cohen, made the point that we do not often promote the success of our work, leaving the media and the general public with the view that there is only an emphasis on continuing to apportion blame on road users.

At the time of writing the death rate last year across Australia and New Zealand appears to have dropped significantly and in Australia at least I saw many positive road safety news stories over the New Year as a result. Several road safety colleagues and Ministers were interviewed, commented favourably on the results and also made the point that we can be even more successful if we continue on a safe systems approach.

We need to all keep making those points.

Last year I commented that we needed to increase collaboration in order to be more effective and I think this year we must continue that theme. We will need to build further on the successes to date.

I was concerned that my Third Party Insurer has had to raise my premium as “over the last three years the number of claims from people injured in NSW roads has risen by more than 12%.” I know that work is underway in many jurisdictions and nationally to define the actual extent and impacts of road crash injuries. Associate Professor Daryl Wall from the Brisbane Trauma Centre, speaking in Adelaide, drew our attention to the huge and unnecessary impact on our hospitals and health care system of road related trauma.

So while we must continue to build on our successes, we should also open a new program to help define and report the extent of injuries from road crashes more widely, and to communicate to the general public that not only can a safe system approach reduce deaths, but also reduce injury trauma.

*Lauchlan McIntosh AM FACRS
ACRS President*

Diary

26 – 27 Feb 2014

Stirred not shaken – Higher Education Conference
National Convention Centre
31 Constitution Ave - Canberra
<http://www.universitiesaustralia.edu.au/page/media-centre/2013-media-releases/stirred-not-shaken--higher-education-conference-2014/>

1 – 2 April 2014

9th Australian Road Engineering and Maintenance Conference
Melbourne Park Function Centre
Melbourne and Olympic Parks, Olympic Blvd
Melbourne, Victoria 3001
<http://commstrat.cvent.com/events/9th-australian-road-engineering-maintenance-conference>

7 May 2014

Fifth International Speed Congress
IMechE, One Birdcage Walk, London
<http://speedcongress.com>

20 – 21 May 2014

Innovating With Asia
Perth Convention and Exhibition Centre, Western Australia
<http://conference.crca.asn.au/index.php/about>

27 – 30 May 2014

Velo-City Global: celebration of cycling
Adelaide, South Australia
www.velo-city2014.com

Guest Editor



Jeremy Woolley

Guest Editor
Conference Convenor and Chair,
SA Chapter ACRS

As 2013 conference convenor and guest editor, welcome to this special edition of the Australasian College of Road Safety journal.

The South Australian chapter of the ACRS was proud to host the 2013 conference and by all measures it was deemed an outstanding success. This success did not occur by chance and there was a team of dedicated people who contributed in differing ways over 14 months leading up to the conference to ensure that the event was unique and stimulating for delegates. Given the unusually high amount of road safety forums, seminars and conferences vying for attention in 2013, the challenge was to run a conference that would provide an alternative experience for everyone. In this regard we feel that we were successful in selecting a theme that could meet this challenge and one that is also vital to the evolution of road safety in the region.

The theme of “Safe Systems: The Road Safety Discussion” highlights the challenge that leading road safety nations have in relation to advancing duty of care principles in road safety. While it is generally agreed that Safe Systems and a vision of zero death and injury should underpin our professional activity, very few practitioners and members

of the public understand, let alone are literate with, this perspective. It would appear that “blaming the nut behind the wheel” and the loudest voices still continue to dominate the public communications diet on road safety. How then, given the ongoing supply of strong evidence from the research organisations, do we transition to a community that has strong leadership in the area grounded in solid evidence and best practice in road safety countermeasures?

We all have a role to contribute towards road safety and as practitioners and professionals we should be ensuring that any community debate is well informed and based on sound evidence. Too often detractors of road safety countermeasures have their say in the absence of any balancing counter-argument.

This journal edition contains some of the peer reviewed papers presented at the conference. In addition to media and communication, topics were spread across many areas of the Safe System. I would like to thank the Scientific Committee for their involvement in the paper review process in what is sometimes a time consuming and thankless task.

I hope that you enjoy reading the papers and that they lead to further discussion and debate. It is very important that we put forward and discuss sound evidence in road safety, particularly so when the new media landscape is filled with misinformation and non-credible sources. We need to ensure that there are balanced discussions and consequences from bad policy decisions. As the keynote speaker Paul Willis mentioned, although our presence in a debate may not guarantee that we win, to not have a presence guarantees that we will not win.

College news

Head Office News

Welcome to:

Corporate Member - VicRoads (Policy and Programs Division, Vehicle and Road Use Policy, Driver Performance Branch)

Road Safety Professional - Mr Wesley Collier of Sinclair Knight Merz, Brisbane

Austroads John Shaw medal presentation to Lauchlan McIntosh

In May 2013 the Austroads John Shaw Medal winner was announced as ACRS President Lauchlan McIntosh. As Lauchlan was overseas at the time, the medal presentation ceremony took place at the Austroads lunch in Sydney at the end of 2013. In attendance were the Deputy Prime Minister and Minister for Transport, Hon. Warren Truss MP, as well as senior road officials together with around 250 representatives from roads organisations.

In his acceptance speech, Lauchlan stated that to be recognised with this medal, initiated in memory of John Shaw's outstanding contribution to roads is for him a great honour, saying that:

It is also for me an encouragement; to encourage you to build tomorrow's roads for tomorrow's cars. I have only achieved your recognition with the help of many others; I thank you all for that.

Collaboration between us all and with many others to build a better and safer road network with safer and smarter cars is vital; safety has to be lifted to become a critical component of our transport infrastructure and our economy, the results with real further reductions in death and injury can be our tribute to John Shaw's memory.

It will be unacceptable, to quote the Swedish Infrastructure Minister; to do anything less.

Again, to Roads Australia, thank you.

To read the speech in full, go to <http://acrs.org.au/wp-content/uploads/John-Shaw-Medal-Acceptance-Nov-2013-JLM-Final.pdf>



Lauchlan McIntosh receives the Austroads John Shaw Medal presented by Deputy Prime Minister and Minister for Transport, Hon. Warren Truss MP

Chapter reports

New South Wales (Sydney) Chapter

The Sydney Chapter closed 2013 with two very successful back-to-back seminars on December 4 and 5. We co-hosted the seminars with Neuroscience Research Australia (NeuRA) and Engineers Australia with sponsorship from

humanIMPACTengineering, as well as NRMA Motoring and Services who supported the attendance of distinguished keynote speaker, Dr Priya Prasad from the United States.

The Day One seminar, *Vehicle Safety: Bringing up the Rear*, was attended by over 80 participants and was opened by our ACRS President, Lauchlan McIntosh. Other speakers included representatives from NCAP and other industry, as well as university researchers. Day Two was a PhD showcase day, *Emerging Researchers in Impact Injury Biomechanics*. This provided the opportunity to learn of emerging research in the field from around Australia and to interact and learn further from Dr Prasad.

The Chapter Executive looks forward to bringing you further diverse in-depth seminars in 2014, with early seminars planned on crash investigations and young driver safety; and later seminars on motorcycle safety and local government road safety issues.

***A/Prof Teresa Senserrick,
NSW (Sydney) Chapter Chair and Representative
on the Australasian ACRS Executive Committee***

ACT and Region Chapter

Another successful year has passed for the ACT and Region Chapter. Two major seminars were held and our first breakfast in November drew a wider range of participants to the Chapter. Our objective of working with local government in the region was strengthened with strong relationships being developed with them and the organisations with which they work. We were also active in advocacy in the local community on road safety issues.

Base funding for the remainder of 2013-14 and 2014-15 has been secured with an NRMA-ACT Trust Road Safety grant. Work is well advanced on our first activity for 2014, *Living Longer: Driving Safer*. Two sessions will be held with older road users as part of COTA's Senior's Week in mid-March 2014.

Two further seminars are planned for mid-year, one on education of vulnerable road users and another on drug driving.

Our thanks go to all members who assisted us during 2013.

Victorian Chapter

The Victorian Chapter held its final seminar for 2013 on December 4 on *'Cutting of the Road Safety Pie'*. The audience had the opportunity to hear from experts on each pillar of the Safe System approach and why they should invest in their ideas/project. The experts included:

- Julian Lyngcoln (VicRoads) – Road Infrastructure
- Samantha Cockfield (Transport Accident Commission) – Speed

- Stuart Newstead (Monash University Accident Research Centre) – Vehicles
- Melinda Congiu (RACV) – People

Attendees interacted with the speakers before deciding where to invest their (fake) money. After much debate, the audience decided that the majority of the funding should go towards the people pillar of the Safe System. Thank you to the speakers and audience for an informative and interactive seminar.

The Victorian Chapter would like to acknowledge the continued efforts of Leon Hain in campaigning for seatbelts on school buses. Leon, your hard work will go a long way in ensuring the safety of school children for years to come. Congratulations on all you have achieved so far!


I would like to say a big thank you to the Chapter committee for their dedication and hard work in brainstorming and organising the activities in 2013. Thank you also to all our speakers, members and attendees. We look forward to a great 2014!

Wishing you all a very happy and safe 2014!

Jessica Truong, Victorian Chapter Chair

33,900

The Australian Road Safety Collaboration



No-one should die or be seriously injured on the Australian road network

www.33900.org.au/join


The Global and Australian Road Death Epidemic

33,900 people were killed or seriously injured in road crashes in Australia in 2010. That is an average of four people killed and 90 people seriously injured every day. Worldwide 3,500 people are killed and 100,000 seriously injured every day on our roads. Road crashes are the biggest killer of 10-24 year olds. This level of death and injury is unacceptable.

In recognising the scale of this global epidemic, the United Nations has declared 2011-2020 the Decade of Action for Road Safety. Australia is a signatory to the resolution and has a responsibility to take significant action within Australia, and contribute to improvement throughout the Asia Pacific Region and the world.

33900: The Australian Road Safety Collaboration

Road safety stakeholders in the non-government sector (NGO) in Australia are committed to making sure it is a Decade of Action where we all do more to improve road safety performance in Australia. The sector is also conscious of our responsibility to help our neighbours in the fast growing Asia Pacific Region where 60% of world road deaths occur.



Together we can
Save millions
of lives.

DECADE OF ACTION FOR
ROAD SAFETY 2011-2020
www.decadeofaction.org

The individual NGOs in Australia have identified the need to improve coordination and action across the sector, to advocate for more action where needed, inform and support Government initiatives and ensure Australia makes an ambitious and appropriate contribution to the Decade of Action.

With this in mind 33900: The Australian Road Safety Collaboration has been established to facilitate greater industry collaboration and to further promote improved road safety outcomes across all sectors. The focus areas of the group also align with the "[Global Plan for the Decade of Action for Road Safety](#)" pillars as promoted by the UNRSC.

To keep in touch with the latest from the United Nations and the Decade of Action join 33900 – it is free and will keep you informed of road safety action globally and connected locally.

Go to www.33900.org.au/join for more information.

Other news

2013 ACRS Conference Papers Now Online: available on ACRS website

Papers presented at the ACRS conference are now available online on the ACRS website.

Papers can be downloaded from the Publications section of the ACRS website at the following address: <http://acrs.org.au/events/acrs-past-conferences/2013-a-safe-system-the-road-safety-discussion/>

Awards

3M-ACRS Diamond Road Safety Award

A Queensland mining project, the Hay Point Expansion Stage 3 (HPX3) Project, has won the prestigious 3M-ACRS Diamond Road Safety Award at this year's Australasian College of Road Safety (ACRS) conference in Adelaide.

The BHP Billiton Mitsubishi Alliance (BMA) Team won the accolade on Thursday 7 November 2013, at the ACRS conference dinner attended by around 200 road safety professionals and specialists from Australasia. Team leader Vince Powell from the HPX3 project accepted the award on behalf of the five-member project team.

ACRS National President Mr Lauchlan McIntosh said the calibre of this year's entries was exceptional. "This again demonstrates the valuable contribution that many road safety projects are making to reducing unnecessary deaths and injuries from road crashes."

"The actions of the Hay Point Expansion Stage 3 (HPX3) Project team have had a direct impact on the safety of all workers and the general community who use the Hay Point Road. This project has been instrumental in building collaborative partnerships between its members and leading agencies such as the International Road Assessment Program (iRAP) relating to the safe transport of workers and all who use these public roads. It is an excellent example of a company making a major contribution to public road safety."

"It is important to note that there is great potential for transferability/replication of the program across many regions. The 3M ACRS Award will increase the profile of the project and encourage others to use the concepts."
(A full report on this award winning project is outlined on page 54.)

Due to the high calibre of entries, a Highly Commended award was given to the City of Wanneroo for the initiative shown in committing to working towards the Vision Zero approach to road safety injuries on the Council's road network. Judges again felt this was a highly transferable project, and one which the College would be proud to support into the future.

This year there were 18 finalists across Australia striving to win the 3M-ACRS Diamond Road Safety Award. Other valuable programs covered indigenous training, learner driver mentors, seat belts on school buses, educational and audit programs, roadside driver drug testing, the Fatality Free Friday campaign, truck emergency breakdown procedures, road awareness programs, and a heavy vehicle initiative to name a few.

The team leader from the winning project will travel to the USA to attend America's largest road safety conference in San Antonio, Texas, and 3M Headquarters in Minnesota to learn about 3M's innovation in road safety next February 2014.

Keep watch for the call for applications for the 2014 award!

ACRS Fellowship

Congratulations to Professor Narelle Haworth who was awarded the prestigious 2013 ACRS Fellowship. The award was presented by the ACRS President, Mr Lauchlan McIntosh at the ACRS conference dinner. Narelle's commendation as a worthy recipient of this award is as follows:

"For her outstanding contribution as an internationally recognised researcher in the road safety field, and for her major contribution as a policy advisor at the state, national and international level."

In making the announcement Lauchlan McIntosh spoke of Narelle's achievements in a wide range of road safety related research areas over her 25 year career, making special mention of her ability to communicate research and strategy in a way which can be easily understood; her role in the American Academy of Science TRB Committee on Motorcycles and Mopeds; and her particular contribution in the area of motorcycle road safety.

Lauchlan also mentioned that the Fellowship was for a distinctive contribution to the advancement of road safety; for excellence; and was acknowledgement by her colleagues and co-workers of her contribution.



3M-ACRS Diamond Road Safety Award presentation

From left: Agota Berces (3M), Chris Frost, Jarrod Erbs and Vince Powell from BHPB, Claire Howe (ACRS Executive Officer), and Lauchlan McIntosh (ACRS President)



Professor Narelle Haworth, recipient of the 2013 ACRS Fellowship

KiwiRAP Wins IRF Global Road Achievement Award

The International Road Federation awards recognise excellence and innovation in road development worldwide. An independent, international panel of judges chose KiwiRAP to receive the 2013 global safety achievement award.

KiwiRAP was developed in partnership by the NZ Transport Agency, NZ Automobile Association, Ministry of Transport, NZ Police and ACC and has played a role in reducing the number of fatal and serious crashes on highways.

Colin Brodie from the NZTA and Rob McNerney on behalf of the NZAA accepted the award that recognised the great and innovative work being done by all of the KiwiRAP partners. With a target to see Strategic National Highways lifted to four-star standard and 75% of kilometres travelled on four-star or better, great results are being achieved at the policy level. Integration of KiwiRAP outcomes within the day to day business of national and local agencies in New Zealand is seeing roads upgraded, the benefits measured and the ultimate outcome of many lives saved now and in the future achieved.

Queensland Road Safety Awards

Five category winners and nine commendations were announced in October as part of the Queensland Road Safety Awards (QRSA), run by the Centre for Accident Research and Road Safety – Queensland (CARRS-Q). CARRS-Q director Professor Barry Watson said the awards recognised practical and positive road safety programs being run in the community.

A driver education program that aims to “brake” the cycle of disadvantaged youths becoming a statistic on our roads has been named winner of the 2013 Queensland Road Safety Community Award. Run by the Queensland Police Citizens Youth Club, the *Braking the Cycle* program targets marginalised youth and helps build their 100 mandatory learner driver hours by offering free driving lessons with volunteer mentors.

Professor Watson said more than 300 disadvantaged youths had taken part in the PCYC program, completing more than 6500 hours of training through programs currently run in Logan, Beenleigh, Crestmead, Ipswich, Dalby and Gladstone.

What made the Braking the Cycle initiative different from other learner driver mentoring programs was its



Colin Brodie from the NZTA and Rob McNerney of the NZAA accepted the IRF Global Road Achievement Award

aim to break the cycle of disadvantage off the road by matching with a volunteer mentor who not only supervises driving but provides life mentoring. *Braking the Cycle* has highlighted the links between obtaining a licence, employment and good social outcomes.

The full list of 2013 QRSA winners included:

Community Award

Braking the Cycle - Queensland Police Citizens Youth and Welfare Association

Local Government Award

Patrick - The School Zone Pace Car - Logan City Council

State Government Award

Stay On Track Outback - Sergeant Dominic Richardson, Queensland Police Service

Innovation Award

Road Safety - Bundaberg Leads the Way - Senior Constable Danielle Loftus, Queensland Police Service

Industry and Business Award

Waverly Creek Rest Area Initiative - Road Accident Action Group Mackay

Schools Award

Highly Commended:

- St Mary's Primary School (Ipswich) Look Out program - St Mary's Primary School P&F Committee
- Warrigal Road State School - SAFEST Committee

The awards, an initiative of CARRS-Q and the RACQ, are actively supported by the Queensland Department of Transport and Main Roads, Queensland Police Service and the Motor Accident Insurance Commission.

Full details on all the winning initiatives can be found at http://www.carrsq.qut.edu.au/qrsa/winners/qrsa_winners_2013.jsp.

Australian Road Safety Foundation Awards

Guest of honour Michelle Yeoh and Australian Road Safety Foundation CEO and Founder, Russell White presented awards to worthy recipients of the 2013 Australian Road Safety Awards in Brisbane on November 27. Winners included:

Community Programs Award:
Youthsafe NSW



The Queensland Road Safety Award Winners for 2013

Indigenous Road Safety Award and State Initiatives Award:

Drive Safe NT Remote
(Department of Transport Northern Territory)

Innovation Award and Founder's Award for Outstanding Achievement:

Braking the Cycle (QLD PCYC)

School Program Award:

Road Safety – Bundaberg Leads the Way (QLD Police Bundaberg)

Local Government Initiatives Award:

Wyong Council NSW

Media Award:

Transport Accident Commission 'Red Line' campaign

For more detailed information about these outstanding initiatives go to <http://www.australianroadsafetyawards.com.au>

New road trauma support service opens in WA

Long awaited support for families affected by serious road trauma has finally become a reality with the opening of

Road Trauma Support WA (RTSWA). The Injury Control Council of WA now offer information, peer support and specialised trauma counselling for those families affected by road trauma within Western Australia.

Services are free and available to those involved and/or injured; the bereaved; their families, carers and friends; those who may have caused a trauma; witnesses; and emergency service personnel.

ICCWA CEO, Deborah Costello, says "RTSWA will help reduce the mental and social distress associated with road trauma. This service is critical to building a healthy and supportive community". Western Australia averages nearly 200 road fatalities each year. 2800 serious injuries occur from road crashes and over one-quarter (28%) sustain life-threatening injuries.

RTSWA manager, Jenny Duggan, adds "the potential for mental and social distress following a major road crash is substantial. Approximately 13 people are significantly distressed by one major crash.

Information & support can be accessed in person, via telephone or Skype, or online, call 9420 7262 or 1300 004 814 or visit www.rtswa.org.au.



