INATTENTION AND DISTRACTION AS A CRASH FACTOR IN TASMANIA:

A ROAD SAFETY PERSPECTIVE

Department of Infrastructure, Energy and Resources

Tasmania

Explore the possibilities

INATTENTION AND DISTRACTION AS A CRASH FACTOR IN TASMANIA:

A ROAD SAFETY PERSPECTIVE

CONTENTS

BACKGROUND

Over the last decade there has been a greater focus on driver distraction and inattention. As more distractions both inside and outside the vehicle compete for drivers' attention, it has highlighted the dangers of driver multi-tasking and its contribution to road trauma.

To date, the United States Governors Highway Safety Association has identified more than 350 scientific papers on driver distraction-related issues published between 2000 and 2010. In addition, two international conferences on driver distraction and inattention were held in Sweden and a third is planned for later in 2013.

In Australia several parliamentary committees have been conducted, informing government agencies on the depth of issues and developing a number of recommendations that may assist to reduce multi-tasking causing driver distraction and inattention.

The National Road Safety Strategy (2011-2020) recognises "…*sources of driver distraction, both within the vehicle and in the general road environment, have increased substantially in recent years*' and the Tasmanian Road Safety Strategy Second Action Plan 2011-13 includes an action to investigate inattention as a crash factor and investigate ways to reduce driver distraction.

This issue is not unique to Tasmania and other Australian jurisdictions are currently investing significant resources to explore the cause and effect of distraction and inattention, and its contribution to road trauma, as well as develop strategies to address this issue.

Given this, it is timely to consider if the Tasmanian project should be deferred to take advantage of the outcomes of the ongoing research projects.

WHAT IS INATTENTION AND DISTRACTION

Despite the number of research projects, there is no commonly accepted definition of driver distraction or inattention.

However, most studies have adopted the concept that driver ***distraction*** occurs when any stimuli involving one or more visual, auditory, physical or cognitive process takes the driver's attention away from the primary task of driving. The diversion or division of attention results in a state of inattention.

Engaging in secondary or competing activities while driving has a number of effects on driver performance and safety:

- poor ability to control speed and following distance;
- difficulty maintaining position on the road;
- reduced awareness of surrounding traffic and events;
- missing traffic signals and signs; and
- slower response to hazards.

Early studies categorised driver distraction into those inside the vehicle (in-vehicle) or those outside of the vehicle. However, contemporary researchers recognise the issue is more complex and refer to four inter-related processes or categories of distraction (Figure 1). The research also recognises that a driver may be engaged in an activity requiring multiple processes, creating a greater demand for drivers' attention and therefore reducing the ability to fully focus on the task of driving.

FOUR PROCESSES THAT ACT AS AGENTS OF DRIVER DISTRACTION		
Visual	the things you see	Eg. signage and roadside advertising
Auditory	the things you hear	Eg. conversations
Physical	the things you do with your hands	Eg. changing radio stations
Cognitive	the things you think about	Eg. forming thoughts and emotions

Figure 1: Four inter-related processes or categories that distract the driver from the primary tasks of safely operating a vehicle

Studies prior to the 1990's focused on distracting activities such as; eating, smoking, grooming, searching or reaching for an object, assisting passengers and using climate controls. However, recent behavioural surveys have concluded that drivers no longer consider these activities secondary tasks or as sources of distraction, but as tasks that are achievable while still maintaining safe control of a vehicle.

Therefore self reported surveys conducted in the past decade report secondary tasks or common driver distractions as use of: mobile phones, satellite navigation, entertainment systems and portable electronic devices.

WHY IS THIS IMPORTANT?

Performing two functions at the same time is often referred to as multitasking, however, in reality the human brain cannot perform two tasks at the same time, instead, the brain handles tasks sequentially, switching between one task and then another. Switching between tasks may only add a time cost of just a few tenths of a second, but this can start to add up when people begin switching back and forth repeatedly. In a situation where safety is important, such as when driving, even small amounts of time can prove critical.

In addition to missing vital safety cues, cognitive fatigue can reduce the amount of information taken in at one time. Multiple short glances, can have a cumulative effect, disrupting cognitive processing of visual, auditory and physical information. It has been estimated that drivers using a mobile phone to talk "look at but fail to see" up to 50 percent of the information in their driving environment (Figure 2).

Figure 2: A representation of what a driver might perceive when they are not talking on the phone (left panel) and when they are talking on a hands-free cell phone (right panel).

