Submission No 30

INQUIRY INTO PEDESTRIAN SAFETY (MINISTERIAL REFERENCE)

Organisation: NSW Injury Risk Management Centre

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Submission to Staysafe Committee on Research Relating to Pedestrian Injuries and Fatalities.

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Submission checked by:

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Overview

This submission is made on behalf of the NSW Injury Risk Management Research Centre (UNSW) in response to a request from the Staysafe Committee. It is based on research relating to pedestrians that has been conducted at the Centre over the past few years that cannot speak directly to the recent increase in pedestrian trauma (not being based on the relevant data). Nonetheless, it is pertinent to the Terms of Reference offered in the request from Staysafe, as outlined in the lettered points below. In addition, we are prepared to offer the expert opinion regarding contributors to the recent increase in pedestrian trauma as outlined in the bulleted points below.

Responses to terms of reference

a) *Short and long term trends in pedestrian injuries and fatalities in metropolitan and non-metropolitan areas*

Our analysis of Traffic Accident Data System (Roads and Traffic Authority) and Admitted Patients Data Collection System (NSW Health) data suggests[1,2]

- A steady downward trend in reported pedestrian injuries for the years 1999-2007, that is more pronounced in children.
- A more pronounced reduction in child injuries for males and in urban areas

[1] Doukas G, Olivier J, Poulos R and Grzebieta R, Child Pedestrian Injury trends in New South Wales, Australia (1997-2006), Injury Risk Management Research Centre, 2009.

[2] Falster M., Olivier J., Chong S, Grzebieta R.H., Watson W.L., Trends of severe pedestrian injuries in older people in NSW, to be presented at Road Safety Research, Policing and Education Conference, Sydney, 2009.

- A downward trend in pedestrian hospitalisations, although this is less pronounced for older people (aged 65 years and above).
- Older people (65+) are consistently overrepresented within the population of pedestrian injuries resulting from motor vehicle collisions.
- From 1999-2007 there was a significant reduction in incident cases of reported older pedestrian injuries. There were no meaningful reductions in mortality among older persons in contrast to a significant reduction in mortality among children and adults.
- It appears the future burden of pedestrian injuries for older people is being underestimated.

b) *Underlying causes of pedestrian injuries and fatalities*

IRMRC researchers have conducted research showing that:

- Mobile phone use impairs pedestrians' ability to cross roads safely3;
- Both pedestrians and drivers demonstrate misunderstanding regarding right of way at official and "unofficial" pedestrian crossings4;
- Older pedestrians can have difficulty negotiating the road environment5.
- In 2008, focus groups and structured interviews conducted with older (60 years and above) residents of the City of Sydney (n=130) identified that outdoor falls are frequent, and often associated with poorly maintained road-surfaces or "unfriendly" curbs (Santos, Hatfield, and van Kamp, manuscript in preparation). For example, study participants who regarded maintenance of roads as a problem, or who disagreed with the statement "it is easy to get on and off the curbs" were more likely to have experienced an outdoor fall or near fall. Falls while crossing the road, or difficulty crossing

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[3] Hatfield J, Fernandes R, Job R.F.S, Smith K. Misunderstanding of right-of-way rules at various pedestrian crossing types: Observational study and survey. Accident Analysis and Prevention 39: 833-842 (2007)

[4] Hatfield J, Murphy S. The effects of mobile phone use on pedestrian crossing behaviour at signalised and unsignalised intersections. Accident Analysis and Prevention 39: 197-205 (2007)

[5] Job R.F.S, Hatfield J. Observational study of older pedestrian behaviour at various pedestrian facilities. Report to the Roads and Traffic Authority of NSW (2002)

the road, may contribute to pedestrian trauma for older pedestrians, who are a particularly "at risk" for pedestrian road trauma.

c) *The incidence of drivers leaving the scene of the accident after hitting pedestrians*

No analysis has been carried out in regards to this question. However, the following opinion is offered by Prof Grzebieta, who has been involved in a number of 'Nominal Defendant' cases for NSW, Victoria and South Australian insurers and presented expert evidence to the WA and NSW Coroners in relation to pedestrian fatalities.

A large vehicle such as a bus, truck or 4WD can impact a pedestrian without the driver being aware of the incident, particularly if the pedestrian is a child. Unless there are other drivers or pedestrians in the vicinity that can alert the driver to what has happened, the driver may continue unaware that they have struck someone. An example of such an incident is the case of the schoolgirl Bethany Holder, who was run over by a Nissan Patrol inside the grounds of Pittwater House School at Collaroy. The driver did not see Bethany because of Bethany's short height and obstructing perimeter fencing. It wasn't until other pedestrians were yelling and waving their arms that the driver realised something was wrong.

Whilst hit and run incidents are horrific and should be heavily punished when a driver is aware they struck a pedestrian, it should be acknowledged that there is an underlying design issue with trucks and 4WD vehicles and that drivers may not have a direct view of a pedestrian who strays into the path of the vehicle.