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RTSWA Manager, Jenny Duggan and bereaved parent, Glenda Maloney lighting a candle of remembrance for WA road fatalities

Peer-reviewed papers

Speed - the biggest and most contested road killer

By Lori Mooren; Raphael Grzebieta and Soames Job

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Abstract

Speeding is arguably one of the most prevalent, if not the most prevalent, behavioural factor involved in fatal road crashes. However, the interventions to redress this continuing serious threat to public safety are amongst the most controversial done by governments in Australia. Media outcries of “revenue raising” when speed cameras are installed are deafening. This is despite the voluminous evidence that speed cameras save lives. In early 2012 there were a number of current affairs programs on commercial TV channels and web internet discussions that were blatantly anti-speed camera enforcement. Expert road safety researchers have attempted to present the facts and provide evidence-based opinions about the injury risks of speeding and the safety benefits of speed camera enforcement. Australian community surveys have indicated that the majority of people do understand that speeding is a road safety risk, and they support speed limits and speed enforcement. But broad public and media understanding of the issues are still confounded by misleading publicity and opinionated non-expert mass and social media discussions of views opposing speed enforcement and even views that disagree that speeding is a road trauma risk. This paper explores this phenomenon, discusses issues concerning mass and social media and suggests ways to address the problem.

Keywords

Speeding, Media, Nanny state, Community debate, Dialogue communication

Introduction

The definition of “speeding”, in simple road injury risk terms, means driving a motor vehicle too fast for the road conditions. This simple definition may be more generally

agreed than the definition, “exceeding the legal speed limit”. Indeed, underlying the community debate about speeding and speed management interventions is a notion that speed limits are arbitrary and do not accurately reflect the injury or crash risk that can be attributed to all road users, all vehicles or all roads.

There is an abundance of research demonstrating the ways in which speed influences crash risk and crash severity [1, 15, 24, 31]. These mostly reside in academic journals, government departments, inquests and conference proceedings and are rarely read by the general community. The findings, however, have been used by policy makers and in public education campaigns. For example, the Transport Accident Commission used the findings from Kloeden et al [15] to build a message around why driving 5km/h slower can exponentially improve chances to prevent a serious injury crash.

Most Australian road users are getting the message that speed increases crash severity and crash risk. A survey of 4,100 Australian drivers found that there was acceptance of the need to lower speed limits on roads such as undivided rural roads, but there is still a lack of understanding that small speed increments can make a large difference in crash risk [16]. Indeed, they found that 88% of respondents admitted exceeding the speed limit by 5-10 km/h. While this low level speed behaviour is common, fatal speed related crashes make up around 78-88% of all speed related crashes in Australia [12]. Whether or not Australian drivers know this, around 90% believe that speeding would increase their risk of crashing, even on a clear day [9].

Moreover, there is solid extensive evidence that speed camera enforcement reduces road trauma [29, 33]. Yet, there are a number of people who are vocally and strongly critical of speed enforcement in Australia. There have been numerous outcries about how Australia is a “nanny

state” in its speed enforcement efforts. Note that “nanny state” is defined as: “A government perceived as having excessive interest in or control over the welfare of its citizens, especially in the enforcement of extensive public health and safety regulations” [23]. Moreover, a survey of public attitudes on road safety in 2011 found that 62% of Australians thought that fines for speeding are mainly intended for revenue raising [28]. This result followed an upward trend from 1995 when 54% held this view. But over the same period the community view that driving at speeds 10km/h over the speed limit significantly increases chances of crashing rose from 55% in 1995 to 70% in 2011. A community survey [25] in Victoria found that while the community don’t approve of high-level speeding, there is an acceptance of low-level speeding (10km/h or less over the speed limit).

Finally, negative attitudes to speed enforcement include the view that speed enforcement is “capricious, unfair and revenue-raising” and this view is most intensified when cameras versus roving patrols are used for enforcement [21].

This paper examines the community discussion on speeding and especially speed enforcement in an effort to understand the apparent paradoxical views on the issue of speeding.

Methodology

The method used to research the nature of community discussion about speeding was to use the popular internet search engine, Google, using the search terms, “Australia nanny state speed enforcement” and “Australia road safety speed enforcement”, thus aiming to find pro-speed enforcement and anti-speed enforcement commentary. Those articles that did not specifically address the issue of speed enforcement were omitted from further examination. The items examined were social media/chat rooms, mainstream media, social commentary articles and websites. An analysis of relevant articles, web pages and blogs posted since 2009 was performed to gain an understanding of arguments in the public domain for and against speed enforcement. It was considered that blogs posted within the last three years could be considered as a reflection of current community attitudes.

Results

Searching Google using the search term “Australia nanny state speed enforcement” resulted in some three million articles being identified. The search on the term “Australia road safety speed enforcement” identified around 1.36 million articles. This indicates that there are close to three times the number of “nanny state” articles compared with “road safety” articles found through this search. The articles from the search on “nanny state” tended to be authored by political lobby groups, members of the general public

or journalists, whereas those from the search on “road safety” were largely authored by government sources and university researchers.

Much of the anti-speed enforcement commentary is based on civil liberties arguments. The Liberal Democratic Party believe that “Drivers should be free to risk their own safety provided that they are responsible for the consequences of the choices they make... Enforcement of speed limits in Victoria, for example, has gone beyond the limits of what is compatible with a free society” [18]. Similarly, the Outdoor Recreation Party’s policy is that the community should be asked to determine speed limits – not governments [26]. Both parties suggest that using the 85th percentile method to determine speed limits is good practice.

Racing personality, Mark Webber, publicly complained about fellow racer Lewis Hamilton being booked by the police for doing a burn-out, lamenting the nanny state that Australia had become. Deputy Commissioner Ken Lay, head of Traffic Police replied that it was disappointing that Webber’s comments may have undermined police road safety efforts on a weekend where four people died in speed related crashes [19]. Nonetheless, a poll of 2640 readers of the article found that 72% of people agreed with Webber. Then in a blog about Webber’s view, 131 comments were elicited [5]. These were mostly supportive, with a poll, asking if Australia is a nanny state, finding that 77% per cent thought so.

In 2010, another racing driver, Mark Skaife, was interviewed by a number of Australian media outlets suggesting that, like Germany, Australia should raise speed limits (to 140km/h), reduce enforcement and instead train young people to drive safely at higher speeds. Skaife argued that Australia should stop being a nanny state focused on speed reduction and should instead take a road safety approach more similar to that of Germany with high speed autobahns. When two of the authors of this paper [22], refuted his claims about Germany, it elicited 39 comments on their opinion piece. The authors noted that contrary to the myth being promulgated, Germany had stepped up its speed enforcement and lowering of speed limits in recent times similar to Australia. They provided road safety links with speed management, particularly speed camera enforcement with hard data, showing Germany, a country that is less than half the size of New South Wales but slightly larger than Victoria, now deploys around 3489 speed cameras compared to Australia’s total of 1125 cameras. They further highlighted that German drivers are the second most likely to be detected for speeding offences behind the Dutch in Europe whereas the average total road length per camera deployed in Australia is four times less than in Germany. Mooren and Grzebieta further elucidated that part of Germany’s road safety improvement is because they have taken the unlimited speed off many of their autobahns contrary to what most believe. Only two of the

39 comments supported the opinion piece [22] despite this hard evidence.

Another blog takes issue with the heavy handed authority in Australia, where Governments treat people like naughty little children, citing mandatory seatbelts and helmets, and strictly enforced speed limits [10].

The general anti-nanny state arguments go beyond a dislike of being caught for breaking a law considered to be trivial. Some have argued that excessive regulation can be socially detrimental. For example, the Institute of Public Affairs posts on its site that: “Much contemporary social regulation is designed to shield individuals from voluntary risk-taking behaviour. However, having the government assume the role of risk manager is damaging to the principle of individual responsibility.” With regards to driving they say, “A spontaneous order emerges when people feel they are fully responsible for their own driving. And it’s a safer one than in a traffic management system that tries to push drivers along pre-determined paths, barking orders along the way” [4]. One example they mention is the notion that raising speed limits would help combat driver fatigue.

But even the blogs found by searching “nanny state” sometimes contain mixed views. To show an example, the following first ten comments from a total of 53 comments to an article [20] on how Australians love high performance vehicles are provided below:

I don't get it! How is it possible to get the full value out of a performance car without breaking Australian road rules? Commenter Noddy

Exactly. The article is based on myth. It is the Europeans and autobahns which offer true high speed performance. We just copied American offerings with just a few quick machines like the Pacer and GTHO. We have no real speed pedicree. Commenter mojo

The value is not in the speed. You don't even need to drive it at all. The thing that matters most is that it's parked where your mates and the girls can see you with it. That's in front of your house and club, not on the racetrack or outback road. Commenter sissifus

When you're on a country road with no one in sight for km's, and the only person at risk is yourself, you don't care about the nanny state road rules. I don't, and never will. The more they try and hold me back, the more I fight. Commenter AdamA

You can't. And you will be in trouble if you get caught. Commenter The Genuine Article

its called trolling mate. desperate car manufacturers coming up with a new tack on trying to flog useless cars. a zombie could see this one coming. there are various versions of this “article” doing the rounds on the web. busted so badly. Commenter smilingjack

Performance is not just top speed but acceleration, handling and braking. Even below 60km/h these 3 traits can be a powerful attraction in a Performance car (depending on the road). So yes maybe you can't get 'full' value without losing your license but you can still have a lot more fun driving than in a “normal” car. Also, as RKDiamond says many people who own these cars take them to the track. Then there is the added attraction of prestige. Just knowing your car can go 3 times the speed limit is something people will pay (a lot) for. Commenter Jason

Don't you realise how important it is to be the first to drag away from the traffic lights? (..... and beat all to the next set of lights.....) Performance is just soooo important these days! Commenter Gagg

@Adam A, @ToxicDebt, @Gus and others - “Nanny” State road rules are there to protect lives. And they are working. Sorry to disagree with you. In Australia fatal accidents dropped from 3,798 road deaths in 1970 to 1,248 in 2010. Do your maths thats more than 2,500 lives saved per year based on the 1970 base line. Reflect on that for a moment. Ponder this also - the highest category of fatal accidents more than 47% in zones with 100km limits, single vehicle crashes 44% and more than 40% under 25 years of age. There has been a concerted effort through greater enforcement of road rules, better roads and car safety features to help bring down the road toll. Over this period there has been a substantial increase in the number vehicles on the roads. The one thing missing is better driver education and training. Yes, the cars are very seductive - but this country does not offer the same standard of road or driver quality as in Europe. Safe driving to you... Source of data: Australian Bureau of Statistics. Commenter Noddy

I rely on my vehicle's performance for extra safety on the roads. If you don't understand what I mean, get back in your Corolla and keep out of the right-hand lane. Commenter Problem?

Separately, another set of 39 replies comment on a first blogger's question about what he should do about receiving three speeding tickets in the mail within a month of his return to Melbourne from the United Kingdom (JYK, 2009). The bulk of the responses were that he should just pay up – either because he broke the law or because he has no way of fighting the fines. Only two bloggers were sympathetic to the bloggers plight of copping fines. They had both been booked by speed camera and complained that they should have been warned about the locations of the speed cameras. Sites including this one often compare Australia with other countries, with commenters often saying that Australia is less free than other countries. Adman75 claims that only North Korea is less free

(Adman75, 2009). A total of 121 comments to his blog were posted. Some were claiming that speed cameras were evidence that Australia is a police state, and that road laws generally indicated that it is a nanny state as well.

Sometimes people feel so strongly about an issue that they chose to directly communicate their views with people quoted in the mainstream media. After the first author was reported to have called for lower speed limits on undivided roads she received the email below:

"dear Lori, have read your opinion about lowering speed limits. I think you are an interfering [sic] academic you have to realise that state and federal govts are ripping off us country people. the roads are shit! Ill grant you that, but we deserve better and we certainly have paid for better. this is a cop out. how much do you get paid to publicly spruke your bullshit? take a trip to Germany. then you will see that you are living the lie. what lie? the one about speed ie. stay out of my local paper please, regards X, Inverell, NSW"

In 2010/2011, two of the major commercial television channels, 7 and 9, ran blatant anti-speed camera stories on their prime time current affairs programs, specifically Today Tonight and A Current Affair (ACA). Today Tonight showed motorcyclists setting fire to speed cameras without interviewing an opposing criticism from a safety expert (Today Tonight, Channel 7, 2/2010). Tracy Grimshaw from A Current Affair interviewed Jeremy Clarkson from the famous Top Gear program. He was stated to say that 'speed never killed anyone, suddenly becoming stationary that's what gets you' and that nothing could be done to save the deaths of our youth on the roads from speeding 'it's just kids being kids'. (A Current Affair, Channel 9, 12/2/10). Such stories do nothing but reinforce our speeding culture. Today Tonight continued to run such stories entitled, "Underhanded Speed Cameras", Speed Camera Secrets", and "Crazy Speed Cameras", while ACA ran a story staging a mock evaluation of speed cameras claiming to 'prove' that speed cameras make "no discernible difference to driver behaviour."

ACA was eventually taken to task by Media Watch, where the show's host, Jonathan Holmes, presented a wealth of scientific evidence that speed cameras do influence behaviour and save lives, concluding that: *"By reinforcing those doubts with its absurd trial, A Current Affair is actively reducing public confidence in a program that saves lives. That's about as irresponsible as the media can get..."* [11]

It is worth noting that, around this time (July and August, 2011), two State Governments, New South Wales and Victoria – no doubt driven by public opinion – called for critical audits of their speed camera programs. The New South Wales Auditor General concluded from his

review that: *"In general, speed cameras change driver behaviour and have a positive road safety impact. We found that the number of speeding offences, and the total number of crashes, injuries and fatalities reduced after the introduction of fixed speed cameras."* [2] The Victorian Auditor General found that: *"Road safety cameras improve road safety and reduce road trauma, and their ongoing use as an enforcement tool remains appropriate.... A strong body of research shows road safety cameras improve the behaviour of road users, and reduce speeding and road crashes."* [27] The Auditor General urged the Department of Justice to educate the community more on the benefits of speed cameras and to dispel community myths that the purpose of the cameras was to increase State revenue.

However, after these reports were released, the Sydney Morning Herald, ran a story entitled "Top Speed Cameras still make a fast buck" emphasising that Minister, Duncan Gay, would shut down some of the cameras that he described as "cash cows for the former Labor Government" [30]. Grzebieta and Moore's article, "Slow down on speed camera hysteria" was published by The Conversation and elicited only one comment [7]. A PhD candidate in Christian Ethics at the University of Edinburgh wrote: *"Thanks - very helpful to have these statistics to put a bit of perspective on the issue. Using a car (a.k.a. being allowed to hurtle round in a tonne of metal at speeds that pack more punch than a bullet) is a privilege, not a right. As a society, we extend this privilege to those who demonstrate that they are capable of respecting it."*

Discussion

Many more people read newspapers and watch commercial television, than read government reports or articles in academic journals or websites. So, how can public misconceptions and baseless opinions about speeding and speed enforcement be turned around?

Civil libertarians tend to argue that governments should let people be responsible for making their behavioural decisions, especially when they only risk harm to themselves and no one else. Given that at least two political parties in Australia have formally expressed these views, and a number of individuals have also made comments on social media sites in support of this view, it seems that while this may be a minority of the population, it is a fairly large and vocal one.

Another problem is that risk behaviour is natural [32] and even desirable in many contexts. So, to some degree, educating drivers on the risks associated with speeding could be counterproductive for safety. Indeed, there is a body of research that indicates that "high sensation seekers are more likely than non-sensation seekers to engage in a range of risky and illegal driving behaviours" [17]. Moreover, the current public discussion on the Northern

Territory Government's proposal to derestrict speed limits on open rural roads has included arguments that higher driving speeds will reduce fatigue-related crashes [8]. It is worth noting that Hall's "Open speed limits" article was recommended by 235 people on Facebook, and elicited 201 comments – mostly in favour of lifting or removing the limits (many citing the German autobahns as proof that high speeds are safe).

The community is clearly divided on the issue of speed management. It seems that there are people who either don't want to know about the evidence that challenges their views or don't really care. Some seem to indicate that, to them, "freedom" is more important than "safety". There are others that dispute statistical evidence, basing their thoughts more on their own personal experience, e.g. "I speed all the time and have not had a crash, therefore my speeding is safe speeding." This perspective may be supporting the view in some driver's mind that others just need to be trained to drive better. Then, there are a vocal few that support lower speed limits and rigorous enforcement.

Certainly, there is strong evidence that publicity backed enforcement campaigns are effective behavioural countermeasures in road safety [6]. But there is evidence that when road users favour a law, they are more likely to comply with it [13]. If speed regulation is seen as unnecessary, it is more likely that drivers will exceed maximum speed limits even at the risk of being caught.

In 1991, seeking to shift away from the former authoritarian style of road safety campaign, and recognition that speed was a highly contested issue in the community, the NSW Roads and Traffic Authority (RTA) applied a 'community dialogue' approach to addressing the speed problem. A campaign was designed to foster community debate on speed and speed related government policy and practices. Using newspaper advertising, the RTA asked people to tell them the problems they have with speeding. Surprisingly, thousands of letters were received with mostly positive road safety suggestions. The responses were collated and reported back to the community using another newspaper advertisement. Other mass media advertising was confined to radio and outdoor advertising – and the brief to the advertising agency was to omit a tagline or "Government message" from the advertisement. After the first set of advertisements went to air many people phoned into the RTA hotline saying that when they heard one of the advertisements on the radio saying "how fast are you going now?" they immediately checked their speedometer. Post-campaign market research confirmed that this tagline resonated strongly with the target audience. So, "How fast are you going now?" was chosen as the tagline the RTA was not originally going to have. To this day, some 12 years later, the NSW road authority still features this tagline on variable message signs. This is an example of an attempt to "dialogue" with the community instead of broadcasting instructional messages to road users.

Some of the more recent road safety advertising in NSW again seems to be using a genre that conveys public sentiment, illustrating differing perspectives on road safety issues. The 2007 "Pinky" television commercial www.youtube.com/watch?v=JqWO7fzwSLM and the "Get your hands off it" commercial <http://www.youtube.com/watch?v=RsgxNLUivy0> are examples of this genre. The authors don't know the evaluation results of these ads but the internet version of "Pinky" attracted 17,679 hits. The comments about the online Pinky video again conveyed a mix of community sentiment – positive and negative.

Conclusion

Perhaps we need to rethink the way in which we communicate anti-speed messages that takes into account the perceived benefits of reducing risky behaviour, similar to the Victorian Transport Accident Commission's TV advertisement with Professor Ian Johnston of a car crashing into a truck (Slow Down: June 2003), where a small increase in speed over the limit is shown to have a detrimental effect in avoiding a serious crash. The road safety messages may be more effective if they can directly speak to this perception and make road risk, like speeding, less desirable or even stupid. It may also help road safety to personalise the story with specific victims of speeding crashes rather than reliance on broad statistics.

Moreover, there has been a community debate on speed and speed enforcement raging for a number of years. The road safety community has been largely absent from this debate.

Having a two-way conversation with the community is worthy of consideration. The social media mechanisms and other tools are currently underutilised for communications between the road safety community and the general community. While this form of communication can be time-consuming and resource intensive for use in a road safety campaign, dialogue communication is a mechanism for engaging people in a more positive way.

Recommendations

Road safety researchers and practitioners are urged to:

- gain an understanding of the key anti-speed enforcement positions held by major and minor opinion leaders in Australia;
- develop more effective ways of influencing community debate on speeding; and
- explore, develop, trial and evaluate "dialogue communications" campaigns on speeding.

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The Safe System in Practice – a sector-wide training programme

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Abstract

Safer Journeys, New Zealand's road safety strategy to 2020, adopted the Safe System approach. *The Safe System in Practice* training course was designed in 2011-12 to improve understanding of the approach, and build the skills, confidence and relationships across the sector to implement it.

The course, aimed at planners, engineers, road operations and maintenance managers, educators, enforcers, and other system designers who influence road safety; outlines the Safe System approach and principles, and best practice treatments to strengthen every element of the system. The cross-disciplinary content is developed and presented by experts and is reinforced by an action learning approach using New Zealand case studies that are worked on by small groups.