To date much research has focused on the visual and physical operation of mobile phones, as it is estimated that more than 60% of drivers own a smart phone or similar device.

Using a mobile phone or application requires visual interaction, forcing drivers to engage in visual absences or 'eyes-off-road' behaviour. For activities such as texting, the average duration of eyes-off-road is 4.6 seconds in a 6 second window and eyes-off-road times for talking or listening on a hands-free phone is 1.6 seconds and 1.3 seconds in a 6 second window.

If 'eyes off the road' time is approximately two seconds and the average person's reaction time is two seconds, nearly four seconds can pass before the average 'distracted' driver can physically react to a critical event.

Figure 3 demonstrates the breakdown of travel distance from the moment a driver takes their eyes off the road, perceives a hazard, begins braking and brings the vehicle to a stop. The extra distraction time more than doubles the current crash risk for the speeds indicated.

TRAVEL SPEED	DISTRACTION TIME	DISTANCE TRAVELLED (METRES)	REACTION TIME	DISTANCE TRAVELLED (METRES)	BRAKING DISTANCE (METRES)	TOTAL DISTANCE (METRES)
40 km/h	2 seconds	22.22	2 seconds	22.22	7.86	52.3
50 km/h	2 seconds	27.78	2 seconds	27.78	12.29	67.85
60 km/h	2 seconds	33.33	2 seconds	33.33	17.70	84.36
80 km/h	2 seconds	44.44	2 seconds	44.44	31.46	120.34
100 km/h	2 seconds	55.56	2 seconds	55.56	49.17	160.29

Figure 3: break down of stopping distance, allowing for distraction and reaction time (The Physics of Car Crashes).

INATTENTION AND DISTRACTION AS A CRASH FACTOR

As there is no commonly accepted definition of driver distraction or inattention, collating and comparing data across jurisdictions is difficult and potentially misrepresentative. However, the results of research are still valid and transferable.

There is evidence that young novice drivers and older drivers (i.e. 55 years and older) are particularly vulnerable to the effects of driver distraction. For young novice drivers, this is due to the fact that they have not yet automated many driving tasks and have less spare attention to devote to other tasks. In recognition of their vulnerability, novice drivers are prohibited from using hands free mobile phones in South Australia, New South Wales and Victoria.

Studies conclude that older drivers are more vulnerable to the effects of distraction because they have less cognitive ability to switch between competing tasks, therefore they require more glances at mobile phones and other devices to read information. As previously mentioned multiple short glances, can have a cumulative effect, disrupting cognitive processing of visual, auditory and physical information.

Other jurisdictions

In the United States, Police-reported data estimates that between 18 and 22 % of all crashes involve some form of driver distraction as a contributing factor (2010).

However, information from the largest analysis of driver behaviour conducted, the 100-Car Naturalistic Study in the USA, found that 78% of the crashes and 65% of near crashes had one form of distraction or inattention as a contributing factor. Of these 30% were derived from driver engagement with sources of distraction outside the vehicle (crash risk increased by 3.7 times when looking at external objects).

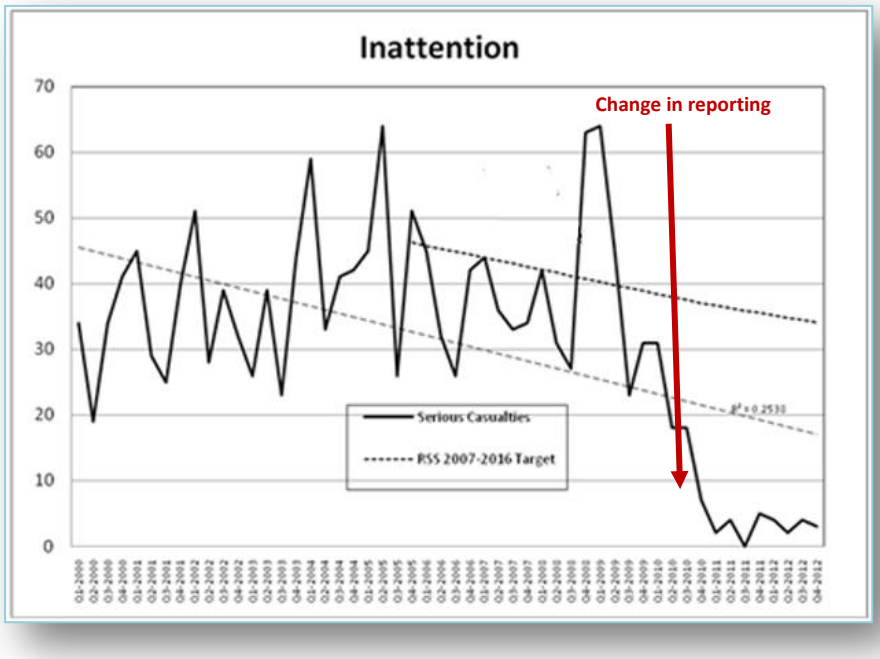
The number of crashes in Australia for which distraction is a contributing factor is not known.