There is also an underlying issue of a pedestrian's responsibility and awareness that drivers will not see them at night if they are dressed in dark clothing and lighting is poor. Likewise jay walking and crossing against red lights increases the risk of being struck by a car.

Besides the injuries the pedestrian suffers during the crash, there are the financial consequences of being involved in a 'hit and run' crash. The pedestrian is forced to sue the nominal defendant in order to cover hospital and subsistence costs. This can require many years of adversarial litigation and sometimes ends in the struck pedestrian not being able to recover costs.

For this reason consideration should be given to making drivers and pedestrians alike, aware of the issues that can lead to such occurrences and the consequences in the event of a hit and run. Also consideration should be given to how a no fault insurance system can be introduced that provides coverage in such incidents and eliminates the substantial court costs in such cases. The scheme could be funded through speed camera fines.

d) *Effectiveness of recent measures to address pedestrian safety*

Our analysis of Traffic Accident Data System (Roads and Traffic Authority) and Admitted Patients Data Collection System (NSW Health) data provided no direct evidence for a benefit of introducing school zones or reducing residential speed limits from 60kmph to 50kmph. However, the lack of information about the exact location and time of the incident, the small counts and low statistical power are likely to hide the contribution being made by such measures to the overall injury reductions produced by a suite of road safety measures ("halo" effect).

e) *Additional strategies to increase pedestrian safety*

A strategy that results in pedestrians becoming aware of the risks of being struck by a vehicle at speeds that exceed around 40 km/hr and that they cannot be seen by drivers in areas of poor lighting. An example of a presentation regularly used by Prof Grzebieta is attached in Appendix A.

Speed limits in high pedestrian active areas such as the CBD and shopping strips, should be set at 40 km/hr or less. Pedestrians struck at the current urban speed limit of 50 km/hr have around a 40% chance of being killed or injured – according to the work published by Kare Rume and acknowledged worldwide.[6,7,8] A pedestrian has a 15% probability of being killed or injured when struck by a vehicle at 40 km/hr.

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[6] Kare Rume, "Speed – a sensitive matter for drivers", Nordic Road and Transport Research No. 1 (1999) see:http://www.vti.se/nordic/default.htm

[7] Organisation for Economic Co-Operation and development (OECD), Towards Zero, Ambitious Road Safety Targets and the Safe Systems Approach, International Transport Forum, Paris, France, 2008.

Another reason why the speed limit in the CBD and high pedestrian active areas (shopping strips) should be set at 40 km/hr has to do with night time driving. Pedestrians in dark clothing in poorly lit streets cannot be seen by drivers in vehicles with headlights set at low beam until their vehicle is approximately 15 to 20 metres away (see Appendix A). It is not possible to perceive, react and begin braking in time if speed limits are set at 50 km/h. At 40 km/hr it is possible to perceive, react and apply some braking to reduce the impact speed from 40 km/h to around 15 to 33 km/hr depending on the perception reaction time of the driver. This reduces the likelihood of death or injury from 40% probability to around 2 to 9%

f) The current emphasis placed on pedestrian road users as part of land use policies and in the planning and management of the road system

Dr Julie Hatfield was invited to participate in a workshop to update the NSW Planning Guidelines for Cycling and Walking. She identified that these guidelines paid insufficient attention to safety issues (focusing more on amenity).

Prof Raphael Grzebieta has been involved in assessing injuries to pedestrians resulting from collisions with bicycles on shared bicycle/pedestrian paths.[9] A key outcome from the report is that shared bicycle/pedestrian paths should not be permitted wherever there are older pedestrians. Impacts into older pedestrians can result in a fatality. Appendix B provides a summary of how the injury mechanism occurs.

g) Pedestrian safety issues and strategies in other jurisdictions

In 2002, Victoria introduced 40 km/hr speed limits in high pedestrian areas such as the CBD and shopping strips, increased the number of covert mobile safety speed cameras, and reduced their infringement tolerance to 3 km/hr (Wipe Off Five campaign). There was an immediate drop in pedestrian fatalities from a high of 81 in 2001 to a low of 41 in 2003.

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[8] World Health Organisation (WHO), Speed Management, A Road Safety Manual for Decision Makers and Practitioners, Global Road Safety Partnership, ISBN 978-2-940395-04-0, Geneva, Switzerland, 2008.

[9] Grzebieta R.H. and Chong S., Pedestrian-Cyclist Collisions, Report for the Pedestrian Council of Australia, NSW Injury Risk Management Research Centre, UNSW, 2009.

h) Any other related matters

Shared bicycle/pedestrian paths are currently being considered to reduce the risk of cyclists being struck by cars. However, recent analysis of pedestrian and cyclist casualties on shared paths, suggests that this solution may simply transfer the risk of injury to the pedestrian. Impacts between cyclists and pedestrians often resulting in hospitalisation or death of the pedestrian and pedestrian.[10] Older pedestrians are particularly vulnerable. The mechanism of injury is described in a presentation by Prof. Grzebieta in Appendix B. Bicycle/pedestrian shared paths should be speed limited at 10 km/hr and pedestrians should have right of way, being the more vulnerable of the two path users. Alternative strategies should be considered for increasing the safety of cyclists in our transport system.