In the first 12 months the course has been delivered to more than 500 people, and initial evaluations show it has been extremely successful. The course designers aim to train 500 more over the next year. This intensive programme gives the sector the best chance of changing the road safety conversation, and developing a shared understanding of how to reduce deaths and serious injuries, in the shortest possible time.

The paper outlines the course design, results and lessons learned, with particular reference to how the course could be replicated elsewhere.

Keywords

Safe System, Capability, Training

Introduction and context

Safer Journeys, New Zealand's road safety strategy to 2020, was published in 2010 and adopted the vision of "A safe road system increasingly free of death and serious injury" [4]. Adopting the Safe System approach, to create a more forgiving system that reduces the price paid for human error, was recognised and explained in the strategy as being a "a significant shift in the way we think about and manage

road safety," from blaming the road user for causing a crash, to acknowledging that even responsible people sometimes make mistakes that result in crashes. [4]

At the time of the strategy's launch, however, the Safe System vision, approach and principles were not well understood by many road safety professionals across the New Zealand road transport sector. Some believed it was an updated version of the "three E's", education, engineering and enforcement, which formed the basis of the previous *Road Safety Strategy to 2010*. [3] and did not understand the level of ambition to reduce deaths and serious injuries in adopting the approach. There were cultural barriers too: existing organisational processes, systems and manuals required safety activities to address the causes of *previous* crashes, rather than proactively identifying the highest risks and working across the entire system to reduce them and thus aim to reduce further crashes. Knowledge of the Safe System approach was not widespread enough to address these cultural barriers at the time. This was recognised in the first *Safer Journeys Action Plan 2011-12* [5] and embedding the Safe System approach into New Zealand's general road safety culture and raising the capability to do this, became an important set of tasks or "workstream" in its own right in the action plan. Embedding the Safe System approach also became one of the New Zealand Transport Agency's five strategic priorities and provided the basis of its internal Road Safety Strategic Plan in 2011.

Most early effort within this workstream aimed to clarify, communicate and raise awareness of the approach, both within the Transport Agency and across the transport sector, through conversations, presentations and workshops. A consistent theme coming through in the early feedback was that staff across the road transport sector wanted to know more detail about what the approach meant in practice and what they needed to do differently to apply the Safe System principles in their own roles. While they often understood their own part of the system well and were willing to change, they did not know what they needed to change, what others were doing, and how to work together with sector partners to create a forgiving road system.

The *Safer Journeys* capability work to address these questions began in 2011. While the Safe System approach was already incorporated into existing training for engineers, the *Safe System in Practice* training programme was designed for a broader audience and to create a widespread and rapid, rather than incremental, change in skills, knowledge and relationships across the sector – often described as a “step change”.

Objectives

The training objectives are to increase road transport sector capability to apply the Safe System approach by developing, piloting and delivering a core training module for road transport professionals that will yield:

- an increase in knowledge about the approach and principles;
- an understanding of all four pillars of the Safe System and how improvements in each can reduce the likelihood and improve the outcomes of crashes; and
- understanding and direction on how to practically apply it in their own role.

Broader benefits are also sought: to support the *Safer Journeys* goals of embedding the approach into the planning and delivery of road safety activity; a change to road safety communication within the sector; and ultimately a change in road safety culture. The training is expected to enable the change in communication because with a shared language and deeper understanding of the approach people can communicate more confidently and consistently about creating a safe road system. [5]

The expected long term benefits for road safety are that deaths and serious injuries on the roads will reduce because all factors influencing crash trauma are more likely to be identified and addressed at the analysis and planning phase and the most effective interventions will be chosen. Road safety planning and delivery should also become more integrated, eliminating duplication of effort and increasing efficiency. For a more detailed discussion of this thesis, and the rationale and evidence for it, see chapter five of *Towards Zero* [9].

These are ambitious goals. The outcomes sought at different levels (individual learning, organisational/sector unity, cultural change, better road safety results) have influenced the way the programme has developed, the way it is designed and delivered, and the way it is evaluated.

Designing the training to achieve the outcomes

The method adopted to achieve these broad outcomes is to train the participants together in cross-functional groups

within their own regions, and taking an action learning case study based approach using actual road safety issues (see below). This involves a two-day workshop comprising seven lecture-style presentations interspersed with small group work (five to seven people) on an assigned case study highlighting various road safety issues and requiring a Safe System problem solving approach.

The content is designed to be generic (aimed at multiple roles) rather than role specific, to support a whole-of-system road safety analysis and planning model, and contribute to building an understanding of the road safety system as a whole. As outlined below, it covers all elements of the system as defined in *Safer Journeys* (p.11): use, speed, roads and roadsides, and vehicles, and the interrelationships between them. It also links to existing New Zealand systems, such as Road Safety Action Planning - which involves local government, Police, Accident Compensation Corporation and Transport Agency representatives in planning and coordinating road safety initiatives at a regional level.

The training incorporates and showcases new and developing Safe System tools in New Zealand such as the *High Risk Rural Roads Guide* [6] and *High Risk Intersection Guide* [8], and will continue to evolve as new tools are developed. All of these training design features increase the relevance of the training, and thus its effectiveness and the likelihood that it will later be applied on the job [13].

A concentrated programme to train at least 500 people in groups of about 50 over an 18-month period was initially proposed, to build momentum, provide opportunities for group learning, and so improve the chance of knowledge transfer back into the workplace. The methodology also builds on the model of training a large number of road safety professionals in a relatively short period of time employed in the Queensland Safe System Engineering Training [2]. A sustainable training programme that would be low cost for attendees was desired, but a programme of this scope and scale was outside the Transport Agency's capacity to develop internally. The Transport Agency entered into a contract with the New Zealand Institute of Highway Technology (NZIHT) to project manage the development of course materials and delivery, including logistics such as venues, enrolments and training administration. In turn NZIHT contracted Traffic Engineering Research New Zealand (TERNZ) to develop the training course content, the course book and provide training design expertise. TERNZ sought input from the University of Auckland education faculty to ensure the soundness of the educational approach.

In practice, TERNZ and appropriately qualified sector subject matter experts in the Transport Agency, the New Zealand Police and other National Road Safety

Management Group agencies worked in partnership to develop the course materials and to deliver the content. Using subject matter experts meant that the course was able to keep current with, and be a communication vehicle for, the rapidly expanding body of learning about the Safe System approach and the tools being developed as part of the wider implementation of *Safer Journeys*.

A governance structure was established jointly with National Road Safety Management Group Agencies (Ministry of Transport, NZ Police Accident Compensation Corporation, Local Government New Zealand and Department of Labour). A communications plan was also developed to promote the availability of the course across the sector nationwide. The plan involved the use of existing networks and no commercial advertising was involved.

Learning outcomes

Learning outcomes (what participants should be able to do after the course) were developed early and carried through into how the programme was developed and is now evaluated.

The eight learning outcomes are that, after the training, participants should be able to:

1. understand and talk about the Safe System principles using real world examples;
2. understand and talk about the “human factors” approach to error and the limits of human performance;
3. understand and talk about what we are aiming to achieve in improving each area of the Safe System;
4. understand and talk about interrelationships across the road system;
5. have contributed to a group Safe System case study, identifying the contributions that all Safe System pillars make to reducing road trauma for a road safety issue;
6. apply the above in their own role (i.e. identify roles and responsibilities across the sector and know who to work with and why);
7. identify effective road safety interventions across all pillars; and
8. report back on one change they have made in their own work (action learning approach).

A two-day course was proposed as being the minimum time required to achieve these outcomes.

Training needs analysis

The question was raised as to whether a single Safe System training course would meet the requirements of a range of organisations and roles. A training needs analysis (TNA) was therefore undertaken. The TNA identified which roles needed to complete the training; the desired levels of knowledge and skill; and the current levels of knowledge and skill by role. It also provided useful information about training gaps, broader training requirements useful for long term planning, and the extent to which a single course could meet them.

Across all organisations surveyed, a total of 95 roles were identified and it was estimated that approximately 1900 to 2000 staff worked in these roles across New Zealand. Two potential audiences for the training were identified:

- staff in roles that were able to effect change and drive the implementation of the Safe System approach within their organisation; and
- all staff that need to incorporate the Safe System approach in their day-to-day work.

The types of roles varied from senior to front line, ranging from transport planners, transport officers, road safety engineers, roading managers, road safety educators, road safety coordinators, Police and communications staff. Other roles that would benefit from the training were identified, including investment managers, asset managers, policy staff and maintenance contractors – anyone whose decisions impact on the forgiveness of the system by introducing hazards (for example roadside utility poles) or failing to maintain safety treatments such as rumble strips.

The TNA identified that the current levels of knowledge and skill were variable across these groups and that the greatest weakness was in identifying the most effective interventions across Safe System pillars, or even within a pillar. The TNA validated the need for the proposed course and the scale of the intervention. It also developed shared understanding across partner organisations about the course objectives and the roles that would benefit most from the training. It was recognised that the estimate of numbers could only be approximate. Nearly 18 months later, over 600 people have now been trained and demand is strong for a further 200 places in 2013 alone, indicating the scope and scale of the analysis was reasonable.

Course content

The curriculum is designed for personnel who have had some prior exposure to the Safe System approach and covers the following modules:

- Safe System overview

- human factors and the Safe System approach
- Safe System approach to speed
- Safe System approach to roads and roadsides
- Safe System approach to vehicles
- Safe System approach to safe use
- communicating the Safe System approach
- case study presentations
- bringing it all together – personal action plan
- Safe System data and information (reference material in course book)
- international context (reference material in course book).

The sessions are presented by experts with relevant qualifications and many years of experience in their fields, and linked together by a course facilitator who has a deep knowledge and passion for road safety. As the course has been developed, tested internally at the Transport Agency and then piloted, other sessions have been trialled – for example, a session on the international context during the pilot phase. In early evaluations, the participants asked for more time on the case studies and as a result the extended material on the international context is no longer covered through a presentation but is covered in the course book.

A feature of the curriculum is the early session on the human factors approach to error, which is carried through and applied in all sections. As Reason states [11]:

“The basic premise in the system approach is that humans are fallible and errors are to be expected, even in the best organisations. Errors are seen as consequences rather than causes, having their origins not so much in the perversity of human nature as in ‘upstream’ systemic factors.”

Each module challenges road safety designers to recognise the upstream causes of human error that they can affect and to reduce the probability of error through good design. For example, this can be done through inclusion of ergonomic thinking into vehicle design, speed management, road design, designing self-explaining roads, or understanding how business practices contribute to driver error. This emphasis on understanding the root causes of errors, and aiming to reduce them, is in addition to making the system more forgiving and, therefore, less likely to result in death or serious injury when errors do occur. The same thinking is carried through into the “Safer Use” session, which does not focus purely on education or enforcement, as might be expected, but on interventions to promote safer use designed around the psychology of driving and

preventing different types of error, whether unintentional or intentional. [14]

The “human factors” content has been developed by TERNZ, which has specific expertise in this discipline. The sections on strengthening the elements of the system (roads and roadsides, speed, vehicles and use) were developed by subject matter experts within the Transport Agency and NZ Police. They showcase and explain tools such as KiwiRAP, guides for improving safety for high rural roads, high risk intersections and motorcycling, Safer Journeys long term objectives for speed, ANCAP and Rightcar, and the evolving approaches to advertising, education, and enforcement.

The course concludes with a section on communicating the Safe System approach, recognising that many of the participants have important communication roles. This content is based on *Communicating the Safe System approach: A manual for system designers* [7] and includes both a suite of key messages relevant to different audiences and practical examples of how and where to deploy them to support the changed conversation about road safety.

Action learning - using the case study approach

Genuine engagement with the Safe System approach was desired, rather than an “information dump” that would have little lasting effect. The approach taken was to give participants the opportunity to apply the content to a set of case studies throughout the course.

The case study topics are representative of generic issues and include pedestrian and cyclist safety, mixed use urban arterials, a high risk peri-urban intersection, a high risk rural intersection, a high risk rural road, older drivers, overseas visitors, commercial operators and motorcyclists. After each presentation, participants work out how the new content applies to their case study, and how it could be applied to reduce error and make the system more forgiving for their assigned topic.

The case study approach uses action learning principles. Action learning evolved in the 1940’s at Cambridge University where Professor R. Revans pioneered the approach of bringing together cross-disciplinary groups to work on difficult issues that could not be solved by each discipline working alone [12, 1]. Since then the approach has spread from the sciences to many different fields.

The case study component includes these specific features:

- The case study scenarios are real life New Zealand locations and road safety issues or exemplify areas of concern identified in *Safer Journeys*.

- Rich and complex information is provided (e.g. Crash Analysis System data, Traffic Crash Reports, maps, aerial photographs, diagrams, engineering reports, relevant research summaries and media reports where relevant).
- Participants must use a collaborative, problem-solving approach based on the four principles of the Safe System and consider interventions under all four elements of the system.
- Realistic recommendations for the short, medium and long term must be developed and presented back in the plenary session on the final afternoon of the course.

Participation in the process therefore provides an experience of, and models how, the Safe System approach could and should work “back on the job”. When participants are working on the case studies, levels of energy and commitment are very high, and this aspect is regarded as one of the success factors of the course. The following verbatim comments illustrate participant reactions:

“The case study kept my attention to each speaker. The team were highlighting key aspects of our case study as the speakers presented them. The case study was the highlight for me.” (Transport planner, city council)

“Was great to work as a team. Sometimes went off track and pulling the correct information from members to put presentation together was a struggle and very effective exercise.” (Community education team leader)

“Great for teambuilding - discipline understanding and negotiating positive outcomes.” (Transport Agency investment manager).

While the above comments reflect the preponderance of opinion, some participants did find the process frustrating and would have preferred more time on presentations. As the course has evolved, minor changes have been made to improve the guidelines and templates for the groups, as well as increasing the number of case studies and diversity of scenarios. The currency of the case studies also needs to be maintained. This will be achieved through annual review and updating as needed.

Testing, piloting and delivery

Draft course content was initially tested by way of a “dummy run” on a group of 15 participants (Transport Agency staff, Police and local government representatives) in July 2012, which gave the designers a chance to refine the content and the case studies. This was followed by the pilot programme of four courses delivered to a further 203 people in groups of approximately 50 in Wellington, Auckland, Christchurch and Rotorua late in 2012. Across

the four courses, attendees comprised 78 from local government (38%), 62 from the Transport Agency (31%), 52 from Police (26%) and 11 from the Ministry of Transport and ACC (5%).

In 2013 the content has been further improved following the evaluations from the pilot and the number of participants on each course expanded to around 60 to meet high demand. In 2013 ten courses have been scheduled nationwide: Auckland (twice), Palmerston North, Christchurch, Hamilton, Wellington (twice), Tauranga, Dunedin, and Napier. The cohort of presenters has also been expanded to provide for future needs.

Results

The evaluation process has been constant, and comprises formal course evaluations against the eight learning objectives; post-course evaluations of whether the course learnings are being applied three months later; and “lessons learned” sessions involving the presenters, facilitators and course designers.

The 2012 pilot results – learning outcomes

Participants in the four pilot courses were asked at the end of the course whether the eight learning outcomes had been met, according to the scale in figure 1.

Ratings for learning outcomes	
Unable to meet this learning outcome	1
Able to meet a few aspects of this learning outcome	2
Able to partially meet this learning outcome	3
Able to meet most aspects of this learning outcome	4
Able to meet all aspects of this learning outcome	5

Figure 1: Learning outcome rating scale

Most participants reported that the learning outcomes were fully or mostly achieved, with the mean outcome score at 4.20 and a standard deviation of 0.7.

How people rated the pilot course

Ratings are also important because the enjoyment and attractiveness of a course influences learning [15, 13]. The most frequent rating was “excellent”, and all save one rated it good or better. The ratings of excellent or very good were slightly more likely to come from the target audience and this was reinforced in the comments.

This course was aimed at people who had a little prior exposure to the Safe System approach and the main predictor of success during the pilot was the knowledge the person brought in at the start. Participants were asked about their prior knowledge at the start of the course. Those few who came in knowing “very little” (nine people) gained a

partial but not full understanding of the approach. Those who came in with some knowledge were more likely to rate the course as excellent and generally became very confident that they could apply the approach in their own role. This is shown in Figure 2 below.

On average, learning outcomes were best for staff from the larger councils (around 4.5 or higher) and less than four for some of the small remote councils. The Transport Agency and NZ Police, who supplied 57% of attendees, were in the middle with scores more closely reflecting the mean. The selection of verbatim comments below is typical of those who rated the course as excellent:

“Very worthwhile course. Great resources which I will refer back to in future.” (Road safety coordinator, district council)

“Excellent days enjoyed the process and met very interesting people - A great opportunity.” (Programme manager, Accident Compensation Corporation)

“Excellent mixing people up in various groups. Discussion on the roles of various professionals, i.e. what does a Council engineer, road safety co-ordinator, police officer do under safe systems and how all can work together to improve road safety.” (Senior Sergeant, road policing).

Follow up survey of pilot participants

All pilot participants were followed up as to how they were applying the content in their jobs through a survey run by the Transport Agency via Survey Monkey in December 2012 to January 2013. A total of 72 responses were received. This is artificially low because the 52 Police respondents did not receive the survey due to system security requirements (this deficiency was not realised until after the survey had closed). In these self-reports the most visible change at that stage was in internal communications and in their own work.

Other comments indicated how attendees were applying their learning back on the job, indicating sustained influence from the course:

“I have given a presentation to Council about the Safe System principles and they have made a formal resolution to integrate Safer Journeys and the Safe System approach in all Council activities where appropriate.”

“Other colleagues who attended the same course now understand the safe system so we can now all go in the same direction when discussing road safety problems.”

“A much greater awareness of how the new road safety strategy is going to be delivered - in my mind it moved from being concepts based to a reality.”

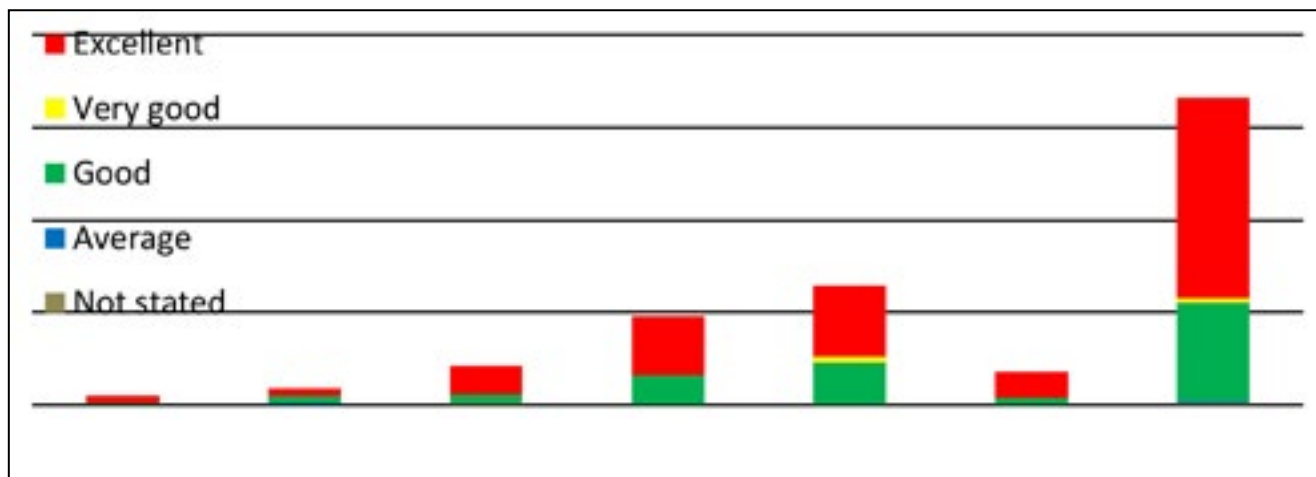


Figure 2: Summary of pilot course evaluations showing the link between prior knowledge and satisfaction ratings.

(Note: comments were recorded anonymously by Survey Monkey, so further identification is not possible, although it is clear that the first is from a local government official).