Not all Police crash report forms have provision for recording the presence of distraction. Even where this provision exists it can be unclear whether distraction played a role in the crash or was merely present.

Tasmania

Tasmanian police reported data (average for 2008-2012) suggests driver distraction/inattention as a crash factor in 38.5% of serious casualty crashes. However, this data has limitations as there was a change in reporting in 2011 and care should be taken in its use.

Of these, 31.8% were aged between 17 and 29 years and 11.4% were aged over 65 years. 44.8% of these were in 100km/h or 110km/h speed zones and 32.7% were in 50 or 60km/h zones. Serious casualty crashes involving motorcycle riders showed 18.7% were as a result of distraction/inattention.



Note: From 1 January 2011 'inattentiveness' will only be reported if there is no other relevant crash factor (DIER Crash Data Manager).

OVERVIEW OF CURRENT STUDIES

The Australian Naturalistic Driving Study

Transport and Road Safety (TARS) Research, at the University of New South Wales, has initiated the Australian Naturalistic Driving Study (NDS). The NDS will bring together researchers from leading universities in Australia and one of the leading transport safety research institutes in the United States, the Virginia Tech Transportation Institute (VTTI). The NDS will also involve key road safety-related stakeholders from government and industry in Australia.

The NDS involves fitting around 200 vehicles over a 2-year period with onboard video cameras, still cameras, accelerometers, GPS, forward-looking radar and a series of sensors that will allow observation of the individual driver and their behaviour (Figure 4). Importantly, the drivers actions preceding all types of crashes and near-crashes (which are normally never reported) will be recorded for analysis.

The information will be used to investigate a range of road safety related topics. In relation to distraction and inattention the NDS should assist researchers to determine how:

- different in-car elements might be or become distracting for the driver;
- drivers initiate or react to distractions;
- some action or event occurs, in real time, leading to a particular driving distraction;
- in-car distractions occur and develop relative to one another;
- in-car distractions impact or impair driving;
- drivers coordinate in-car distractions with driving; and
- drivers manage and resolve in-car distractions during driving.

This research will provide an evidence base from which a suite of recommendations and countermeasures can be developed.

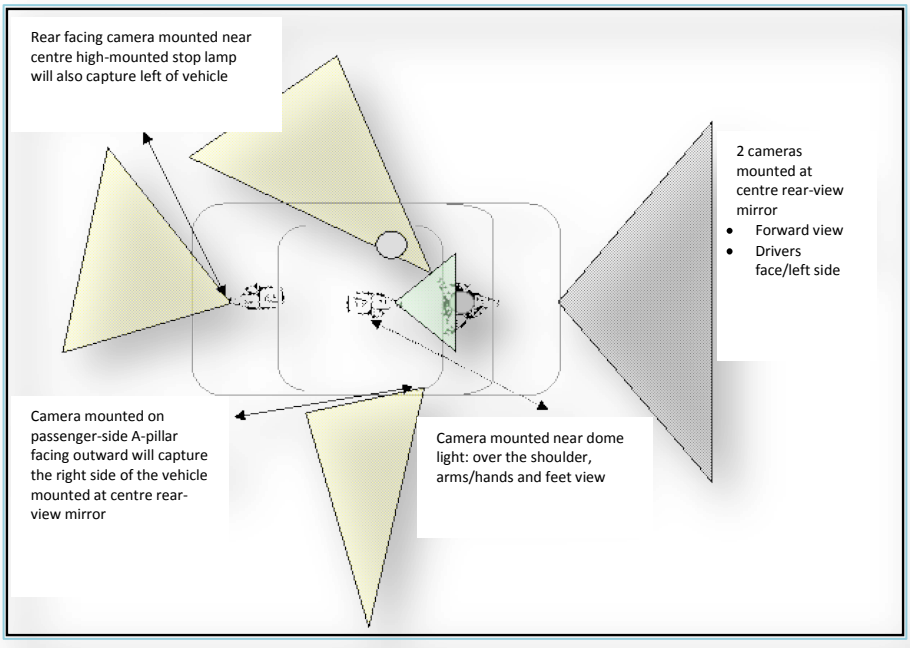


Figure 4: Similar onboard technology used in the US Naturalistic Study by VTTI

Austroads Research Report – 'Impact of Roadside Advertising on Road Safety'