Expert opinion regarding contributors to the recent increase in pedestrian trauma

- Reduction of penalties for exceeding the speed limit.
    - Higher vehicle travelling speeds are recognised to be associated with higher risk and severity of pedestrian injury[11].
    - Regulation and enforcement are recognised as key methods for controlling vehicle travelling speeds[12], and there some evidence that greater penalties have stronger deterrent effects[13]
    - Vehicle travelling speeds are likely to have increased with publicity about plans to reduce penalties for exceeding the speed limit. Firstly, the plans to reduce penalties undermine the perceived seriousness of speeding. Secondly, many motorists will

[10] Chong S., Poulos R., Olivier J., Watson W.L., Grzebieta R.H., Relative injury severity among vulnerable non-motorised road users: comparative analysis of injury arising from bicycle-motor vehicle and bicycle-pedestrian collisions, Accepted for publication Accident Analysis and Prevention, 2009.

[11] Gårder Per E. The impact of speed and other variables on pedestrian safety in Maine. Analysis & Prevention 36: 533-542 (2004)

[12] De Waard D, Rooijers T., An experimental study to evaluate the effectiveness of different methods and intensities of law enforcement on driving speed on motorways. Analysis & Prevention 26: 751-765 (1994)

[13] Redelmeier D.A, Tibshirani R.J, Evans L. Traffic-law enforcement and risk of death from motor-vehicle crashes: case-crossover study. The Lancet 361: 2177–2182 (2003)

understand the media attention to indicate that the changed regulations have come into force already. Both of these factors will reduce motorists' motivation to adhere to speed limits.

  - Increased travelling speeds are likely to increase pedestrian trauma.

- Increased numbers of pedestrians.

  In the current economic and environmental climate more people are likely to choose active over motorised transport. Thus there will be more walking and cycling (although also less driving). This might be expected to produce a higher number of injured pedestrians, as well as a higher rate of pedestrian injury by population (though not by exposure) – in the absence of increased measures for pedestrian safety. Active transport should be encouraged for its net health and environmental benefits, and pedestrian safety initiatives should be enhanced to support the trend away from motorised transport. Actions which are detrimental to pedestrian safety – such as reduction in penalties for exceeding the speed limit – should be particularly strongly avoided at this time.

- Increased age of pedestrians.

  The ageing population is likely to increase both pedestrian numbers, and the average age of pedestrians. This has been reflected in a slower decrease in pedestrian casualties for older than for younger people. Because the pedestrian injury rate in NSW is highest within the older population[14], the ageing population is likely to contribute to an increasing trend in pedestrian casualties, and particularly pedestrian fatalities (since older pedestrians are more likely to die in the event of a collision). IRMRC researchers are currently conducting a detailed investigation of trends in pedestrian hospitalisations, fatalities, and severity of injury among older people in NSW, the results of which should become available in the coming months.

- 50 km/hr speed limit for the CBD and shopping strips

  It can be show using crash reconstruction methodology that drivers cannot see pedestrians dressed in dark clothing in poor lighting situations. Travelling at a speed of 50 km/hr at night it is not possible to apply any braking prior to striking a pedestrian. Travelling at a speed of 40 km/hr it is possible to perceive, react and brake in time to reduce the probability of a pedestrian fatality from around 40% to 2 to 9 %. Hence a 40 km/hr speed limit should be introduced as a matter of urgency for the CBD and shopping strips.

- Shared Pedestrian Footpaths

[14] RTA Pedestrian Safety, Problem Definition and Countermeasure Summary Report

A number of pedestrian injuries and fatalities resulting from bicyclist pedestrian impacts have been recorded. The bicyclist is usually not injured in such crashes. It is recommended that bicycle/pedestrian shared paths not be used where large numbers of older pedestrians use the path. It is also recommended that bicyclists be restricted to a speed of 10 km/hr and pedestrians have priority on bicycle/pedestrian shared paths.