Lessons learned post-implementation review

In October 2012 the experience of running the pilot and the evaluation results were formally reviewed by the Transport Agency in consultation with partner agencies. The facilitator and presenters also contributed their own assessments of what had worked or not worked so well on the pilot programme. Various adjustments were then made to the course for 2013: these included a review of the curriculum, and improvements to individual modules.

From the above, it is clear that the learning outcomes for individual participants are being met overall, and the course is developing a prestigious reputation. It is still a little too early to judge whether the broader benefits and cultural objectives such as the goal of embedding the approach into the planning and delivery of road safety, and a changed road safety conversation and culture, are being achieved fully.

Post pilot course outcomes

Seven courses have been held in 2013 at the date of writing. Evaluation results have so far been broadly consistent with the 2012 results. Approximately half the participants rate the course as excellent, with a further 40% ranking the course as good. More detailed analysis of the 2013 results, including results from a planned follow-up survey will be completed.

Discussion

Authors such as Stone; P Ramsey, Franklin, and D Ramsey; [13, 10] outline generic success factors for training. There are several factors that we believe have contributed to the success of the course that are consistent with Stone's success factors.

A focus on meeting the learning outcomes and broader course objectives

Clear learning outcomes were specified at the start, carried through into the design, and evaluated at the end of each course. This has kept the curriculum and design of the course true to the learning outcomes and broader objectives and helped to maintain course quality.

Commitment to quality

The course's success stands on a strong commitment to quality and continuous improvement. This includes the quality of the course book and presentation materials, and the calibre and credibility of the presenters, who are subject matter experts in their fields. The Transport Agency has required facilitators to be highly professional and

credible in the road safety field and has ensured venues and catering are conducive to learning. After every course, the evaluations are scrutinised and improvements fed into the next course.

The cross-functional action learning approach using New Zealand case studies

The use of case studies has helped keep the course relevant, particularly to regional staff, both in keeping the content practical, and in building a model of how the content can be applied on the job and with one's colleagues – for example, during Road Safety Action Planning. Participants have repeatedly said that they value the opportunity for networking and relationship building and that informal learning is equally important.

The attractiveness of the course

Every effort has been made to make the course accessible to attendees from all organisations. The pilot courses were free and the first four courses were full. After this, interest grew by word of mouth. Course costs are still kept low at NZ\$200 per person, because of a substantial grant from the Accident Compensation Corporation and contribution of project management and administration from the Transport Agency. The fee just covers the remaining direct costs of materials, venues and logistics, with most presenter time being provided gratis. The course fits into professional development frameworks and over time, will be a prerequisite for the annual NZ Road Safety Engineering Course (recently renamed Safe System Engineering Workshop). This increases its attractiveness to engineers.

Strategic alignment and sector leadership

Raising capability to apply the approach was included in the *Safer Journeys* Action plan 2011-12. Strong leadership from the National Road Safety Management Group and the Transport Agency's road safety governance group helped secure organisational support and seed funding in the early stages. Delivering and attending the training was then incorporated into the Transport Agency's Statement of Intent as a performance measure. The sector has retained full responsibility for the training and its future direction, which has fostered a strong sense of commitment and pride.

Future challenges

One challenge is keeping the course fresh and current, especially for the facilitators and presenters. This is partly being met by widening the circle of facilitators and presenters. However, that presents different challenges, as there is a risk of loss of speaker credibility as more people are brought on board. This risk is managed by careful selection of subject matter experts and professional training to polish presentation and training skills where needed.

A second challenge, noted earlier, is that it has been difficult to achieve the target of ensuring senior organisational leaders attend the course. To meet this challenge, a shorter more intense programme targeted at their needs is proposed for development in late 2013 and early 2014 with a pilot and subsequent delivery in 2014.

A third is that the current case study approach demonstrates how the approach can be applied to road safety issues in the regions. This may be less relevant for central policy makers and a follow-up session on how the approach can best be translated into policy direction could be worthwhile in the future.

Finally, individual change needs to be accompanied by systemic change. In the follow-up survey, while 55% said they had not experienced barriers to implementing the approach, 45% did. The barriers encountered included lack of alignment of funding principles and processes with the Safe System, lack of understanding among colleagues, managers or elected officials, and reluctance to let go of “blame the driver” mindsets. This supports the need to develop a more tightly focused programme for senior leaders and elected officials who have the decision making authority to address the barriers.

Conclusion

The paradigm shift in adopting the Safe System approach requires both the willingness and ability to change. We cannot expect people to change without building both. An effective course that empowers them to challenge the status quo and pursue the *Safer Journeys* vision is an essential part of driving strategy into action.

The course is designed on best practice principles and the reputation and credibility of the course; and the presenters are important factors in building the willingness to adopt the change. The practical approach builds the ability to apply the learnings back on the job. Together they empower people to approach the task of reducing death and serious injuries on the road differently. *The Safe System in Practice* course gives practitioners the vocabulary, the tools and the mandate to use the Safe System approach. The effectiveness of the course is demonstrated by the course evaluations and the post-course follow up survey, indicating that most attendees achieve most of the learning outcomes and change their behaviour when back in the workforce. Another indicator is that many pilot course attendees are sending their colleagues to the course this year. The course has been designed to be transferable and the course materials are open source: there is no charge for using them although an acknowledgement is required.

It is our recommendation that other jurisdictions consider using and adapting the materials and methods in the broader interests of furthering the adoption of the Safe System

approach, and in the interests of contributing to the goals of the United Nations Global Decade of Action for Road Safety.

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Promoting a more positive traffic safety culture in Australia: lessons learnt and future directions

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Abstract

Adopting a traffic safety culture approach, this paper identifies and discusses the ongoing challenge of promoting the road safety message in Australia. It is widely acknowledged that mass media and public education initiatives have played a critical role in the significant positive changes witnessed in community attitudes to road safety in the last three to four decades. It could be argued that mass media and education have had a direct influence on behaviours and attitudes, as well as an indirect influence through signposting and awareness raising functions in conjunction with enforcement. Great achievements have been made in reducing fatalities on Australia's roads; a concept which is well understood among the international road safety fraternity. How well these achievements are appreciated by the general Australian community however, is not clear. This paper explores the lessons that can be learnt from successes in attitudinal and behaviour change in regard to seatbelt use and drink driving in Australia. It also identifies and discusses key challenges associated with achieving further positive changes in community attitudes and behaviours, particularly in relation to behaviours that may not be perceived by the community as dangerous, such as speeding and mobile phone use while driving. Potential strategies for future mass media and public education campaigns to target these challenges are suggested, including ways of harnessing the power of contemporary traffic law enforcement techniques, such as point-to-point speed enforcement and in-vehicle technologies, to help spread the road safety message.

Keywords

Community attitudes, Road safety, Speeding, Public awareness, Traffic safety culture

Introduction

Australia has experienced remarkable success in reducing the number of people killed in road traffic crashes since the highest peak in fatalities in 1970 [9]. This reduction was achieved at the same time as a 50% increase in population and a two-fold increase in vehicle numbers [3]. This success is well recognised by the international road safety

community and has involved a wide range of Australian stakeholders including policy makers, road users, police and the media. It is widely acknowledged that mass media and public education initiatives have played a critical role in the significant positive changes witnessed in community attitudes to road safety and road user behaviours [51]. It could be argued that mass media and education have had a direct influence on behaviours and attitudes, as well as an indirect influence through signposting and awareness raising functions in conjunction with enforcement [11]. The relationship between attitudes and behaviour is a complex one [30]. Theoretical evidence supports both perspectives in terms of changes in behaviour prompting changes in attitudes (i.e., cognitive dissonance; [13]) and vice versa (i.e., Theory of Planned Behaviour; [1]). Two approaches to education/awareness raising can be considered. Firstly, a reinforcing approach is one where messages are used to reinforce the purpose of enforcement (e.g., influencing perceptions of the likelihood of detection) in order to educate about enforcement practices. Secondly, a transformative approach is one that attempts to modify community-wide values, attitudes and perceptions in order to change cultural beliefs about offending behaviour and to increase moral attachment to the law [52, 55]. In practice, therefore, public education can play an important role in directly encouraging changes in the beliefs, values, and norms within a society. However, it can also indirectly encourage change by reinforcing enforcement activities which may have changed behaviour in the first instance. Indeed, the temporal order of change (i.e., whether behaviour or attitudes change first) is not always clear. In regard to drink driving in Australia, it has been argued that behaviour change occurred first as a result of enforcement (i.e., random breath testing) and that attitudinal change followed [25].

Two risky road user behaviours, in particular, have witnessed significant positive changes in Australia: drink driving and the non-use of seat belts. It is acknowledged that the contemporary traffic safety culture surrounding these two behaviours has changed dramatically and is different to what it was several decades ago. Traffic safety culture has been conceptualised in a number of ways and can be considered as a continuum (i.e., positive to negative). For instance, Ward, Linkenbach, Keller and Otto

[52] described it as inclusive of virtues valued by society, beliefs about what is normal, expectations associated with violations, attitudes about individual behaviours, and the influence of these factors on decision making by individuals. With these concepts in mind, this conceptual paper draws upon the changes that have occurred in Australia's traffic safety culture relating to drink driving and seat belt use in order to explore potential strategies that might be useful in changing the culture surrounding other behaviours that have not attained the same status; namely, speeding and phone use while driving.

Drink driving

Much has been written about the dramatic changes in both the practice of, and attitudes towards, this high risk behaviour (see McLean for a recent detailed historical account [32]). Generally speaking, the 'culture' associated with drink driving has changed over the last few decades. It is no longer socially acceptable to drink and drive in Australia. This situation is reflected in the almost universal support (98%) found for the existence and implementation of random breath testing (RBT) in the most recent national *Community Attitudes to Road Safety* survey [34]. Notably, this figure has been consistently high for some time, reflecting evidence of the changed community views and culture surrounding drink driving. Sustained and appropriately resourced police enforcement, coupled with legal penalties and sanctions, have played important roles in bringing about behaviour change. Extensive media coverage, including road safety advertising campaigns, has also played a role, both in terms of providing information about enforcement activities and in changing public perceptions of the behaviour. Tay [43, 44] has provided evidence of drink driving advertising campaigns contributing to reductions in alcohol-related crashes and of such campaigns having significant and independent effects from enforcement. In terms of changing public perceptions of the behaviour, as Elliott noted [12], the social disapproval associated with drink driving is evidenced by an individual who is caught for drink driving being likely to be considered by society as a 'criminal' and as 'breaking the law'.

Despite these important successes, work is still needed to eliminate the adverse consequences of alcohol on road safety. Approximately one quarter of road fatalities in Australia are still linked to illegal blood alcohol levels [3] and evidence suggests that there may be new and emergent road safety challenges, such as the increase in women being detected for drink driving. In addition, youth binge drinking and the subsequent interactions that youth may have with the road system when intoxicated, whether as a drink driver or a drink walker [22, 31], reflect the extent to which broader alcohol-related problems in society impact upon road safety. In sum, while notable improvements have been made by public education and awareness campaigns in

recent decades, ongoing efforts are needed and road safety researchers and practitioners must be prepared to address both traditional and emerging alcohol-related road use problems.

Seat belt use

Another important change in Australia's traffic safety culture has been observed in regard to seat belt use. Despite substantial initial opposition in the 1970s, seatbelt wearing rates are consistently high [3]. Consideration needs to be given to why these rates remain high in Australia because in some countries, seatbelts are viewed as an unnecessary inconvenience and a hindrance to freedom of movement (for instance, see Routley [38] for examples from China). As chronicled by McLean [32], the introduction of compulsory seatbelt wearing in Australia was not without dissent. The quote below from the Traffic Accident Research Unit of the New South Wales Department of Motor Transport in 1971 highlights just how much has been achieved in terms of changing the safety culture associated with seat belt use:

It is suggested that the fundamental source of public resistance is that motorists do not feel vulnerable to death or injury under normal driving conditions. This may prove to be an insurmountable barrier to public education designed to increase the seatbelt wearing rate [13], pg 15.

History reveals, however, that what was initially considered 'an insurmountable barrier' relating to seatbelt use in 1971 has proven not to be so, given the high levels of restraint wearing now evidenced among road users. Evidence from other countries supports the important role and positive effects of enforcement as well as seat belt advertising campaigns in encouraging/promoting greater adherence [46, 47, 51].

Overall, when considering drink driving and seat belt wearing, evidence would suggest that the community has generally grasped the link between alcohol intoxication and high(er) risk of road crashes/fatalities, as well as between non-restraint use and high(er) risk of serious injuries/fatalities in a road crash. In contrast, however, for other high risk behaviours, such as speeding and phone use while driving, evidence suggests that the same degree of social disapproval and identification of risk associated with such behaviours does not yet exist in the general community.

Speeding

Currently, all Australian jurisdictions have laws that nominate a maximum speed limit. However, consideration is currently being given to the removal of an upper speed restriction on some roads by the Northern Territory government, despite protests from the road safety

community. The concept described above in the quotation from 1971 relating to seatbelts (i.e., that motorists do not feel vulnerable under normal driving conditions) can be considered an issue relevant to speed management. Speeding remains prevalent and contributes to approximately 34% of fatalities and 13% of serious injuries each year [3]. Despite extensive and sustained police efforts and mass media education and awareness campaigns over many years, some people still reject the link between speed and crash risk and crash severity. Indeed, some drivers report deliberately disregarding legally posted speed limits, preferring instead to rely on their ability to determine speeds appropriate to the driving environment, even if those speeds are well above posted limits [14, 24]. It is clear that some segments of the Australian community and media regard posted speed limits as an unnecessary and unwarranted invasion of personal freedom to choose to drive as fast as they desire. Furthermore, speed enforcement and associated penalties are viewed by some as having only one purpose – to raise funds for governments.

The most recent survey of *Community Attitudes to Road Safety* indicated that a substantial proportion of those sampled reported the belief that driving at speeds above posted speed limits are acceptable [34]. In terms of the social perceptions of the acceptability of speeding behaviour, in direct contrast with the negative views that an individual caught for drink driving may attract, a speeding driver may consider themselves (and others may consider them) as simply having been ‘unlucky’ for being detected [12]. The *Community Attitudes to Road Safety* survey also revealed that a minority of respondents reported the belief that there should be zero tolerance associated with enforcing speeding (i.e., no speed allowed above the posted limit):

- 30% (when asked about driving in a 60km/hour speed zone) and
- 24% (when asked about driving in a 100km/hour speed zone).

This outcome suggests that the majority consider some degree of tolerance appropriate. In other words, the majority of people sampled reported the belief that it is acceptable to drive above posted speed limits. For the 60km/hour speed zone, approximately half the respondents (48%) indicated the belief that people should be allowed to drive at or above 65km/hour – a figure that has remained constant in recent years [34]. For the 100km/hour zone, at least one third of respondents indicated that they believe people should be able to drive at 110km/hour without attracting an offence.

In the same survey, participants were asked to indicate what factors they believed contributed to road traffic crashes. Speed was the factor mentioned by most people, identified

by over half of the sample (54%). Drink driving (47%), inattention (26%), driver fatigue (21%) and distraction/talking on a phone (14%) were also mentioned. The majority of the sample (70%) also expressed the belief that the chance of being involved in a crash significantly increased if their driving speed increased by 10km/hour; notably, the number of respondents agreeing with this aspect has increased substantially over the last decade. This desirable increase may represent a general awareness of the link between speeding and crash risk, or it may simply reflect a heightened awareness among the driving community that police are improving speed management approaches, perhaps prompted by ongoing mass media communication. These figures, taken together with those previously discussed relating to the high levels of self-reported speeding, provide more evidence for the existence of the ‘speed paradox’. This paradox refers to the mismatch between drivers’ beliefs and behaviour, reflecting the tendency for many individuals to report the belief that speeding is dangerous and yet still report engaging in the behaviour on a regular basis [15]. This mismatch is likely to be a substantial part of the challenge in producing similar changes in attitudes and behaviour which have occurred for drink driving and restraint use.

Speeding and drink driving are distinctive behaviours and are, therefore, likely to be perceived and practiced differently by motorists [21]. One notable example of this distinction is the extent to which speeding is a much more transient violation than drink driving and which may occur numerous times during a driving episode. In addition, when it comes to identifying strategies to avoid/reduce one’s engagement in such behaviours, many more strategies may be offered and promoted to avoid drink driving (e.g., take a taxi, identify a designated driver who remains sober) than may be identified for speeding with the main strategy to avoid speeding being encouraging a driver simply not to speed [44]. Given this distinction between behaviours, it follows that advertising interventions need to be deliberately and carefully devised to address a particular behaviour [44]. Thus, extensive work continues in relation to anti-speeding message development [23, 29, 28] in the attempt to devise targeted and effective message content.

Traditionally and predominantly, anti-speeding messages have focused on the risks associated with speeding and, in particular, the risk of death and injury to self and others and the risk of being apprehended and receiving the legal consequences as aversive consequences of speeding. Attempts have also been made to educate motorists about issues such as the need for greater stopping distances when driving faster and potential difficulties in vehicle control at speed. One avenue that may assist in relation to speeding is in identifying what motivates people to speed and then challenging these motivations through appropriately devised and targeted public education campaigns [18, 28].

Devising effective campaigns to tackle speeding can also assist in altering the current level of social acceptability of the behaviour. There is an ongoing need to challenge normative beliefs about speeding – that is, to challenge the notion that everyone speeds. The NSW Roads and Transport Authority's Pinkie campaign [54] is an example of an attempt to challenge the status quo regarding acceptable community norms towards speeding. Lewis and Newnam [27] reported a study in which anti-speeding messages were developed for a fleet of community care nurses which included an attempt to challenge the notion that everyone speeds. Specifically, the authors noted that messages were designed to challenge the common beliefs that: (i) everybody speeds, (ii) speeding saves and/or makes up time; and (iii) 'safe' speeding is okay. Reductions in self-reported speeding were reported as a result. In addition, governments could also assist by conveying the message that not everyone speeds via the dissemination of information collected from speed surveys (e.g., Kloeden, [26] for an example from Queensland). These surveys provide information such as mean speeds across large parts of the road network that are below posted speed limits. In other words, they provide objective data showing that not everyone speeds and that a considerable proportion (approximately two thirds) of the Queensland driving population adhered to posted speed limits across a three year period [26].

Other key challenges relate to the need to counteract the often misleading and inaccurate statements and claims made by sections of the community and media. It is unfortunate that the media often report extremely high speeds attained by some offenders which may serve to motivate others to copy this high risk behaviour and may also glorify it. In addition, some sections of the community and media consistently campaign to discredit speed enforcement policies, equipment, and practices [2, 3, 35, 37, 49]. Numerous strategies have been suggested in order to alter many of the commonly expressed beliefs about the perceived benefits of speeding [28]. The use of technology also has a role to play here. Various authors have examined and discussed the potential for in-vehicle technologies, such as Intelligent Speed Adaptation (ISA), to assist in promoting speed limit compliance [36, 53]. Interestingly, in a study conducted in the United Kingdom, even participants who were strongly opposed to the use of ISA conceded that they would, if forced to by the introduction of legislation, use the technology [7]. Interestingly, analogies to seat belt use and legislation were made to illustrate how driver behaviour has altered in the past, even though the introduction of the countermeasure was not popular initially [7]. This finding is encouraging in that it suggests that people are able to appreciate the value of new countermeasures, even though they may not understand or agree with such countermeasures in the first instance.

One area that has not yet received much attention when promoting the benefits of speed limit compliance is the role of new speed enforcement technologies. For instance, point-to-point speed enforcement (also known as section control and average speed enforcement) is a relatively new enforcement approach in Australia, compared to its use in parts of the United Kingdom and Europe (see Soole, Fleiter and Watson [41] for an extensive discussion of the use of this technology in Australia and elsewhere). Not all Australian jurisdictions currently use point-to-point speed enforcement. Among those that do, the extent of use differs in various ways and it is likely that each jurisdiction also promotes the approach differently.