Research shows convincingly that roadside advertising is distracting and that it may lead to poorer vehicle control. Evidence suggests that by looking at an external object, crash risk increases approximately 3.7 times.
The Impact of Roadside Advertising on Road Safety report provides guiding principles designed to reduce the potential for roadside advertising to be distracting. The principles are divided into sign design and sign placement recommendations and cover movement, dwell time, transition time, message sequencing, quantity of information, information content / meaning, luminance, longitudinal placement, lateral placement, vertical placement, orientation/viewing angle, sight distance/visibility, and speed environment.

At this stage most road authorities have applicable guidelines to inform the design and placement of roadside advertising. These are quite diverse across jurisdictions and often do not deal appropriately with digital technology. In addition, the actual distraction risk associated with roadside advertising is not incorporated and communicated well in these guidelines.

The Tasmanian Roadside Signs Manual is designed to provide basic information for administrators in State and Local Government. The Manual is based on internal policies developed from best practice research and will be updated periodically to reflect these. At this time the Manual is considered adequate and meets the needs of stakeholders.

In-car distractions and their impact on driving activities

Road safety practitioners and authorities are beginning to respond to growing concerns as more in-vehicle technologies enter the market. Numerous studies have already produced convincing evidence that distraction and inattention erode a drivers ability to safely perform the task of driving, particularly if the secondary activity involves more than one physical, visual, auditory or cognitive process.

Completed

In Europe and Japan, in-vehicle technology standards have already been developed to ensure devices do not distract or visually entertain the driver while driving (European Statement of Principles for Driver Interactions with Advanced In-vehicle Information and Communication systems).
In April 2013, the US Transportation Secretary Ray LaHood released voluntary guidelines that encourage vehicle manufacturers to limit driver interaction with electronic devices built into vehicles, such as communications, entertainment and navigation devices.

The guidelines establish criteria for electronic devices installed in vehicles at the time they are manufactured that require drivers to take their hands off the wheel or eyes off the road to use them. The guidelines include recommendations to limit the time a driver must take his eyes off the road to perform any task to two seconds at a time and twelve seconds in total.

The guidelines also recommend disabling several operations unless the vehicle is stopped or parked, such as:

- Manual text entry for the purposes of text messaging and internet browsing;
- Video-based entertainment and communications like video phoning or video conferencing;
- Display of certain types of text, including text messages, web pages, social media content.

Currently underway

Dr Kristie Young of Monash University has commenced research to provide evidence for the development of Australian guidelines for use by vehicle manufacturers when developing and designing in-vehicle technologies that require interaction by the driver. Dr Young will also investigate after market and portable devices, some of which can be categorised as drivers aids and others as entertainment and communication systems. As these systems become more prolific in the market, the potential number of devices that can operate within a vehicle at any one time increases.

From a distraction perspective, Dr Young will compare the risk of using multiple devices, as opposed to a fewer number of electronic devices capable of multiple functions which may; minimise eyes off the road time, minimise mind off the road time and effort, and eliminate or minimise physical interactions that impact upon vehicle control.

This research will provide evidence for use by Australian jurisdictions to consider whether allowing drivers to use multiple applications on smart phones or similar devices, bringing together a range of functions into a single unit will provide road safety benefits over current restrictions.

INTEGRATION OF INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transport Systems (ITS) refers to a range of advanced computer control, communication, information, sensor and electronics technology designed to improve the effectiveness and efficiency of the transport system. A subcategory of ITS is known as Advanced Driver Assistance Systems (ADAS), which have the potential to substantially reduce the incidence and severity of road crashes.

ADAS use advanced information, communication and sensor technology to support the driver in performing the driving task by offering drivers assistance to either avoid hazardous situations, or information to make travelling easier. This support can range from simple information presentation, such as visual or auditory over-speed warnings, fatigue warning systems, forward collision warnings systems, through to newly developed automated driving interventions.