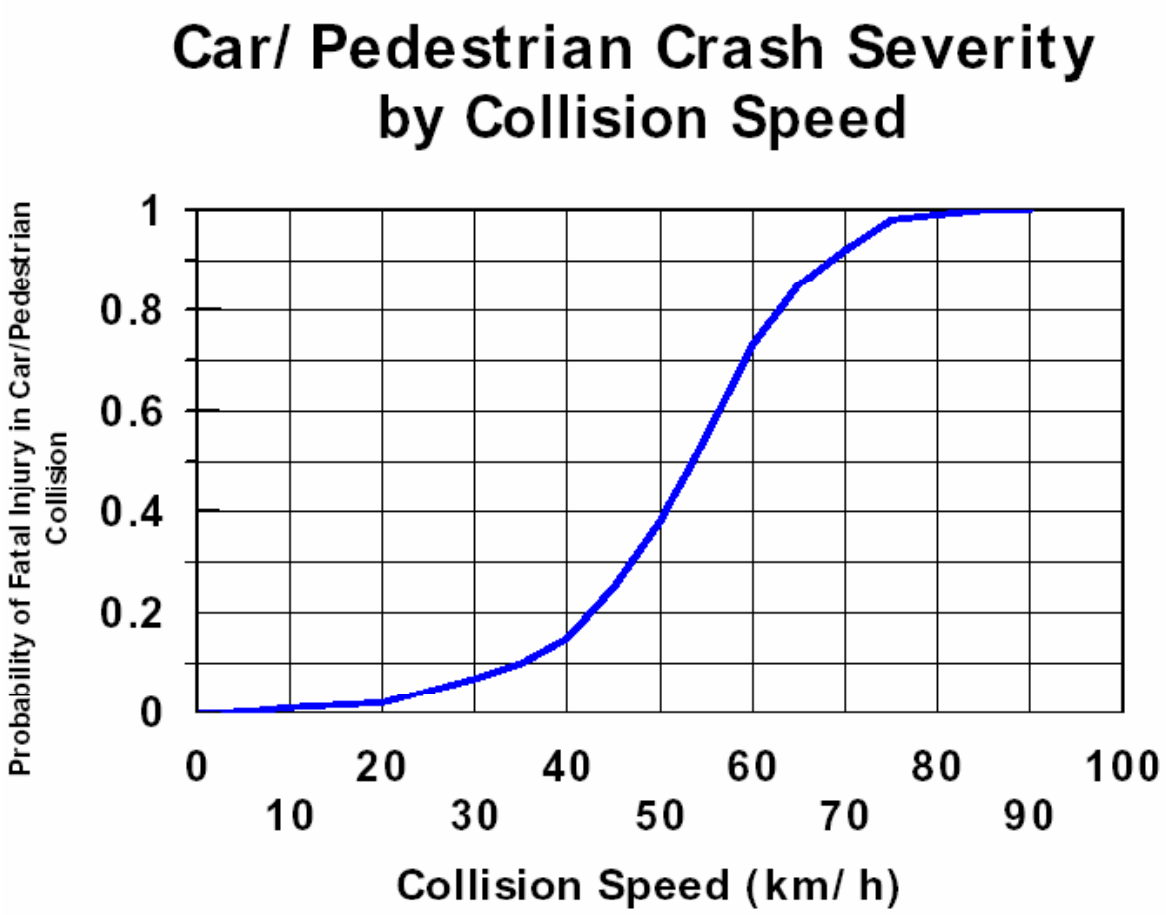
APPENDIX A Presentation regarding vehicle-pedestrian impacts by Prof Grzebieta

(see attached PDF)

What is a survivable impact?

Video source: Transport Accident Commission (TAC) Victoria

What is a survivable impact?



Reference: Kare Rume, “Speed – a sensitive matter for drivers”, Nordic Road and Transport Research No. 1 (1999) see:http://www.vti.se/nordic/default.htm

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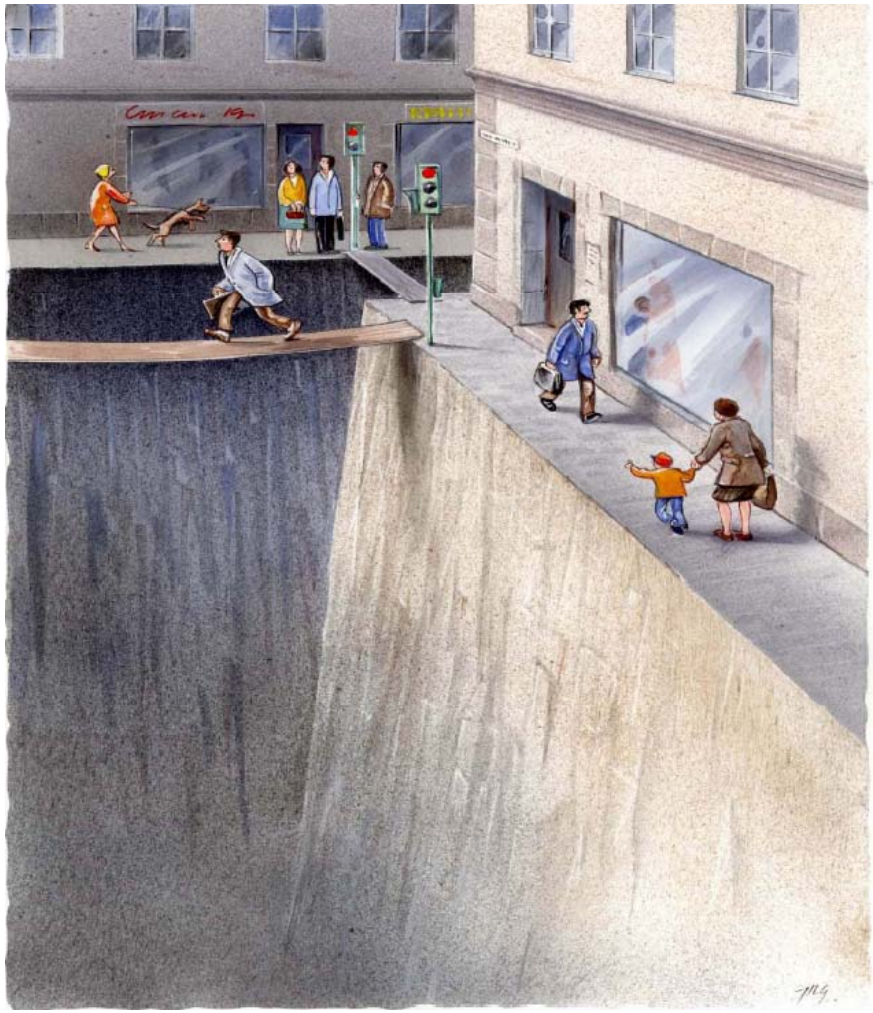
What is a survivable impact?