Recommendations regarding public education about point-to-point speed enforcement in Australia include the need to educate motorists about exactly how the system operates and the extent of the operations [41]. Further, it has been recommended that the general and specific deterrent effects of the approach be highlighted, as well as its cost-effectiveness; although expensive, it can produce significant returns on investment owing to reductions in crash-associated social and economic costs [42]. Finally, it has also been recommended that the ability of the technology to detect those who speed over a longer period of time be publicised. In this way, the technology could be promoted as better able to detect those who deliberately break the speed limit over an extended time more effectively than other speed enforcement approaches. In other words, point-to-point enforcement has the ability to better differentiate between those motorists who inadvertently speed (and may be caught by a mobile or fixed camera at a single location/time) and those who deliberately speed over longer parts of the road network. This ability to detect more persistent speeders may be an important 'selling point' of the technology and might assist in promoting acceptance of it among those who are sceptical of speed enforcement. Inadvertent speeding and feelings of being 'caught out' by police for a momentary lapse of concentration are commonly reported beliefs (complaints) about speed enforcement [8, 24]. This barrier to acceptance may be reduced for point-to-point enforcement if it is explained clearly to the motoring public.

Attempts to quantify support for this new speed enforcement approach among Australia's motoring public have occurred recently. For instance, the most recent Community Attitudes to Road Safety survey [34] and an Austroads project investigating attitudes to speed enforcement [24] both found reasonably high levels of support among participants (two thirds of participants reported agreement with use of this speed enforcement approach in both surveys). Indeed, the Ipsos research indicates that among those interviewed, some participants reported a preference for point-to-point enforcement over other detection methods because it was perceived as

more efficient at detecting those who speed across longer sections of road network as opposed to those who make a momentary error of judgement. Results also indicated that point-to-point speed enforcement was not strongly associated with perceptions about potential revenue raising – another key challenge traditionally facing government authorities, particularly in regard to automated speed enforcement [8, 16].

These findings [34, 24] are encouraging and provide reason for optimism when it comes to future expansions of point-to-point enforcement in Australia. However, caution is also required. The relatively high levels of support for point-to-point speed enforcement reported above were, in some instances, reported by participants living in jurisdictions where this enforcement approach was not operational. Furthermore, some participants reported perceptions of inaccuracies about point-to-point equipment and operations which suggests that there is a need to clearly explain how the technology works, how it differs from other types of speed cameras, and how it can promote safer road use and a more efficient road network.

Phone use while driving

Despite hand-held mobile phone use when driving being illegal in all Australian jurisdictions, research indicates that many drivers continue to report engaging in this behaviour [19, 33, 34]. For instance, a recent study conducted in NSW by the National Roads and Motorists' Association Insurance found that 88% of drivers reported making calls while driving, and 68% reported sending text messages [6]. Drivers in Queensland also self-reported their mobile phone use when driving [50]. One third of surveyed drivers (36%) reported reading a text message and a smaller proportion (18%) reported sending a text message while driving. In the sample of 801 drivers, two thirds did not have a hands-free mobile phone kit and of those who did, only one half (49%) reported using it all the time for phone calls. These self-report data show much higher rates of use than observational studies that indicate that approximately 2% of drivers were using a hand-held phone at any given time [20, 45].

Together, these findings show a discrepancy between observational and self-report phone use data. However, it is important to note that it is likely to be more difficult to accurately determine if a driver is sending/reading a text message than if they are speaking on the phone from an observational point outside the vehicle. Indeed, as Gauld et al. (under review) identified, drivers are aware that texting while driving is illegal and as a consequence, a majority of young drivers in that study reported deliberately concealing their texting while driving (i.e., holding their phone and texting from below the level of the steering wheel) to avoid detection.

Phone use while driving can be considered similar to speeding in that there is evidence of a misalignment between community beliefs and behaviours. One example of the contradiction in community behaviours and beliefs about this high risk behaviour can be seen nationally and internationally in instances where substantial media attention follows the death of (typically young) drivers who were using a phone at the time of a crash. Often there is public outrage at the occurrence and calls for changes to be made to prevent the ability to use a phone while driving, which even extends to debate about the use of technology to block their use while they are in a vehicle which is in motion.

Further attesting to the misalignment between behaviours and beliefs, Walsh [50] found that one quarter of their study's sample reported using a phone while driving at least once a day. When asked to describe the advantages and disadvantages of phone use when driving, it was the disadvantages that were most frequently given by this group of respondents. Being 'distracted from driving' (47%), 'having less concentration' (34%) and 'dangerous' (34%) were more frequently nominated than any of the advantages of phone use when driving. This finding suggests that the risks to personal safety from phone use when driving are recognised at some level, yet the behaviour continues despite this recognition. The potential of receiving a fine for using a phone was the least frequently reported disadvantage which may relate to the challenges associated with enforcing this behaviour.

Collectively, the body of evidence which is emerging in relation to phone use while driving reflects attempts to understand more about the key underpinning psychosocial influences of behaviour and then using such understanding to devise better-targeted advertising initiatives [19, 33, 39]. As Gauld et al. (under review) discuss, the extent to which drivers may conceal texting while driving suggests that detection and thus enforcement of such a behaviour is increasingly difficult, relative to other behaviours such as speeding. As such, mobile phone use while driving (and concealed texting, in particular) may represent a risky driving behaviour where advertising campaigns which attempt to persuade drivers against engaging in the behaviour may be particularly important at reducing/preventing it.

As noted above, debate is occurring about the appropriateness of, and the need to employ, technologies to block the use of phones when driving in order to remove the temptation for drivers to communicate with others while in control of a vehicle. Recent Australian research examined crash records over a ten year period in two Australian jurisdictions and found that driver inattention and distraction were key contributors to crashes where at least one person was admitted to hospital because of the injuries they sustained in the crash [5]. Interactions with passengers

were the most commonly reported type of distraction. However, other activities such as adjusting vehicle controls, changing CDs and using a mobile phone when driving were also distracting activities leading to a crash. The authors commented on the ever-increasing array of in-vehicle technologies and portable electronic devices on the market that are likely to provide opportunities for additional driver distraction in future. They also suggested that it may be possible to legislate to prohibit certain devices when driving or to block and/or restrict device functionality.

However, until any such legislation is implemented, many people continue to illegally use their phones while driving, despite the threat of legal penalties. As discussed above, the threat of penalty does not appear to deter some people, given that it was the least frequently reported disadvantage of phone use while driving in one Australian study [50]. This finding may indicate that the perceived risk of apprehension for illegal phone use is low. Alternatively, it may indicate that legal penalties when apprehended are not considered severe enough to act as a deterrent. Education campaigns to help alter this risky behaviour may benefit from a relatively new type of research being conducted in several international jurisdictions and soon to be applied in Australia for the first time. Naturalistic driving studies, where driver behaviours are constantly recorded in their own vehicle over extensive periods of time [10], are likely to provide much more accurate information about the extent of phone use while driving and associated distractions from the driving task. Recorded images of a real trip where the driver was using his/her phone may be useful in demonstrating the dangers associated with this practice. For instance, the ability to show the real consequences of people engaging in phone use, such as near misses, loss of vehicle control, or minor and major collisions may be more meaningful than watching advertisements showing actors experiencing these events.

The use of technology may also assist in enhancing ongoing education efforts in regard to drink driving. As noted earlier, the safety culture surrounding this behaviour has dramatically changed in Australia, and yet alcohol remains a major contributor, playing a role in a quarter of all fatal crashes. Currently, alcohol ignition interlocks are used in many jurisdictions to manage repeat drink driving offenders by encouraging them to separate their drinking and driving [56]. However, their use is widening; an outcome that has the potential to strengthen the message that drinking and driving do not mix and to further enhance the cultural norm that drink driving is not acceptable. For example, the Victorian government has announced that it intends to introduce laws requiring all drink driving offenders to have an interlock fitted to their vehicle, although the exact commencement of this change is uncertain [40]. Additionally, the use of interlocks in commercial/professional fleets is widespread in several European

countries [48]. Promoting interlocks more widely in our community (e.g., fitting them on all vehicles) could assist in normalising the role of this technology and in sending a clear statement to the community that drink driving is never acceptable.

Finally, Australian jurisdictions have made important and often innovative progress in altering road user attitudes and behaviours as well as in policing and punishing risky and illegal road use. Australia is internationally recognised as a country with a strong track record of improving safety outcomes. However, the extent to which the Australian public understands this achievement and the international praise and recognition that it has brought is unclear. While the aforementioned national *Community Attitudes to Road Safety* surveys and others like them assess many road safety-related issues, they do not provide any information to gauge the extent to which the community understands the burden of road trauma, the significant achievements made in reducing road fatalities, and Australia's international standing as a strong performer in road safety. Indeed, there is extremely limited information to indicate what the broader community knows about these issues. There may be value in promoting the significant reductions in road fatalities that have been achieved as a means of demonstrating the need to continue enforcement and education campaigns that have served the motoring public so well in the past.

Furthermore, individual road crashes and subsequent fatalities (i.e., the 'road toll'), and to a lesser extent, the amount and extent of injuries, are regularly reported in the media, especially during major national holiday periods such as Christmas and Easter. Despite this high profile coverage, it is not clear how well the broader Australian community understands the extent of the road fatality problem. Research conducted in Queensland sought to begin addressing this gap in knowledge. A sample of 833 Queensland drivers was asked to report how many people they thought had been killed on Queensland's and Australia's roads in the previous year [17]. Results indicated that the majority of people under-estimated the extent of road deaths. For instance, three quarters of respondents under-estimated the national fatality figure, with one half of the sample nominating a number that was less than half the actual number. The pattern of results was similar for the question relating to Queensland fatalities. Another finding of relevance to the current paper was that the media may, in part, contribute to underestimations of the road trauma burden. Some participants reported basing their (under) estimates on media reports of fatalities during holiday periods. It is possible that such reporting may inadvertently create the perception that these periods are more risky than other times of the year; a proposition shown to be incorrect [4]. Further, such reporting may also give the inaccurate impression that the number of fatalities

reported during these periods represents the bulk of annual road fatalities. This misperception is likely to do little to highlight the true extent of the road trauma problem. These inaccurate perceptions may also be barriers to convincing motorists of the need to heed road safety messages and of the need for future countermeasures. Consideration could be given to informing the public about these misperceptions in the hope that the true extent of the road trauma burden is fully appreciated. This appreciation may lead to more support for road safety countermeasures.

Conclusion

Great gains have been made in changing Australia's traffic safety culture, particularly with regard to drink driving and seat belt use. However, other illegal and risky behaviours have not experienced the same changes despite sustained and multi-pronged attempts to alter them. This paper has focused on two such behaviours; speeding and phone use while driving. These behaviours remain resistant to change, particularly in relation to their prevalence and the levels of social acceptability surrounding them. This paper has identified various ways that technology could be harnessed to assist in changing the culture surrounding speeding and phone use while driving and how research into the design and evaluation of advertising countermeasures may help to alter the current norms and culture associated with these high risk behaviours. Additionally, there is a need to better understand how much the community knows about the significant gains Australia has made in road safety in recent decades. It is hoped that improving awareness of these gains will promote an understanding of just how effective road safety countermeasures have been and assist in creating a culture that is accepting of new initiatives aimed at reducing harm and saving lives.

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The accuracy of determining speeding directly from mass crash data and using the NSW Centre for Road Safety method

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Abstract

Exceeding the posted speed limit, or speeding, is generally accepted as a major cause of road crashes and in particular fatal crashes. However, the actual proportion of crashes in which one or more vehicles was speeding is not easily determined. The exact travelling speed of a vehicle prior to a crash can only be determined by detailed crash reconstruction. Such a reconstruction is considered beyond the scope of regular traffic police who record the majority of the crash data that makes up the mass crash databases such as the South Australian Traffic Accident Reporting System (TARS). It is therefore thought that speeding is under-reported in the mass crash data. A method was developed by NSW to identify, from mass data, crashes that involved speeding as a factor. This method was subsequently used by other states, including South Australia. The Centre for Automotive Safety Research conducts the crash reconstructions required to determine speed as part of its at-scene in-depth crash investigation work. This paper compares the actual proportion of speeding crashes in the most recent set of at-scene in-depth crash investigation cases with that found by using the mass data and the method developed by the NSW Centre for Road Safety. It was found that the error 'excessive speed' recorded in the TARS database is not accurate in identifying crashes where a vehicle was speeding. The NSW Centre for Road Safety method of determining speeding in crashes

was also found to lack accuracy, though it was more accurate than simply relying on the error 'excessive speed' in the TARS database.

Keywords

Speed, Speeding, Crash data

Introduction

Higher vehicle travel speeds have been shown to elevate the risk of being involved in an injury crash [4-6]. Travelling at a speed above the legal speed limit, or speeding, is considered to be one of the major factors in fatal crashes. For these reasons speeding has been the focus of major enforcement efforts (more than 100,000 hours of enforcement per year [3]) and media campaigns in South Australia, and similarly around Australia.

However, the actual proportion of crashes in which one or more vehicles was speeding is not easily determined. The most reliable method of determining a vehicle's speed, and therefore if it was speeding or not, is a detailed crash reconstruction conducted by a suitably qualified person. Such a reconstruction is considered beyond the scope of regular traffic police and is usually only conducted by dedicated police officers in circumstances where a driver will be charged with a serious driving offence. It

is therefore thought that speeding is under-reported in the mass crash data, such as the Traffic Accident Reporting System (TARS) database in South Australia.

A method was developed by the NSW Centre for Road Safety to identify, from mass data, crashes that involved speeding as a contributing factor. This method was subsequently used by other states, including South Australia. It is important to note that this method includes “excessive speed for the prevailing conditions” [1] in its definition of speeding. The concept of “excessive speed for the prevailing conditions” is problematic; it is subjective in nature, it is not easily enforceable, and it is contrary to the general understanding of speeding. It has also been criticised by Diamantopoulou et al. [2] for having an insufficient scientific basis, though an analysis of its accuracy was not conducted.

This paper will examine the accuracy of determining speeding directly from the mass crash data and using the NSW Centre for Road Safety’s method by comparing their results with the results of detailed reconstructions undertaken as part of the Centre for Automotive Safety Research’s (CASR) at-scene in-depth crash investigations. The difference in the definition of speeding in the NSW method means that the comparison conducted is not of the accuracy of the method in determining speeding by the definition it uses, but by the general definition (speed above the legal speed limit).

Method

Crashes from CASR’s most recent at-scene in-depth crash investigations study, conducted between July 2006 and April 2012, that had been reconstructed were identified. The speed of each vehicle, the applicable speed limit for each vehicle and the TARS number were extracted from CASR’s database (the TARS number is an identifier that allows a specific crash record to be extracted from the TARS database).

Because the involvement of speeding in a crash is a crash based variable only one vehicle needs to fulfil the requirements for the crash to be deemed as involving speeding. It is therefore useful to come up with a speed metric that is not vehicle specific but represents the crash as a whole. This metric was termed ‘speed relative to the speed limit’ and is determined by Equation 1. The actual proportion of crashes involving speeding could then be calculated.

$$\text{speed relative to the speed limit} = \max(V_1 - SL_1, \dots, V_n - SL_n) \quad (1)$$

where

n = number of vehicles involved in crash

V = speed of vehicle

SL = speed limit applicable to vehicle

Next the actual proportion of speeding crashes was compared to the proportion directly identified in the mass data as speeding crashes. To accomplish this, the TARS number was used to look up the individual crash record and note the ‘error’. This is the field in the TARS database that may identify if the police officer believed one of the vehicles was speeding, as one of the choices is ‘excessive speed’.

Finally the proportion of speeding crashes as determined by the NSW Centre for Road Safety method was determined and compared to the actual proportion. The NSW Centre for Road Safety method is as follows [1]:

Speeding is considered to have been a contributing factor to a road crash if that crash involved at least one speeding motor vehicle.

A motor vehicle is assessed as having been speeding if it satisfies the conditions described below under (a) or (b) or both.

- (a) The vehicle’s controller (driver or rider) was charged with a speeding offence; or

the vehicle was described by police as travelling at excessive speed; or

the stated speed of the vehicle was in excess of that permitted for the vehicle controller’s licence class or the vehicle weight (introduced 1 January 2010); or the stated speed of the vehicle was in excess of the speed limit.

- (b) The vehicle was performing a manoeuvre characteristic of excessive speed, that is: while on a curve the vehicle jack-knifed, skidded, slid or the controller lost control; or the vehicle ran off the road while negotiating a bend or turning a corner and the controller was not distracted by something or disadvantaged by drowsiness or sudden illness and was not swerving to avoid another vehicle, animal or object and the vehicle did not suffer equipment failure.

This method only used information available from the TARS mass crash database: any information gained from CASR’s at-scene in-depth crash investigation was ignored.

In TARS there is no field for offences, such as a speeding offence, associated with the crash to be listed therefore part (a) relied upon the police officers text description of the crash and the field where the speed of the vehicle is listed.

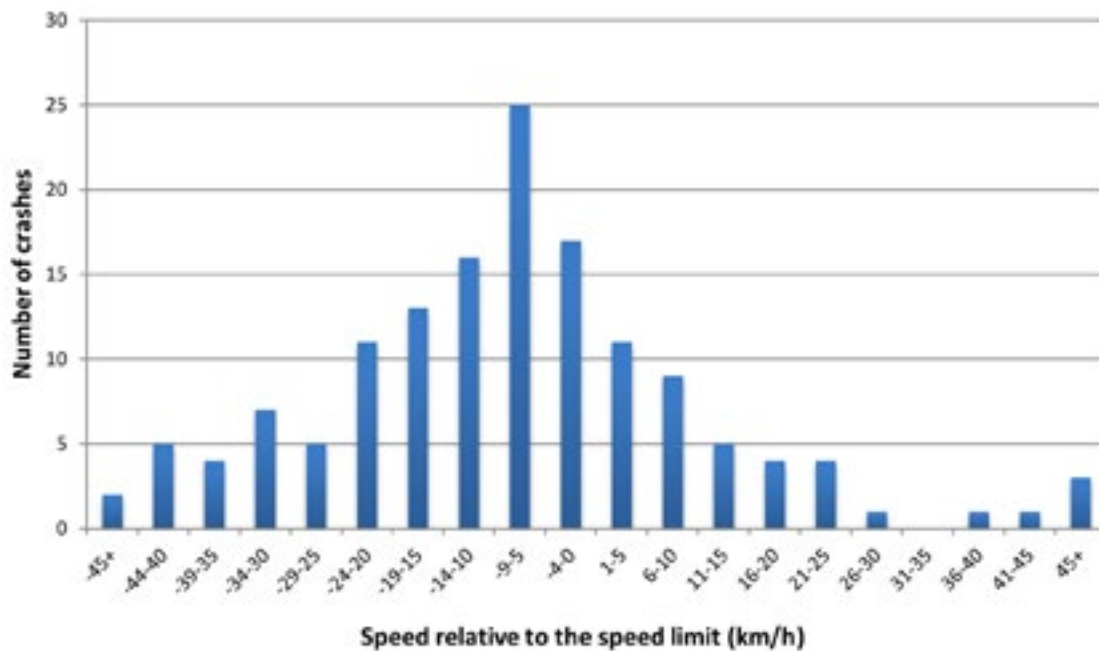


Figure 1: Distribution of speeds relative to the speed limit

Results

A total of 144 crashes where the speeds of the vehicles had been determined by reconstruction were identified in CASR's in-depth at-scene crash investigation database. Figure 1 shows the distribution of speeds relative to the speed limit. The distribution appears to roughly approximate a normal distribution centred on the negative nine to negative five range. There were five crashes where the speed relative to the speed limit was greater than 35km/h.