The development of portable devices, such as mobile phones, portable navigation systems and music players are often integrated, to varying degrees, with the vehicle via Bluetooth. The “Ford Sync” is an example of a system for portable device integration. (Figure 5) However, the assumption that integrated systems are necessarily better in minimising distraction than non-integrated devices requires further research.

While the introduction of ADAS into the vehicle is expected to have many positive safety benefits, it can also lead drivers to change their behaviour in ways not intended by the system designers. Identified or unintended negative effects of ADAS may include compensatory behaviour, over-reliance and diminished attention or distraction.

Current research is investigating the implementation of stricter regulations for vehicle manufacturers, requiring them to design in-vehicle systems that meet minimum safety criteria and standards when designing ADAS and to demonstrate the safety impact of these technologies prior to deployment.

Figure 5: Example of portable device integration system (Ford Sync)

It is envisaged that manufacturing regulations could then create an incentive scheme encouraging manufacturers to make the safety of their interfaces a sales feature through provision of additional or bonus points under the ANCAP safety rating scheme.

At this point in time, the safety implications of many in-vehicle ADAS applications are unknown given that most systems have not been available in the vehicle market long enough, or available on a wide enough scale to establish their overall impact.

Capturing driver behaviour with onboard monitoring systems will better inform road safety practitioners and authorities of the value of installing ADAS. The NDS will provide an opportunity to analyse the benefits of such systems.

CURRENT MEASURES

Education

To date in Tasmania there has been a wide range of activities aimed at improving driver awareness of the increased risk of distractive activities and inattention whilst driving. Mass media campaigns have used newspapers and television to communicate key messages to drivers, however it is acknowledged that not all road users engage with these mediums and the Community Road Safety Partnerships (CRSP) has implemented several 'grass roots' initiatives.

A summary of current educational measures addressing distraction and inattention:

- Road Torque 2 is a road safety initiative involving seven 3 minute segments to be televised on Southern Cross during the Sunday night news, featuring different road safety topics in a bid to educate drivers and challenge existing behaviours.

- The RSAC has developed the 'Be Ready to Drive' initiative aimed at drivers aged between 17 and 25, providing a checklist for drivers before driving, reminding them to:
    - switch off mobile telephones;
    - fasten seatbelt;
    - be mentally ready to drive by giving driving 100 percent of attention the whole time;
    - not driving if there is any doubt about being over the blood-alcohol limit;
    - ensure everyone has their seatbelt on; and
    - ensure children are safe for the journey.

- The CRSP program has provided the opportunity to engage with a wider cross section of the public to remind drivers of the dangers of distraction and inattention:
    - a crashed car and mobile phone on the roadside in the Huon Valley communicate the dangers of inattention whilst driving:
    - the Breath Of Life Festival displayed large banners near the stage reminding patrons of the risk of distraction (Figure 6); and
    - Postcard developed by YNAG youth in Clarence.

Figure 6: Breath of Life Festival distraction campaign

Enforcement

There are two major offences which address driver inattention. If you are caught using a hand-held mobile phone while driving, the penalty is a $300 fine and three demerit points. It is also illegal to drive without due care and attention or drive without reasonable consideration for other road users, the penalty applying is $140 and three demerit points and $100 respectively.

Engineering

Infrastructure solutions do not directly stop the driver from engaging in distracting activities and becoming inattentive, however they do have the ability to provide measures that refocus attention or assist a driver to safely recover from a potential crash. Most engineering solutions are a key consideration when designing a section of the road network, but can easily be applied to existing roads.

Examples of engineering solutions that redirect attention to the primary task of driving are:

- street lighting; and
- audible line marking.

Examples of engineering solutions that assist a driver to safely recover from a potential crash:

- surface skid resistance;
- sealed shoulders; and
- guardrails.

CONCLUSIONS

Studies have demonstrated that many cases of inattention and distraction that precede serious casualty crashes are potentially avoidable. This suggests some crashes could be prevented or their severity reduced if the source of the distraction was removed or ignored.

Given the recent proliferation of in-vehicle technologies, as well as portable devices that can be used in-vehicle, there are increasing opportunities for drivers to engage in distracting activities.

It may be possible to regulate the use and/or design of technological devices that have the potential to be used so that certain devices are prohibited from use or contain lock-outs or driving modes that restrict some functionality. For non-technology based distractions, such as passengers, educating drivers of the potential risks of may be beneficial.