Picture source: Dr Anders Li, Swedish Road Authority

Being hit by a car at 30 km/h is equivalent to jumping off the roof of a house.

At 40 km/h is equivalent to jumping off a 3 story building and hoping you will survive.

At 50 km/h it is equivalent to jumping off a 5 storey building.

At 60 km/h, jumping off a 7 story building.

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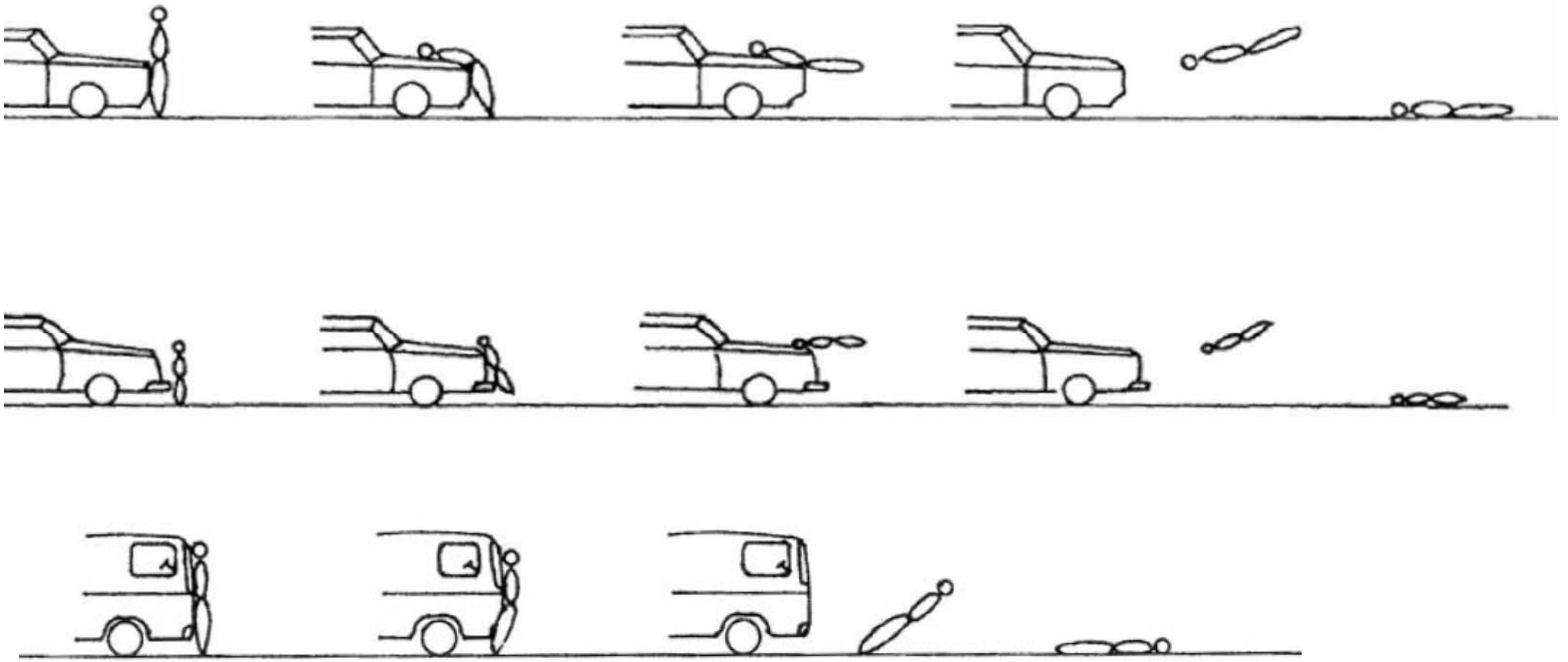
Crash reconstruction

“Typical Vehicle Pedestrian Impacts”



Ravani B, Brougham D and Mason R T, ‘Pedestrian Post-Impact Kinematics and Injury Patterns’, Twenty Fifth Stapp Car Crash Conference, SF, CA, USA, SAE Paper No. 811024, 1981.