The error recorded in the TARS mass crash database relative to the results of the reconstruction (not speeding, speeding) are shown in Table 1. There are many different errors that can be chosen in TARS with the most frequent being 'inattention'. Excessive speed was only chosen in two of the 144 crashes, and in both cases the reconstruction showed that none of the vehicles involved were speeding. The error 'dangerous driving' is related to speeding as the legislation defines dangerous driving as "drive[ing] a vehicle recklessly or at a speed or in a manner which is dangerous to the public" [7]. This error was also chosen in two crashes but, unlike 'excessive speed', in both of these crashes the reconstruction showed that a vehicle was speeding. Other errors that appear to be good indicators of speeding are DUI (four of six were speeding) and 'change lanes to endanger', though the latter is only based on one crash that also happened to involve speeding.

Table 1: Error recorded in TARS mass crash database relative to reconstruction results

Error recorded in TARS mass crash database	Reconstruction		Total
	Not Speeding	Speeding	
Change Lanes to Endanger	0	1	1
Dangerous Driving	0	2	2
Died Sick or Asleep At Wheel	1	0	1
Disobey - Give Way Sign	9	3	12
Disobey - Stop Sign	6	3	9
Disobey - Traffic Lights	2	0	2
DUI	2	4	6
Excessive Speed	2	0	2
Fail to Give Way	13	3	16
Fail to Give Way Right	1	0	1
Fail to Keep Left	7	7	14
Fail to Stand	8	2	10
Follow Too Closely	2	2	4
Inattention	43	9	51
Incorrect or No Signal	0	1	1
None	5	0	4
Overtake Without Due Care	3	2	5
Vehicle Fault	1	0	1
Total	105	39	144

The NSW Centre for Road Safety method for determining speeding in crashes is compared to the results of the reconstructions in Table 2. While the predictive power of the NSW method was marginal it was in the right direction: 34% of the predicted speeding crashes were actually speeding compared to 24% of the predicted not speeding crashes; and 31% of actual speeding crashes were identified as speeding compared to 22% of actual not speeding crashes. Overall the NSW method predicted 24% speeding crashes - an underestimate of the actual 27%.

However, the method only correctly classified 65% of the 144 crashes and a Fisher exact test on the predictions gave a p-value of 0.281, which indicates that the method is not statistically significantly better than just randomly allocating cases.

Table 2: Determination of speeding involvement by the NSW Centre for Road Safety method compared to the reconstruction results

NSW Centre for Road Safety method	Reconstruction		Total	Percentage actually speeding
	Not Speeding	Speeding		
Not Speeding	82	27	109	24.8%
Speeding	23	12	35	34.3%
Total	105	39	144	27.1%
Percentage predicted speeding	21.9%	30.8%	24.3%	
Fisher exact test p = 0.281				

A comparison between the distribution of speed relative to the speed limit for incorrect identifications of speeding and not speeding made by the NSW Centre for Road Safety method is shown in Figure 2. The majority of the incorrect identifications of not speeding took place at speeds just over the speed limit. It is to be expected that these would be the hardest to correctly identify. Of concern is that a number of incorrect identifications of not speeding still occur when the speed is more than 20km/h above the speed limit. The distribution of incorrect identifications of speeding is much more even than might be expected, with many occurring at speeds far below the speed limit.

The accuracy of the NSW Centre for Road Safety method by injury severity and speed limit is shown in Table 3. The method was much more discriminating when determining speeding in fatal crashes; however the overall accuracy was only slightly better for fatal crashes than for other injury severities. When the accuracy is examined by speed limit the most striking result is that in low speed zones (40, 50 and 60 km/h) not a single crash that was determined by reconstruction to involve speeding was correctly identified as such by the NSW Centre for Road Safety method. Once again the overall accuracy varied very little between the categories of speed limits.

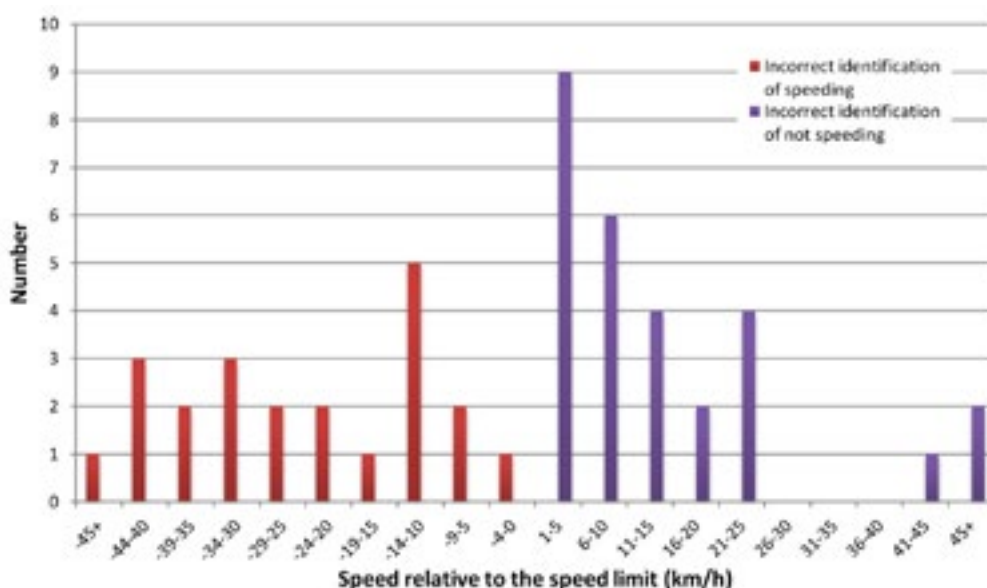


Figure 2: Comparison between the distributions of speeds relative to the speed limit for incorrect identifications of speeding and not speeding by the NSW Centre for Road Safety method

Table 3: Accuracy of NSW Centre for Road Safety Method by injury severity and speed limit

NSW Centre for Road Safety method percentage predicted as speeding		Reconstruction		Total % correct
		Not Speeding	Speeding	
Injury Severity	Minor injury	23.6 (n=38)	25.0 (n=8)	67.4
	Serious injury	23.5 (n=51)	22.2 (n=18)	62.3
	Fatal	12.5 (n=16)	46.2 (n=13)	69.0
Speed limit	40, 50, 60 km/h	4.8 (n=21)	0.0 (n=9)	66.7
	80 km/h	25.0 (n=24)	45.5 (n=11)	65.7
	100, 110 km/h	26.7 (n=60)	36.8 (n=19)	64.6

The accuracy of the individual criteria of the NSW Centre for Road Safety method is shown in Table 4. There are essentially four individual criteria that make up the method: if any of these are satisfied then the crash is deemed to involve speeding. The first criterion is that the vehicle was described by police as travelling at excessive speed. The second criterion is that the stated speed of the vehicle was in excess of the speed limit. The third criterion is that the vehicle, while on a curve, jack-knifed, skidded, slid or the controller lost control. The fourth criterion is that the vehicle ran off the road while negotiating a bend or turning a corner and there is lack of an explanation other than speed. Note that multiple criteria may be satisfied in a single crash. A stated speed in excess of the speed limit and ran off the road with lack of another explanation were the most accurate of the criteria though they were rarely used. The criterion that was most used - the vehicle lost control on a bend - was particularly inaccurate. The description was also not particularly accurate though, once again, the number of times it was used was low.

Table 4: The accuracy of the NSW Centre for Road Safety Method by the individual criteria

NSW Centre for Road Safety method	Criterion of method that was satisfied			
	Description	Stated Speed	Lost control	Ran off road
Correct identification of speeding	2	3	6	3
Incorrect identification of speeding	3	1	17	1
Total	5	4	23	4

Discussion

It is clear from the results that the 'excessive speed' error recorded in the TARS database is not indicative of a speeding crash and should not be relied upon to determine the proportion of crashes that involve speeding in South Australia.

The wording of this error, excessive speed, is somewhat ambiguous. On the one hand it could imply that it is only to be used when the vehicle is travelling well above the speed limit: on the other hand it could imply that the vehicle's speed does not need to be above the speed limit but could just be considered excessive for the conditions. Note also that generally only one error is selected per vehicle therefore it is generally thought of as the main error that is listed under this variable. This may hinder the accurate identification of speeding in the database.

The NSW Centre for Road Safety's method for determining the involvement of speeding in a crash was compared to the involvement of speeding according to the results of reconstructions. This method did identify a similar number of speeding crashes in the sample of 144 crashes as the reconstructions (35 compared to 39). However, this appears to be mostly due to chance as just under two thirds of the method's identifications of speeding were incorrect.

It might be expected that any method to determine speeding from mass crash data would struggle to do so accurately most often when the vehicles were travelling at speeds close to the speed limit. This was only true for the NSW Centre for Road Safety method when considering crashes that involved speeding, but the method failed to identify them as such. When considering the other type of possible error, identifying a crash as involving speeding when it does not, the errors were relatively evenly distributed between speed differences from the speed limit, the only real exception being a high proportion at 10 to 14km/h below the speed limit.

The overall accuracy of the NSW Centre for Road Safety method was relatively consistent between various levels of injury severity and speed limits. Of note, however, was the increased accuracy of predicting speeding in fatal crashes (though still below 50%) and the method's inability to identify any speeding crashes in low speed zones.

The increased accuracy in fatal crashes may simply be a product of the higher proportion of such crashes involving speeding. The inability of the method to identify any of the nine speeding crashes in low speed zones may be a direct result of the criteria of the method. While speeding in a higher speed zone may be more likely to result in a single vehicle-loss of control crash, which would be identified as involving speeding if it happened on a bend, speeding in a low speed zone may be more likely to result in a crash with another vehicle, which will only be identified as speeding if

the police officer stated as such in the text description of the crash or recorded its speed as being faster than the speed limit.

Examining the accuracy of the NSW Centre for Road Safety method by the individual criteria of the method revealed that the criterion that was most used; the vehicle lost control on a bend, was particularly inaccurate. This is most likely due to the method defining speeding as including excessive speed for the prevailing conditions. While these cases may fit that definition this is not the general-use definition of speeding. Speeding is generally defined as travelling above the legal speed limit and this is the definition that was applied when considering speeding as determined by reconstruction. If the general definition of speeding is used, thought should be given to removing this criterion. The other criteria lacked the numbers to draw any firm conclusions on their accuracy.

The sample of crashes used has two main biases. CASR's at-scene in-depth crash investigations were only undertaken for crashes occurring between 9am and 4:30pm on weekdays within 100km of Adelaide. (The exception being fatal crashes that were followed up regardless of the time of day they occurred at the discretion of the project leader, which in turn produces a bias towards fatal crashes). This bias in the CASR at-scene in-depth crash investigation database should not have an obvious effect on the comparisons performed. It does, however, mean that the percentage of crashes involving speeding found by the reconstructions can not necessarily be generalised.

The second main bias is the ability to reconstruct crashes. Only about half the crashes in the at-scene in-depth crash investigation database could be reconstructed. The two main reasons that reconstructions could not be confidently performed were a lack of physical evidence, and the crash involving complex mechanisms. A common crash type that lacks the physical evidence needed to reconstruct is rear end crashes. These crashes tend to be lower severity crashes. A common crash type that has complex mechanisms that cannot be easily replicated in a reconstruction are motorcycle crashes, particularly single vehicle motorcycle crashes. Conversely, crashes where a vehicle has lost control or struck another vehicle at an intersection can be readily reconstructed. The reconstruction bias may have had some effect on the comparison. A vehicle that lost control will be over-represented in the sample and will also satisfy the NSW Centre for Road Safety method for determining speeding if it occurred on a bend.

An underlying assumption of the results is that the speeds determined by reconstruction are accurate. Error in reconstruction speed can come from several sources: the quality of evidence collection; the skill of the person(s) undertaking the reconstruction; and the computer programs or equations used to perform the reconstruction. The error

in the reconstructed speeds cannot be quantified, however, every effort was taken throughout the process to ensure that errors were minimised. Scene evidence was recorded using highly accurate surveying equipment, experienced staff performed the reconstructions, and the programs and equations used are arguably the most accurate (Generally SIMON and DyMESH within HVE, SMAC on occasion, and the critical speed equation). In any case, errors in the reconstruction speed would only change the result at speeds close to the speed limit. The errors in the method's identification of speeding occurred at many speeds, close and not close to the speed limit alike. Therefore any errors that may be present in the reconstructed speeds would not be expected to have a meaningful effect on the overall findings.

Conclusions

The error 'excessive speed' recorded in the TARS database is not accurate in identifying crashes where a vehicle was speeding.

The NSW Centre for Road Safety method of determining speeding in crashes was also found to lack accuracy in determining speeding, though it appears to be more accurate than simply relying on the error 'excessive speed' in the TARS database.

Recommendations

It would be worthwhile to invest in developing methods that can more accurately determine the involvement of speeding in a crash from the mass crash data.

Improvements could also be made to the data collection for the mass crash database to assist the determination of speeding in a crash. This may include a specific field dedicated to speeding that needs to be filled out in all crashes as either speeding or not speeding. This would at least ensure that a police opinion on the topic is recorded. Another improvement could be to require the field where the vehicle's speed is recorded to always be filled in: currently this field is often not used to record a speed.

New equipment is becoming available that allows data from the vehicle's airbag control module to be downloaded, including pre-impact speed. In the future such equipment may present a relatively simple and quick method by which regular traffic police can ascertain the speed of a vehicle prior to a crash.

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Mobile phone use and driving: the message is just not getting through

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Abstract

Previous research has shown that mobile phone use while driving can increase crash risk fourfold while texting results in 23 times greater crash risk for heavy vehicle drivers. However, mobile phone use has changed in recent years with the functional capabilities of smart phones to now also include a range of other common behaviours while driving such as using Facebook, emailing, the use of ‘apps’ and GPS. Research continues to show performance decrements for many such behaviours while driving, however many Australians still openly admit to illegal mobile phone use while driving despite ongoing enforcement efforts and public awareness campaigns. Of most concern are young drivers. ‘Apps’ available to restrict mobile phone use while in motion do not prevent use while a driver is stopped at traffic lights, so are therefore not a wholly viable solution. Vehicle manufacturers continue to develop in-vehicle technology to minimise distraction, however communication with the ‘outside world’ while driving is also perhaps a strong selling point for vehicles. Hence, the safety message that drivers should focus on the driving task solely and not use communication devices is unlikely to ever be internalised by many drivers. This paper reviews

the available literature on the topic and argues that a better understanding of perceptions of mobile phone use while driving and motives for use are required to inform public awareness campaign development for specific road user groups. Additionally, illegal phone use while driving may be reinforced by not being apprehended (punishment avoidance); therefore stronger deterrence-focussed messages may also be beneficial.

Keywords

Mobile phone; Cell phone; Road safety; Enforcement; Public education

Introduction

The level of crash involvement from using a mobile phone while driving is difficult to establish from data commonly collated by transport authorities. This is due to the under-reporting of mobile phone use during crash events. Unless a police officer or witness expressly notes that mobile phone use contributed to a crash, it is unlikely that it will be reported. Elvik [6] noted that there is a lack of firm evidence to accurately quantify the degree of crash

involvement from mobile phone use and that most studies suffered from methodological limitations. Hence, while some research estimates that mobile phone use may be implicated in up to 25% of all road crashes in the United States (see review by the Governors Highway Safety Association [8]), this cannot be asserted with certainty.

Research using case-crossover designs to examine driver distraction from mobile phones showed a fourfold increase in crash risk for hand-held phone use, and a similar result for hands-free phone use [14, 21]. However, these relatively early studies did not discriminate between the range of behaviours that were able to be performed on mobile phones while driving, such as the differential risk posed by making a call, receiving a call, sending a text message, or reading a text message. In a naturalistic study using on-board cameras to observe driver behaviour, the Virginia Tech Transportation Institute found in 2009 that sending a text represented 23 times greater crash risk for heavy vehicle drivers [28].

More recently, mobile phone use has changed from calling or text messaging to now also include a range of other common behaviours linked to the internet capabilities of smart phones such as using Facebook, emailing, gaming, the use of various 'apps' and the use of Global Positioning Systems (GPS) [16]. The various behaviours differ in the type and likely level of distraction posed to the user when

engaging in these secondary tasks while also in control of a motor vehicle [18], or while walking [10, 15, 24], or cycling [5, 24].

Commonly these distractions are recognised as being manual (tactile/psychomotor), cognitive, visual, and/or auditory in nature. It is logical that behaviours that divert the gaze of users (i.e. visual distraction) *and* require manual manipulation would present a higher crash risk in association with the amount of time spent on the secondary task [16]. Texting, emailing, and using Facebook are examples where this may be most prominent. Additionally, situational demands of the traffic environment may impact on the level of distraction posed by a secondary task. For example, the level of distraction posed by using a particular function of a mobile phone while driving at 110kmh on a motorway may vary to that posed while using the same function when driving at 50kmh in heavy traffic. Perceptions of crash risk by individuals across a range of driving situations need to be established through research, as these perceptions may motivate their decision to use the mobile phone or not. That is, people may self-regulate their behaviour depending on the perceived risk of certain traffic situations or the cognitive demand associated with the traffic situation. For example, do people think that it is dangerous to text while stopped at traffic lights and/or do they know that this constitutes a traffic offence in Australian states?

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Decrements in driving performance are well established for using mobile phones while driving. Naturalistic studies and driving simulator studies have established that poor lane control, poor speed control, increased reaction times (e.g. late braking), and increased headway by way of driver compensation for reaction times, are all linked to distraction caused by mobile phone use while driving [8,9].

The road user group of most concern are P1 Provisional licence holders [4] who are restricted by legislation in all Australian states and territories from using a mobile phone in any manner while driving. This is due to the lack of driving experience when combined with the risk that using a mobile phone while driving presents in general. The Australian Community Attitudes to Road Safety Report [20] noted that 59% of drivers surveyed use a mobile phone in some manner while driving; however usage was 70% for Provisional licence holders which were the highest of all licence classes. Given that P1 Provisional licence holders are banned from using a mobile phone in any manner while driving, and that 25-39 year olds were the highest user group by age, it may be that P2 Provisional licence holders should be a key target group as well as P1 licence holders. Drivers aged 17-29 have been found to more frequently send texts while driving than other age groups [16] and this is arguably one of the most dangerous of all behaviours relating to mobile phone use while driving. Petroulias [20] reported a declining trend for the percentage of active drivers making phone calls, with 27% found in 2011 compared to 34% in 2009. More than half of the drivers surveyed in 2011 used hands free mode to make calls. It must be kept in mind however that the overall risk for behaviours related to mobile phone use while driving also depends upon how frequently each behaviour is performed and for how long it is performed on each occasion, as well as the driving situation and the road user.

In essence, a conundrum for road safety practitioners is that while the vast majority of road users acknowledge that there is some level of increased crash risk from using a mobile phone in some capacity while driving, they continue to do so [4, 18]. For instance, Petroulias [20] found that 86% of drivers surveyed thought that talking on a mobile phone while driving increases their crash risk, yet the majority of these people admitted to recently performing the behaviour. Hence, mobile phone use while driving remains of major concern for road safety in Australia and internationally. This paper outlines the key issues of concern related to mobile phone use while driving and, more specifically, comments on how the development of public education campaigns on the topic can be informed by research.

Look, no hands!

Hands free mobile phone use, while legal for most drivers in Australia, has not conclusively been shown to be safer than hand held mobile phone use while driving [1]. This is

due to the cognitive distraction caused by holding a phone conversation as a secondary task to driving. However there is some conjecture in the literature regarding this issue. Early research [14] found little difference in crash risk between hands free and hand held operation of a mobile phone regarding making and receiving calls. However, naturalistic study methods offer more definitive observation of explicit behaviours that are performed concurrently with the driving task. Such research has found that using a hand held mobile phone presents a higher risk (due to the combination of cognitive and manual distraction) than using hands free mode [12]. For driver performance, a recent program of experimental studies using a driving simulator and an instrumented vehicle found little difference between hand held and hands free mobile phone use for eye glance, brake reaction time, or following distance [23]. Hence, the likely differences in risk between using a hand held or hands free mobile phone remain clouded.