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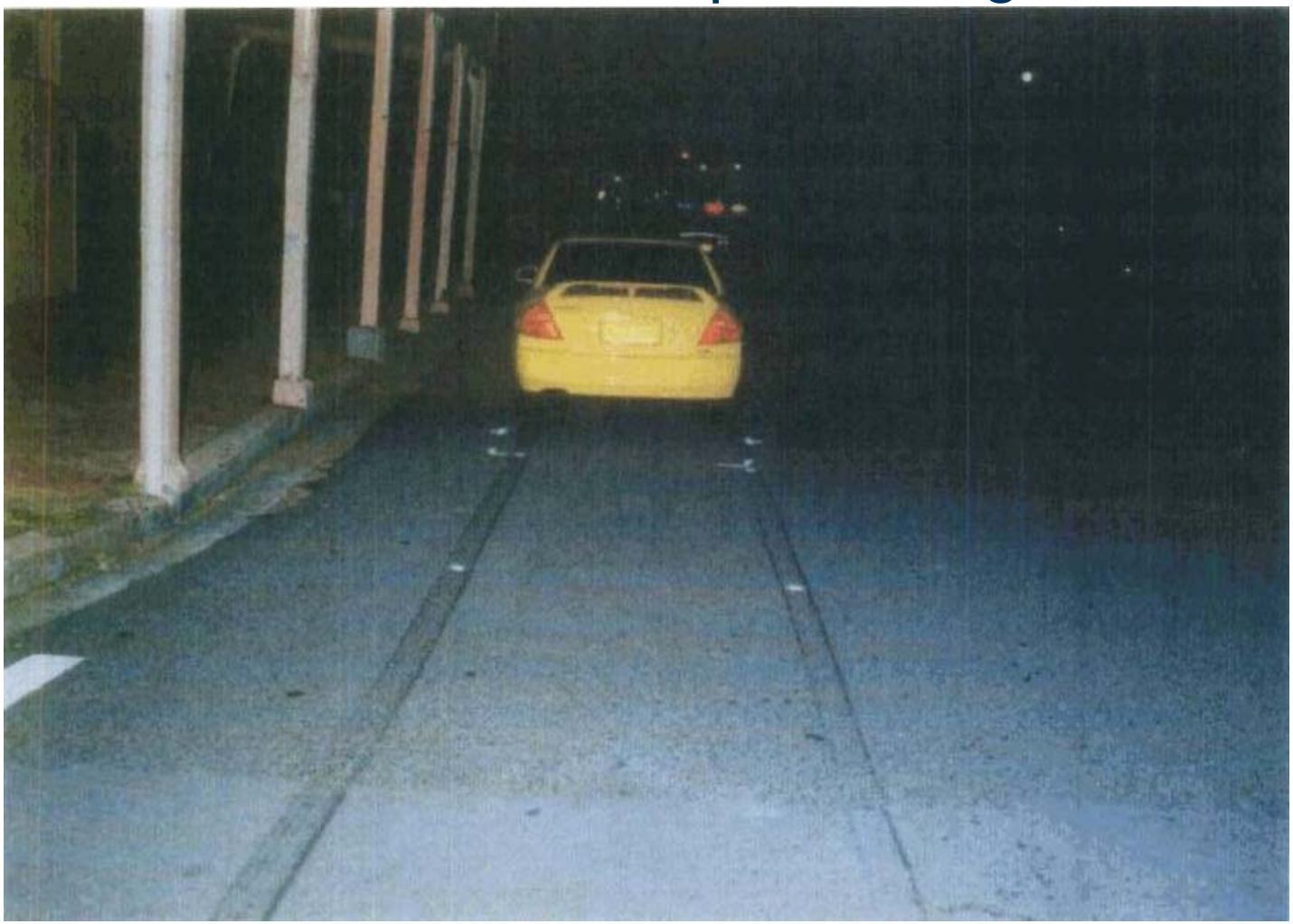
Crash reconstruction

Pedestrian impact at night



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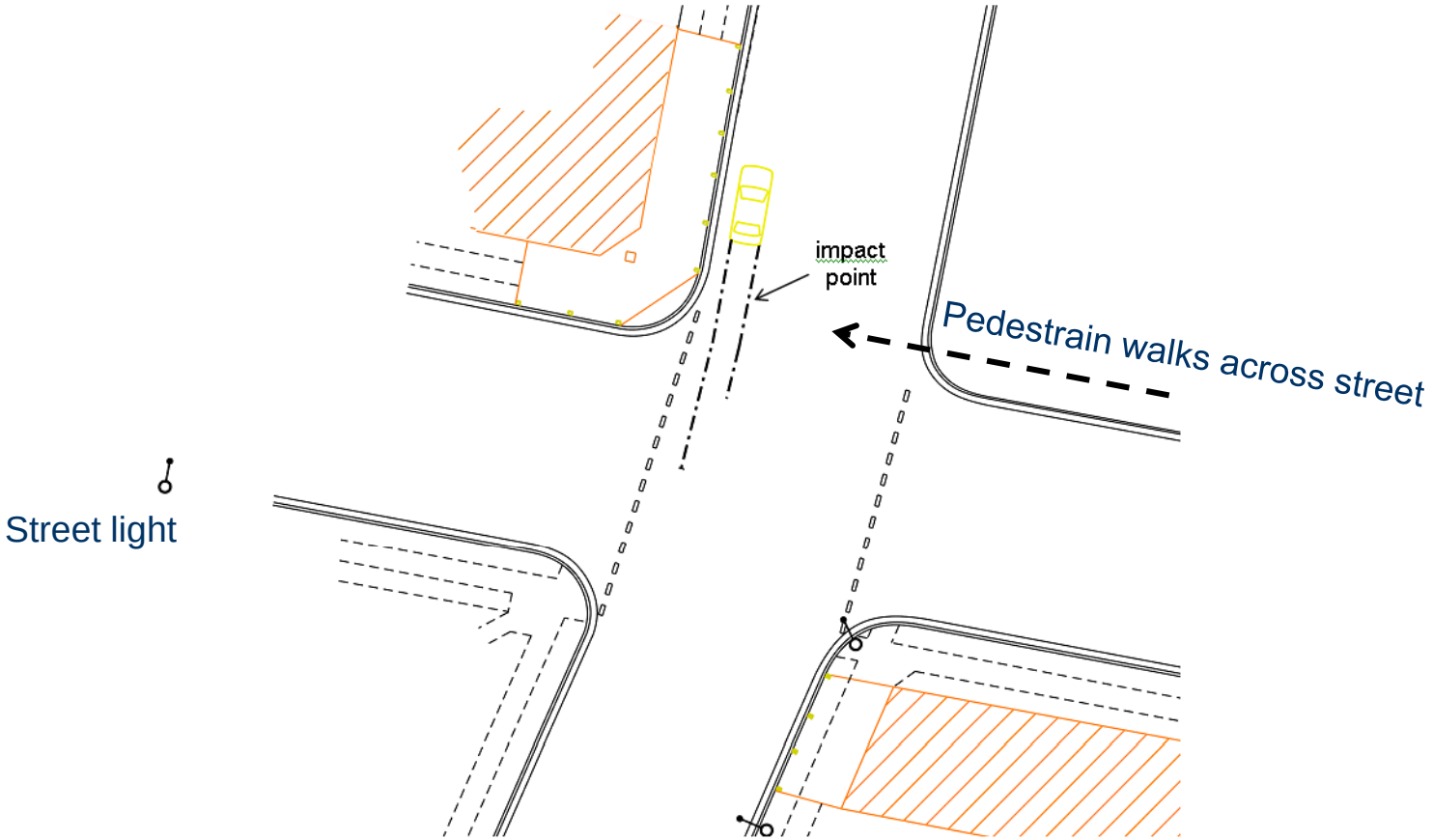
Crash reconstruction

Pedestrian impact at night



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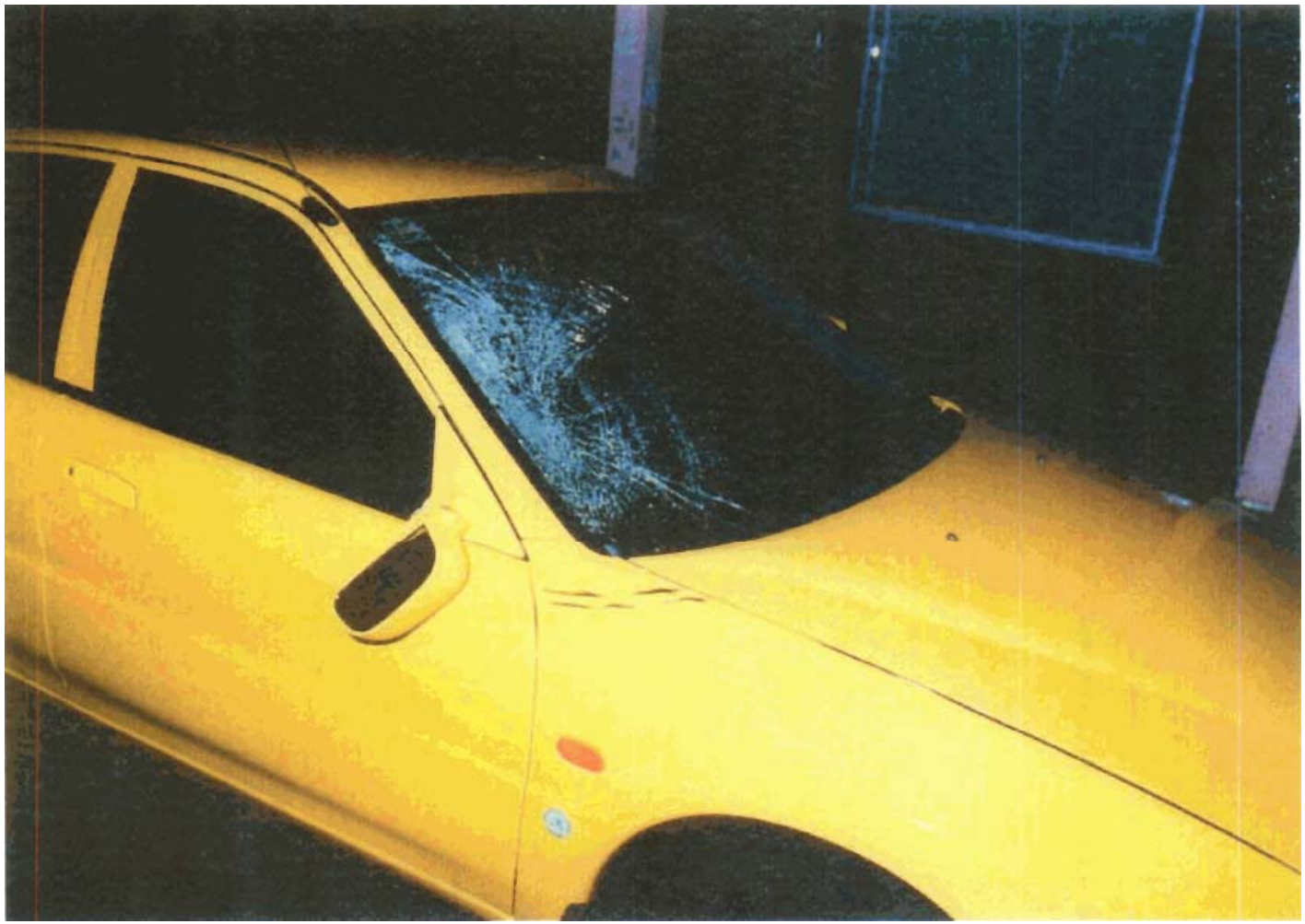
Crash reconstruction