New technology from vehicle manufacturers provides the driver with the option of converting speech to text rather than manually texting. On face value this may appear to be a worthwhile initiative for road safety. However, this may not be the case. For example, the AAA Foundation for Traffic Safety [1] on page two noted the following when reviewing cognitive distraction while driving:

"The principal finding that driver use of in-vehicle speech-to-text technologies is the most distracting of the six tasks has important implications given the skyrocketing growth in voice-activated infotainment and other dashboard systems available to consumers. The findings also challenge prevailing public assumptions that hands-free devices are safer than their hand-held counterparts."

Work-related driving may be more likely to require the use of a mobile phone to conduct business [22]. Employers have a responsibility to ensure that mobile phone use only occurs in hands free mode to comply with legislative requirements¹. However, the aforementioned research findings suggest that laws allowing hands free mobile phone use may be misguided and still place road users at risk. To this end, the legal implications for employers of requiring hands free mobile phone use by staff require further investigation.

Motives for mobile phone use while driving

The illegality of using a hand held phone while driving may be superseded by the need to fulfil other motives for some people. By examining the various motives for performing specific behaviours while driving such as sending a text, making a phone call, or using the internet on smart phones,

¹Note: P1 Provisional licence holders in Australia are restricted from using a mobile phone even in hands free mode.

we may gain a greater understanding of how to reduce the likelihood of such behaviours being performed. To this end, various road users groups may be motivated in different ways to perform the same behaviour.


For instance, young drivers may feel a social expectation among their peer group to communicate at all times, including while driving [25]. That is, for young people, the mobile phone may represent a means by which to feel socially included within their immediate peer group and they will use their mobile phones in bed, in classrooms, or while driving to fulfil their perceived need for social inclusion. Hence, to some degree social acceptability of using a mobile phone while driving may contribute to the behaviour for this group. To some degree it may also perhaps be that individuals have performed the behaviour so often and the behaviour has been sufficiently reinforced socially, that it has become habitual [27]. Young drivers may also be motivated to use other functions of their phones for entertainment (e.g. accessing music play lists) or for information access.

Long haul truck drivers may perhaps call or send a text while driving in order to keep in touch with friends and family as the drivers are often away from home and drive for a substantial portion of their day. Other individuals may

use mobile phones while driving to conduct business and feel that they would be at a competitive disadvantage if they couldn't use their phones while driving. The use of mobile phones while driving in general may also be motivated by instrumental needs, for example, to call emergency services, access route information/maps, or to advise someone else that the person is running late for a meeting.

Psychological theory can provide a framework for assessing the underlying motives for using various functions of mobile phones while driving. For example, the Theory of Planned Behaviour [2] asserts that an individual's intentions are the greatest influence on behaviour. In turn, attitudes, social norms, and perceived behavioural control are all factors that influence intentions. Perceived behavioural control may also have a direct influence on behaviour within the theory. Deterrence Theory has been used in road safety for behaviours such as drink driving [11] and may also be used to provide insight into why using a mobile phone while driving appears to be so prevalent within Australia. Classical deterrence is used to dissuade the performance of illegal behaviours in the broader population by inducing the perception that being apprehended is likely, and that punishment will be swift and severe [26]. Specific deterrence targets offenders to ensure that they feel that the consequences of reoffending are sufficiently unattractive

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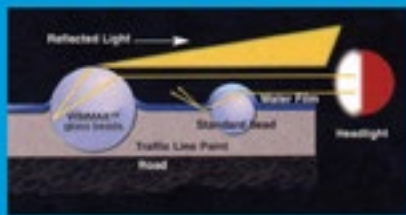
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in terms of the swiftness and severity of punishment. The following section comments further on how punishment avoidance (not suffering any negative consequences for the action) has been shown to have a greater effect on using a mobile phone while driving than classical deterrence (which is based on an individual's perception that they are likely to be apprehended and punished).

Enforcement and Deterrence

Enforcement efforts by police continue to regularly detect illegal mobile phone use while driving. For instance, the NSW State Debt Recovery Office [19] note that 42,377 infringement notices for illegal mobile phone use while driving were issued in NSW for the financial year 2011/2012. Fines and demerit points vary from state to state in Australia for such offences but fines are generally upward from \$300. Despite enforcement efforts, the behaviours continue. This suggests that there is little general deterrence relating to illegal mobile phone use while driving. It is possible however that some road users are simply ignorant to the laws regarding mobile phone use on the roads. Little research has been conducted to examine public knowledge of these laws, and public education is vital to inform people of the exact nature of the legislation (and any legislative changes). For example, people may believe that it is satisfactory to text at traffic lights as their vehicle is stopped, however this behaviour is illegal.

Where people are aware that their behaviour is illegal, yet still continue to perform the behaviour and are not detected by police, punishment avoidance may be a strong reinforcer for performing the behaviour in the future. Watson [26] found that punishment avoidance was a stronger predictor of illegal traffic behaviour than classical deterrence. This suggests that deterrence for illegally using a mobile phone while driving is being undermined by a substantive lack of detection and punishment. Hence, more enforcement is required in relation to these behaviours or the development of new methods of enforcement that enhance the perception of being apprehended and punished would be beneficial. The apparent reality that motives for illegally using a mobile phone while driving may outweigh the concern for being punished for some individuals, and also that individuals behaviour may be reinforced through punishment avoidance, are both issues that require the immediate attention of authorities.

Mobile phone apps

Mobile phone applications (Apps) are available to prevent phone use while in motion. However, these generally also prevent phone use while in other situations where travel is involved, such as when travelling on a train or when a passenger in a car. Hence, there are some practical limitations that may influence people not to use such apps and they do not represent a wholly viable solution to

preventing mobile phone use while driving. The apps also generally do not preclude use while stopped at traffic lights and therefore may imply that such behaviour is both legal and safe.

How public education campaign development can be informed by research

Many Australians still openly admit to illegal mobile phone use while driving despite ongoing enforcement efforts and public awareness campaigns. So how do we get the message through in order to reduce such behaviour? Firstly, the message that drivers should focus on the driving task solely and not use communication devices while driving (or at the very least only use mobile phones in accordance with the law) is unlikely to ever be internalised by all drivers. Therefore it is argued here that a harm minimisation approach to the problem is the best strategy to adopt. Targeting the highest risk groups (such as young drivers) and the highest risk behaviours (such as sending text messages) when designing public education campaigns may achieve the best 'bang for your buck' in colloquial terms for well-designed campaigns. Such campaigns in road safety are also likely to achieve better results if applied in combination with targeted enforcement, as has been evidenced in the past with highly successful Random Breath Testing (RBT) initiatives. Altering perceptions of enforcement and punishment for illegal use of mobile phones while driving would also be useful in a holistic strategy for public education campaigns. As discussed in a previous section of this paper, punishment avoidance may undermine such efforts if there is not alignment of drivers' perceptions of enforcement and punishment with their actual experiences on road [26, 7, 3]. It is therefore important that the deterrence approach only be used if actual enforcement for laws regarding mobile phone use is ubiquitous and ample.

Secondly, using research regarding the target groups' perceptions of the issue and their motives for using mobile phones while driving may be able to best address the underlying factors that influence or reinforce the behaviour. For young drivers in particular this may require ongoing campaigns aimed at addressing the social culture regarding the perceived need for immediate communication, with specific reference to peer influence and the level of acceptability of using a mobile phone while driving. Attitudes to mobile phone use while driving have been shown to be a significant predictor of future intentions to perform the behaviour [27], hence for cultural change to be achieved, such attitudes need to be targeted in countermeasure development along with enforcement measures that aim to directly address the undesirable behaviour. Additionally, providing options for alternate actions is part of many psychological interventions when addressing such behaviours. Displaying these alternate actions as a solution to the undesirable action is also likely to be useful in designing successful public education

campaigns for road safety [13]. For example, drivers can be encouraged to turn their mobile phones off before each trip and/or place their phone somewhere that it cannot readily be accessed while driving, such as in the boot of their car. Drivers may then perceive greater control over performing alternate actions and confidence that these actions will be socially reinforced if campaign strategies include such issues.

Lastly, the medium used to convey the message is a key issue of importance. The media used must suit the target group in order for the reach of the message to be maximised. For example, young people are highly targeted in marketing through social media as they are a high user group for media such as Facebook, Twitter and YouTube. The recent NSW '*Get Your Hand Off It*' campaign utilised such media.

Summary and conclusions

Mobile phone use while driving remains a major issue for driver distraction and road safety in general. While many drivers acknowledge that using a mobile phone while driving is likely to increase their crash risk, efforts to reduce the range of associated behaviours must be increased as current countermeasures do not appear to be reducing the extent of the problem. Strategic approaches to dealing with mobile phone use by a range of road users must be of a multidimensional nature. Public education campaigns are one way of addressing the problem, however they must be complemented with enforcement and technological solutions in order to minimise the potential harm. The design of public education campaigns may be best to consider specific target groups and their underlying perceptions of the issue and motives for mobile phone use. Development of such campaigns can be further informed by research to guide content development and message delivery for the specific target audience.

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Contributed articles

Safer speeds: an evaluation of public education materials

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Abstract

The association between speed and road safety outcomes is well documented, yet reductions in speed limits continue to meet with resistance from the public. This paper outlines the findings of a review of speed education resources undertaken in order to identify those that may be used to increase public acceptance of reduced speed limits. Relevant agencies throughout Australia were contacted and web searches were conducted in order to find speed education resources. Public media campaigns were excluded from the review. An initial search identified 203 potential resources; of these 70 were included in the study. All were evidence-based drawing on one or more of 27 central arguments. Based on consideration of the use of evidence, ease of understanding, potential to influence the general public, and the extent to which the resource supported the speed management principles of the National Road Safety Strategy, nine resources were identified as providing the best examples of speed education. In general the speed education resources were found to adopt predominantly safety-based arguments for reduced speed limits. It is suggested that the efficacy of these materials may be improved further by addressing the ways in which drivers rationalise their speeding behaviour.

Keywords

Evaluation, Speed, Speed limit, Road safety, Road user education

Introduction

The current Australian National Road Safety Strategy (NRSS) based on the Safe System approach to road safety has identified the setting of speed limits as an important measure. The NRSS aims to achieve “speed limits that reflect a better balance between safety and mobility”; that is speed limits that reduce the likelihood of a crash occurring and mitigate the consequences when they do with as little effect on travel time as possible. One of the aims of the strategy with regard to safe speeds is to increase community acceptance by explaining the rationale for lower speed limits and providing information about the safety, economic, and environmental benefits of lower speeds. The National Road Safety Council¹ commissioned the Centre for Automotive Safety Research to identify, collate and review speed education materials used by road agencies and government insurance agencies/commissions throughout Australia.

Background on speed

Within the field of road safety, the reduction of vehicle travelling speeds through the setting of appropriate speed limits is recognised as one of the simplest but most effective measures for reducing road trauma. Research has consistently demonstrated that vehicle travelling speeds affect both the likelihood of collisions occurring; (e.g., increased stopping distances and increased the likelihood of losing control of a vehicle at higher speeds); and the

severity of collisions when they do occur. Case-control studies undertaken in Australia by Kloeden and colleagues [1, 2] have demonstrated that minor increases in travelling speeds on urban (e.g., 5km/h over 60km/h) and rural (e.g., 10km/h over average speed) roads approximately double the risk of an injury crash. Other research drawing on the risk curves developed by Kloeden et al. has shown that reducing the speeds of vehicles travelling up to 5km/h over the speed limit would yield significant reductions in injury crashes, with the greatest reduction coming from reduced low-level speeding on high speed roads [3]. Large reductions in injury crashes can also be expected even if a full 5km/h reduction in travelling speed cannot be achieved [3, 4].

In an analysis of travelling speeds and injury outcomes for pedestrians, McLean, Anderson, Farmer, Lee, and Brooks [5] conducted detailed investigations of fatal pedestrian accidents occurring in the Adelaide area between 1983 and 1991. They found that reducing the travelling speeds of vehicles by 5km/h could be expected to yield a 30% reduction in the incidence of fatal collisions (with 10% being avoided entirely). In a more recent study, Anderson [6] demonstrated that a reduction in travelling speed would reduce the number of fatal pedestrian crashes in two key ways: slower speeds would allow more crashes to be avoided due to shorter stopping distances, and those crashes that would still occur would happen at more survivable speeds. The potential reduction in pedestrian fatalities is estimated to range from 13% if all drivers obeyed the 60km/h speed limit to 48% if all drivers were travelling 10km/h slower [6].

An effective way to lower the travelling speed of vehicles is to set lower speed limits. Evidence that setting speed limits affects the travelling speed of vehicles can be observed in the results of speed surveys undertaken in South Australia since 2002. Following the introduction of the default 50km/h speed limit on urban rural roads in 2003 a significant decrease in the average travelling speed of vehicles on these roads was found [7]. Evidence that changing speed limits also has a positive association with crash and injury rates can be found in studies analysing the change in these measures following a change in speed limit.

Studies analysing the change in crash and injury rates following the introduction of 50km/h speed limits undertaken in Queensland and Victoria have demonstrated that lower speed limits reduced the number of casualty crashes [8, 9], the number of young driver crashes in Queensland [8], and serious injury or fatal pedestrian crashes in Victoria [9]. Furthermore, Hosking et al. [8] found evidence that the reduction in crashes was due to the reduction of vehicles travelling in excess of 60km/h on 50km/h roads. A South Australian study evaluating the effect of a speed limit reduction from 100 to 80km/h in the Adelaide hills produced a number of estimates based

on assumptions of factors affecting crash rates following this change [10]. The estimated reduction in injury crashes ranged from 3-36% with the most likely change considered to be a 15% reduction [10].

There are also a number of studies examining the effect of increased speed limits on roads. In the USA the National Maximum Speed Limit law setting the maximum speed limit at 55mph was first introduced in the early 1970s as a means to conserve oil, however the subsequent reduction in traffic fatalities saw it adopted as a permanent road safety measure [11]. However, in the early 1980s the laws were relaxed which saw 44 states raise the speed limit to 65mph. The National Maximum Speed Limit law was later repealed in 1995 allowing states to control the setting of speed limits within their jurisdiction, many of which chose to raise the speed limits on some roads. As a result of this the maximum speed limit across the USA ranges from 55mph in some states to 75mph in others [12]. Three separate studies have demonstrated that raising the speed limits following the repeal has increased both the crash rates and number of fatal crashes on roads with increased limits [11-13]. Grabowski et al., [12] also found that increased speed limits were associated with an increase in young driver fatalities and that there is some evidence of an association with increased speeds and crash rates on other roads.

Vision zero, safe system, and speed limits

Vision Zero is a road safety strategy originating in Sweden during the mid-1990s. The underlying premise of this strategy is that, in a crash, no road user should be exposed to forces that could result in death or serious injury, with the ultimate vision of zero deaths or injuries due to road crashes. Based on research regarding the biomechanical tolerances of the human body, the maximum speeds allowable before the risk of injury or death is significantly increased are provided in Table 1 [14]. Based on the principles of Vision Zero the maximum proposed travelling speeds allowable under different traffic conditions are provided in Table 2 [15].

Table 1. Maximum impact speeds based on biomechanical tolerance [14]

Type of crash	Maximum impact speed
Car v pedestrian	20 to 30km/h
Car v motorcycle	20 to 30km/h
Car v tree or pole	30 to 40km/h
Car v car (side impact)	50km/h
Car v car (front impact)	70km/h

Table 2. Proposed maximum travel speeds based on Vision Zero [15]

Type of infrastructure and traffic	Maximum proposed travel speed
Location with potential conflict between pedestrians and cars	30km/h
Intersections with potential side impact between cars	50km/h
Roads with possible frontal impacts between cars	70km/h
Roads with no possibility of side or frontal impact (only impact with infrastructure)	100+km/h

As shown in these Tables the maximum safe speeds for urban roads are between 30 and 50km/h depending on the type of road, while for rural highways and other roads outside of built up areas the maximum safe speeds are between 70 and 100km/h. On well protected roads such as freeways, speeds greater than 100km/h may be appropriate.

Speed effects on travel time

One of the more common objections to a reduction in the speed limit is an expected increase in travel time [16]. Based on the simple assumption that $Travel\ Time = Distance/Speed$ an increase in travel time would be expected following a reduction in the speed limit. However, in a traffic environment there are a number of other factors that affect travel time such that the increase in travel time is not of the magnitude expected and in many cases the increase in travel time is negligible [17, 18]. For example, research has shown that other factors such as congestion, traffic delays and turning manoeuvres have the strongest effect on travel times and are largely unaffected by the posted speed limit [19]. Archer et al. [19] also suggest that under some conditions lower speed limits may improve travel time by, among other things, reducing lane-change friction and the speed dispersion of vehicles leading to a more harmonious traffic flow and a reduction in delays caused by crashes.

Dutschke and Woolley [17] developed a mathematical model to assess the impact of reduced rural speed limits on travel times (100km/h down from 110km/h). Using this model a simulation of travel times based on a distance of 100km with the fastest vehicles not exceeding the speed limit was undertaken. The results indicated that the lower speed limit was found to reduce the speed differential between faster and slower vehicles, reducing the likelihood of a faster vehicle being held up by a slower vehicle. The increase in travel time associated with the lower speed limit varied between 4% and 10%, or 2.2 and 5.5 minutes.

Environmental effects of speed

In addition to the safety benefits, lower speed limits have a positive environmental effect through reduced emissions and pollutants produced by cars and other motor vehicles. For example, research has shown that lower speed limits and smoother driving styles improve fuel economy, reduce emissions, and improve safety [20]. In an examination of the differences in travel time between aggressive and non-aggressive drivers Panwai and Dia [21] found that over the course of a 44km trip the fuel consumption and vehicle emissions of aggressive drivers were as much as four times that of non-aggressive drivers and resulted in a time saving of as little as one minute. Madireddy et al., [22] found that lower speed limits in residential areas reduced the distance travelled in these areas (due to vehicles using alternate routes) and also reduced carbon dioxide and nitrogen oxide emissions. Lower speed limits also reduced the distance travelled and vehicle emissions on major roads, although to a considerably smaller extent due to a change in traffic. This provides strong evidence that reduced speed limits can be expected to have a positive environmental benefit.

Purpose

Despite these benefits, the Australian driving public generally opposes plans to reduce speed limits. In order to change this we need to understand why people think that higher speeds are not that dangerous and how people justify or rationalise non-compliance with speed limits. The purpose of this paper is to provide an overview of a qualitative review of speed education resources in order to identify those that are most likely to influence public opinion in this area.

Method

Identifying resources

A detailed search of the world wide web was used to identify educational materials addressing the benefits of reduced speed limits or lower travelling speeds produced by road agencies, government insurance agencies/commissions, police forces and other private or government organisations concerned with road safety in Australia. Resources were identified by searching websites for content relating to: speed, speed limits, speed education, and speed enforcement. Relevant organisations were also contacted directly in order to identify other relevant materials that the initial search may not have located.

Inclusion and exclusion criteria

In order to be included in the study, resources were required to at least address the safety or environmental benefits of reduced speeds, or the minimal impact on travel time associated with small reductions in speed. Resources solely

dedicated to enforcement activity (e.g., speed cameras, fines, etc.) without addressing any of the other safety or environmental elements were excluded. Resources intended for use by the wider community were included, as were those developed for use in school curricula and by community groups. Television, radio, and print-form (including signs and billboards) mass media campaign materials were excluded from the evaluation.

A total of 203 potential resources were identified. Following a filtering process based on the inclusion/exclusion criteria described above, a total of 70 resources were included in the evaluation. For a list of all resources included in the review see the final report by Raftery, Kloeden, and Royals [23].

Justifications for speeding

It was considered that resources intended to reduce speeding or increase drivers' compliance with speed limits should address the reasons for and justifications used by drivers to rationalise their non-compliance. A small workshop involving several experts in the area was undertaken to identify the key arguments used by drivers to rationalise or justify their non-compliance with speed limits. This was done in order to identify the arguments necessary to counter these points of view, identify the evidence or information necessary to support these counter arguments, and compare these with the arguments and information presented in current speed education resources.

The workshop identified nine common justifications for speeding. These include (references provided where appropriate): normalisation [24-27], perception of risks as minimal [28, 29], a belief that excessive speed and hoon drivers are the real problem [30], variability in speed limits causes confusion [30], questioning the legitimacy of enforcement [31, 32], a belief that roads should be made safer, reductions in speed will increase travel time [16, 31], questioning the logic in the application of speed limits, and a belief that speeding is fun [27]. For a description of each of the justifications, refer to the final report by Raftery, Kloeden, and Royals [23].

Evaluation criteria

The following criteria were used to evaluate each of the resources.

1. Is it evidence based?

This criterion considers the extent to which the content of the resource is based on current scientific knowledge. Consideration was given to the use of recent statistics (e.g., police data regarding the role of speed in crashes), whether the content matches current knowledge and whether supporting evidence is

provided via reference to relevant research (including citations where appropriate).

2. Is it or can it be presented in a way that will be understood by the general public?

Judgements regarding the ease of understanding of the information presented in each document were made giving consideration to: the use of abstract concepts (e.g., "risk"), jargon or other scientific/mathematical terminology, whether the message is explicitly stated or relies on the individual to draw a conclusion from the information provided, and the general simplicity or complexity of explanations provided.

3. Is it likely to influence public opinion?

In order to rate the ability of each document to influence public opinion, consideration was given to the following issues: ease of understanding (i.e., criterion 2), the length of the document, the extent to which an individual must engage with the material, and the amount of information presented. Consideration was also given to the use of arguments to counter common justifications for speeding.

Furthermore, the OECD and ECMT [e.g.,12] report on speed management suggests that the most effective educational campaigns encompass the logical basis of speed limits, provide a rationale for speed management measures, and highlight both the positive safety outcomes and environmental benefits of speed management and moderated speeds. These factors were also considered when evaluating resources against this criterion.

4. Does it support the speed management principles of the National Road Safety Strategy 2011-2020?

The speed management principles outlined within the National Road Safety Strategy (NRSS) include a) the setting of speed limits that match the road and environment and reduce crash impact forces to within the range of human tolerance, and b) increasing compliance with speed limits. Evaluation against this criterion was primarily based on the extent to which the information provided was judged to be in line with or could be used to explain the theory behind the setting of speed limits to mitigate the role of speed in crashes. Consideration was also given as to whether the information provided might increase compliance with speed limits.

Results and Discussion

The initial search identified 203 resources addressing speed, all available via the internet. Of these, 70 met the criteria

for inclusion in the study. A review of these identified 27 evidence-based arguments used with some regularity (see Table 3). The most common argument or evidence addressed the reasons why travelling at faster speeds increases the risk of a crash (e.g., less time to react to hazards, increased stopping distances, loss of control, faster speeds lead to more crashes, and higher speeds increase the severity of a crash); followed by the speed risk curve of Kloeden et al. [18]; identifying low level speeding as a safety issue; the use of police crash statistics; explanation of the penalties for speeding (demerit points, fines, etc.); and the benefits of lower speeds for pedestrian crashes – the pedestrian argument [1]. The explanation of stopping distances and impact speeds accounting for reaction times was also common, as were describing the expected benefits associated with reduced speed [e.g., 6]. The frequency with which these arguments were encountered can be observed in Table 3. An overview of the evidence provided in each of the resources included in the evaluation is provided in the final report.

Table 3. Types of evidence used in speed education resources

Evidence	Number of documents
Reasons why speed causes crashes	39
Risk-curve (5km/h = double the risk)	31
Low level speeding	27
Statistics	23
Demerit points, fines, and other penalties	22
Pedestrian argument	19
Safety benefits (e.g., fewer crashes, lower severity, etc.)	17
Distance to stop 60 = 38-56m (dependent on reaction time)	16
Define speeding	15
Costs to community	14
Selection of sites based on safety	14
Safe following distance	14
Small reductions in speed	13
Risk of fatality curves	12
Energy at impact	12
Minimal travel time effects	10
Expected safety benefits (e.g., projected reduction in crashes or casualties)	10
Safe system 30/50/70/100km/h	9
Speed cameras work	7
Excessive speed	6
Change from 60 to 50 produces 20% reduction	6

Evidence	Number of documents
Emissions	6
Compare to alcohol risk	5
Fuel economy	5
Speed survey data	4
Nilsson's power model	3
50km = 3 storey building	2

Given that all resources included in the study were found to draw on the same general pool of evidence, differences in the quality of the resources was determined by the range of information presented and the accessibility of this information to the general public. Further determination of the quality of the resources was based on an assessment of the ease with which the information could be understood, the likelihood that the information will influence the general public and the extent to which the information presented supports the speed management principles of the NRSS. Nine resources were considered to provide the best examples of speed education information. An overview of the evidence contained in these is provided in Table 4. A more complete summary including comments relevant to the evaluation criteria and copies of each resource are included in the full report.

Table 4. Exemplar resources and the evidence they contained

Evidence	Resource ^a								
	1	2	3	4	5	6	7	8	9
Risk of fatality curves	X		X			X	X		X
Pedestrian argument	X		X	X		X		X	X
Risk-curve (5k = double)	X				X	X	X	X	X
Reasons why speed causes crashes	X	X	X	X	X	X	X	X	X
Low level speeding	X		X				X	X	X
Excessive speed			X					X	X
50km= 3 storey building					X				
Safe system 30/50/70/100	X	X			X				
Change from 60 to 50 produces 20% reduction				X	X				
Compare to alcohol risk	X			X					
Speed cameras work		X		X	X				
Distance to stop 60 = 38m-56m				X			X		X

Evidence	Resource ^a								
	1	2	3	4	5	6	7	8	9
Costs to community						X		X	
Emissions	X	X		X		X			
Minimal travel time effects	X	X		X		X		X	
Demerit points, fines, and other penalties					X	X		X	
Crash statistics	X	X		X	X		X		X
Selection of sites based on safety				X			X	X	
Speed survey data							X		
Expected safety benefits	X	X	X	X					
Fuel economy	X	X							
Safety benefits		X	X		X			X	X
Define speeding			X		X			X	X
Energy at impact					X			X	X
Safe following distance									
Small reductions in speed		X	X	X	X	X			X
Nilsson's power model					X		X		
Note: ^a resources are arranged in no particular order									
Resource 1: Road safety: Speed facts (DPTI, SA)									
Resource 2: Towards zero together - safer speeds (DPTI, SA)									
Resource 3: Community safety: Speed (Victoria Police)									
Resource 4: 50km/h general urban speed limits: FAQ (DIER, Tasmania)									
Resource 5: Speeding (ORS, WA)									
Resource 6: Speeding and safety (Vicroads)									
Resource 7: The danger of speeding (Justice and Community Safety, ACT)									
Resource 8: Why is speeding a problem? (RMS, NSW)									
Resource 9: How does speeding increase the chances and severity of a crash? (RMS, NSW)									

While the majority of resources reviewed tended to focus on the safety aspects of speeding (e.g., risk of crashing, injury severity and benefits of reduced speed) the better resources tended to address a wider range of evidence and often included information regarding the environmental impacts of speed (e.g. emissions and noise), fuel economy and travel time. The better resources were also considered to be more accessible to the public both in how the information was presented aesthetically and in terms of

the content. It is evident that the present focus of publicly available speed education resources is to promote adherence to speed limits in order to achieve a level of safety on our roads. While there is nothing inherently wrong with such an approach, it is possible that this could be strengthened further with the addition of evidence or information that addresses drivers' justifications for speeding and offers some counter arguments.

Conclusion

Current speed education resources generally draw on the same pool of evidence in order to highlight the safety benefits of adhering to speed limits or setting lower speed limits. The better resources tended to address a wider range of evidence and often included information regarding the environmental impacts of speed (e.g. emissions and noise), fuel economy and travel time. The better resources were also considered to be more accessible to the public both in how the information was presented aesthetically and in terms of the content. While there is nothing inherently wrong with an approach that promotes adherence to speed limits in order to achieve a higher level of safety on our roads, the efficacy of resources could be strengthened further with the addition of evidence or information that addresses the reasons why people speed, or offers some counterpoint to the manner in which they rationalise their speeding behaviour. Several options with regard to the use of existing educational materials (that vary from using resources unchanged or with some amendments to the development of a new, comprehensive resource) are provided in the final report.

A copy of the full report can be obtained from Jaime Royals at: Jaime@casr.adelaide.edu.au.

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Notes

1. Due to the disbanding of the NRSC the project was completed under the oversight of the Department of Infrastructure and Transport.

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Star safety ratings drive improvements on risky roads

By Vic Rechichi

The Hay Point Expansion Stage 3 (HPX3) mining project is the winner of the 2013 3M-ACRS Diamond Road Safety Award presented at the Australasian College of Road Safety (ACRS) conference in Adelaide.

The project has had a positive impact on the safety of all workers and the general community who use the Hay Point Road and is an excellent example of a company making a major contribution to public road safety. This article describes the work undertaken in this award-winning project.

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Introduction

BHP Billiton has a strong global focus on safety, with the company taking a Safe Systems approach to safety across its operations. For example, insisting on five-star safety-rated new vehicles promotes safe vehicle use and investing in safer roads and roadsides reduces injuries and fatalities.

Many of BHP Billiton's operations are based in rural, regional and remote Australia. As such, employees travelling to and from work along minor roads are one of the safety risks the company faces.

This case study focuses on the work by BHP Billiton Mitsubishi Alliance (BMA) to help mitigate the risk at the HPX3 Project in central Queensland. The Project has worked together with the International Road Assessment Programme (iRAP) to examine road safety risks and dangers on the road that leads to the Port of Hay Point and the Project has committed \$17 million to help minimise one of the safety risks to employees. The road assessment demonstrated that one of the highest risks to employees was simply getting to and from work.

Organisation overview

BMA is a 50/50 joint venture between BHP Billiton and Mitsubishi. BMA is Australia's largest metallurgical coal miner and exporter. The company operates seven mines in central Queensland along with the Hay Point Terminal near Mackay.

The International Road Assessment Programme (iRAP) is a registered charity dedicated to preventing the 3,500 road deaths that occur every day worldwide. Its vision is a world free of high-risk roads. iRAP works in partnership with government and non-government organisations to inspect high-risk roads and develop star ratings and safer roads investment plans. Assessment programmes are active in 70 countries, including in Australia through the AusRAP

initiative. As part of AusRAP the safety of 30,000 km of roads has been assessed and given a star rating.

The RAPs are designed as a catalyst for change, providing political leaders, policy makers and road builders with the social, economic and engineering evidence needed to improve road networks. The plans demonstrate that by investing in safer roads, the social and economic burden on families, communities and workplaces can be significantly lessened.

Star ratings for road safety

Just as the Australasian New Car Assessment Program (ANCAP) provides star ratings indicating the safety of vehicles, the road assessment programmes provide a star rating score outlining the safety of specific roads and roadsides. Reflecting a Safe Roads and Roadsides approach, the star ratings assessment system is an objective measure of the safety performance of the road infrastructure and the resulting likelihood of a crash occurring and its severity. The assessments draw on road safety inspection data and the extensive real-world relationships between road attributes and crash rates. By measuring the risk associated with the physical road engineering and roadside features, star ratings can provide a basis for targeting high-risk sections of road for improvement before people are killed or seriously injured.

Research shows that the risk of death or serious injury is highest on a one-star road and lowest on a five-star road. A five-star road will provide road users with the safest form of design standards in road cross-section, layout and roadside environment; and a one-star rating represents a road with relatively poor road infrastructure design.

The assessments examine run-off, head-on and intersection risks taking into account specific factors for each category such as speed, lane width, road condition and curvature. RAP inspections use specially-equipped vehicles to collect



The Hay Point Coal Terminal

digital panoramic images or videos of roads. These images are then used to record road design attributes that are known to influence the likelihood of a crash and its severity. The inspections create a permanent record that can be reviewed easily by local engineers and planners.

Hay Point: rating the risk

BMA is increasing the capacity of the Hay Point Coal Terminal through a third expansion, known as the HPX3 Project. This will increase port capacity from 44 million tonnes per annum (mtpa) to 55 mtpa and reduce storm vulnerability of the coal terminal. There are two coal terminals located within the Port of Hay Point – BMA's Hay Point Coal Terminal and the Dalrymple Bay Coal Terminal. A number of small communities are also located in the area.

Hay Point Road is the only road in and out of the Port of Hay Point area. People living in the small local communities near the Port of Hay Point, the employees and contractors working at the coal terminals and the Project; all commute to and from work along the road.

As part of the HPX3 Project, BMA commissioned a road safety plan to assess and improve overall road safety

outcomes surrounding the project. The subsequent star rating assessment examined Hay Point Road and gave its entire length just one or two stars; indicating a road with poor infrastructure that could benefit from infrastructure-related improvements.

Taking action

With the initial assessment showing that the personnel risk was high, a road safety audit was then performed. This closer inspection of problems resulted in a list of recommendations and an investment plan outlining measures to improve Hay Point Road's safety performance and reduce the risk to the community and employees. The audit's recommendations also examined the safest modes of transport for staff in getting to and from the site.

Using the findings of the audit, the Project and the Department of Transport and Main Roads worked together to undertake safety improvements along Hay Point Road. The Project funded nearly \$2 million in improvements including road surface modifications and improved line marking, including edge lines and curve delineation.

Other key recommendations being implemented to improve the safety of the road environment include:



Providing safe roadsides by installing safety barriers and removing unforgiving roadside objects;

Regular cleaning of debris on Hay Point Road, installing new highly-reflective signs and removing surplus signs that were simply acting as roadside obstacles;

Reviewing and providing proper bus stops and bus stop warning signs; and

Reviewing the signal timings of the traffic signals and installing a monitoring camera at the Bruce Highway/Hay Point Road intersection.

A different approach

The possibility of employees being transferred to the HPX3 Project by company bus, rather than each commuting individually in a private vehicle, was also investigated as part of the road safety plan. The study showed the Project could significantly reduce the risk to its staff by providing the opportunity, and encouraging them, to travel to work by bus. In fact, the study showed bus was the safest way to get to and from work; with a 6.7 times lower risk if staff travelled by bus over self-driven private vehicles. It also

meant that a professional non-fatigued driver was in charge of the vehicle, and each bus trip removed up to 40 private vehicles from the road – vehicles often driven by people who had just finished a day's work.

The increased safety of providing a company bus is reinforced by crash data analysed as part of the BMA Hay Point Road Safety Plan statistics showing that the most dangerous time to drive on Hay Point Road is during the morning peak at 7am to 8am and the evening period between 4pm and 6pm; and that driver fatigue and inattention were identified as significant causes of crashes.

Relax; I'll be your driver today

The HPX3 Project has implemented the bus option recommended in the road safety plan at a cost of \$14 million over the life of the project. A central bus service runs from Mackay in the morning to Hay Point and then back after work, and shuttle buses operate continuously to ferry workers around the site and between four satellite sites within a five kilometre radius. The project has also invested a further \$1.1 million to build a car park with the local council at a central bus pick-up point in Mackay.

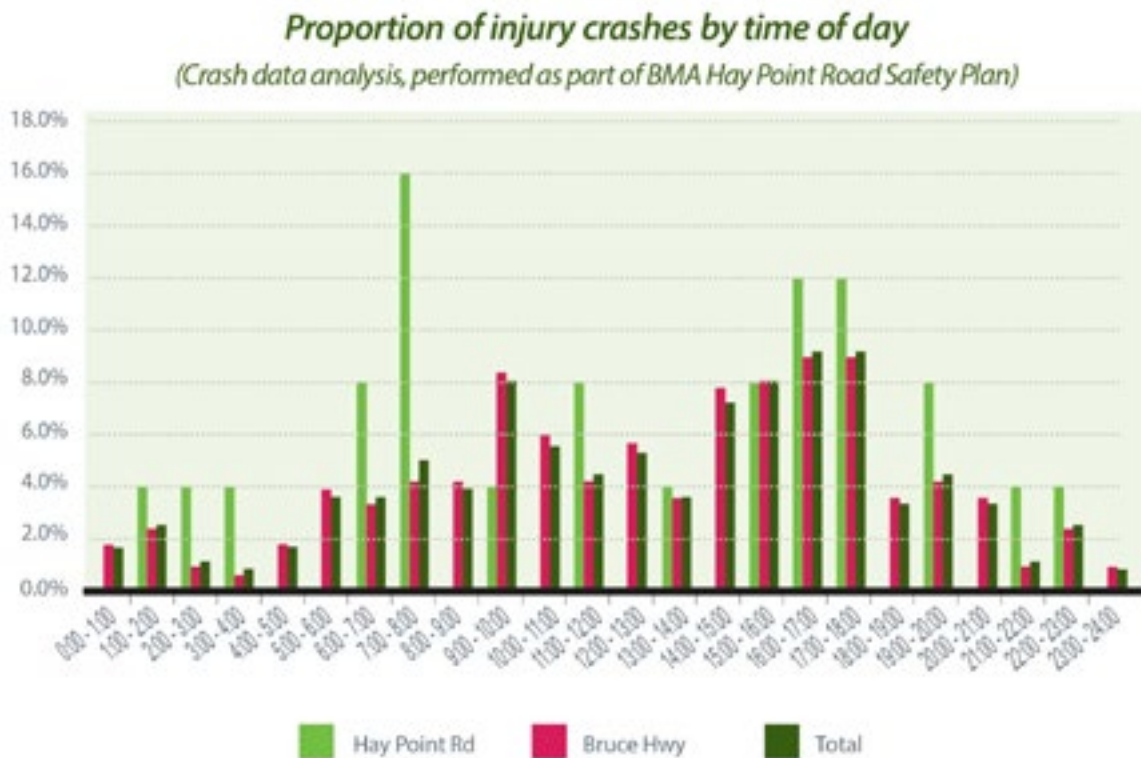


Figure 1: Proportion of injury crashes by time of day (Crash data analysis, performed as part of BMA Hay Point Road Safety Plan)

The bus service has removed hundreds of vehicle trips from Hay Point Road per month.

While taking the bus has many benefits – it's free, is safer, saves on fuel costs and free Wi-Fi is available on selected buses – it faces some logistical challenges in increasing patronage. For example, passenger pick-ups on the way mean the bus takes an extra 15 minutes compared to car, and as most employees live in Mackay or Sarina, rather than a mine camp, many need to drive to the central bus pick-up point in Mackay. Overcoming a mindset of 'I need to come and go as I please' has also been an issue.

The project has been proactive in addressing these challenges and as a result bus patronage continues to increase.

One of the key lessons learnt by the project is that to improve bus patronage, in turn a focus on road safety, employees must apply the same rigour to safety outside work as they would on-site. It requires a change in mindset.

As such, to encourage people to take the bus, the project has created road safety videos that are shown in new employee inductions. The videos feature employees who have crashed on Hay Point Road on their way to or from

work discussing their experiences; reminding viewers that injury does not discriminate between whether it occurred at work or on the way to work.

Results of the star rating assessments are used to demonstrate to employees that their chances of getting to and from work safely are much higher on the bus. The project reinforces that the bus is the safest way to get to work through reminders at toolbox meetings and conducting incentive programs.

Lessons and challenges

The initiatives implemented by the HPX3 Project demonstrate the importance of a coordinated Safe Systems approach to road safety, with all those using Hay Point Road now negotiating a much safer road environment thanks to the implementation of the bus service and improvements to the road and roadsides that diminish the risk of a crash and reduce the severity of injury, or the risk of a fatality, when a crash does occur. Receiving the 3M-Diamond Road Safety Award recognises the contribution this project has made to road safety.

For further details, see the NRSPP website at <http://www.nrspp.org.au/CaseStudies#case296>.

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