glancing blow in this instance



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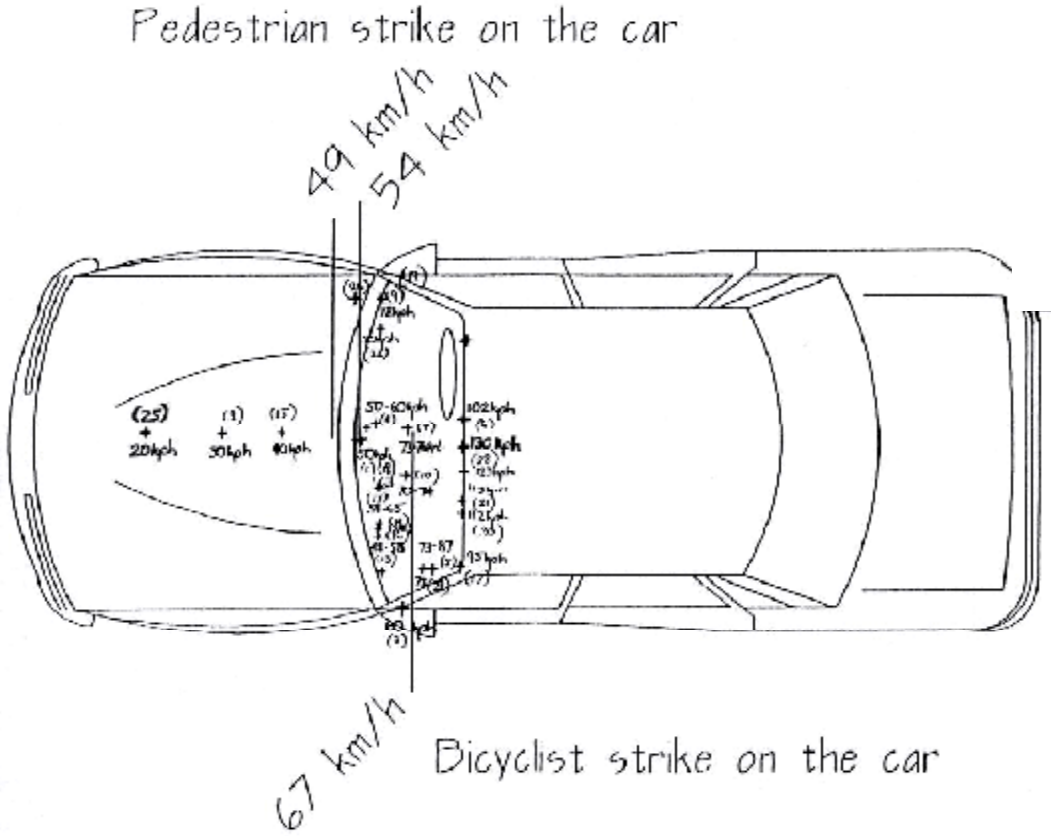
Crash reconstruction

Relationship between speed of impact and measured impact points



Source: Bellion P., Adult Pedestrian Head Strike Indicates Car Impact Speed, Proceedings ICRASH2002, 3rd International Crashworthiness Conference, Society of Automotive Engineers Australia, Melbourne, February 2002.

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Crash reconstruction

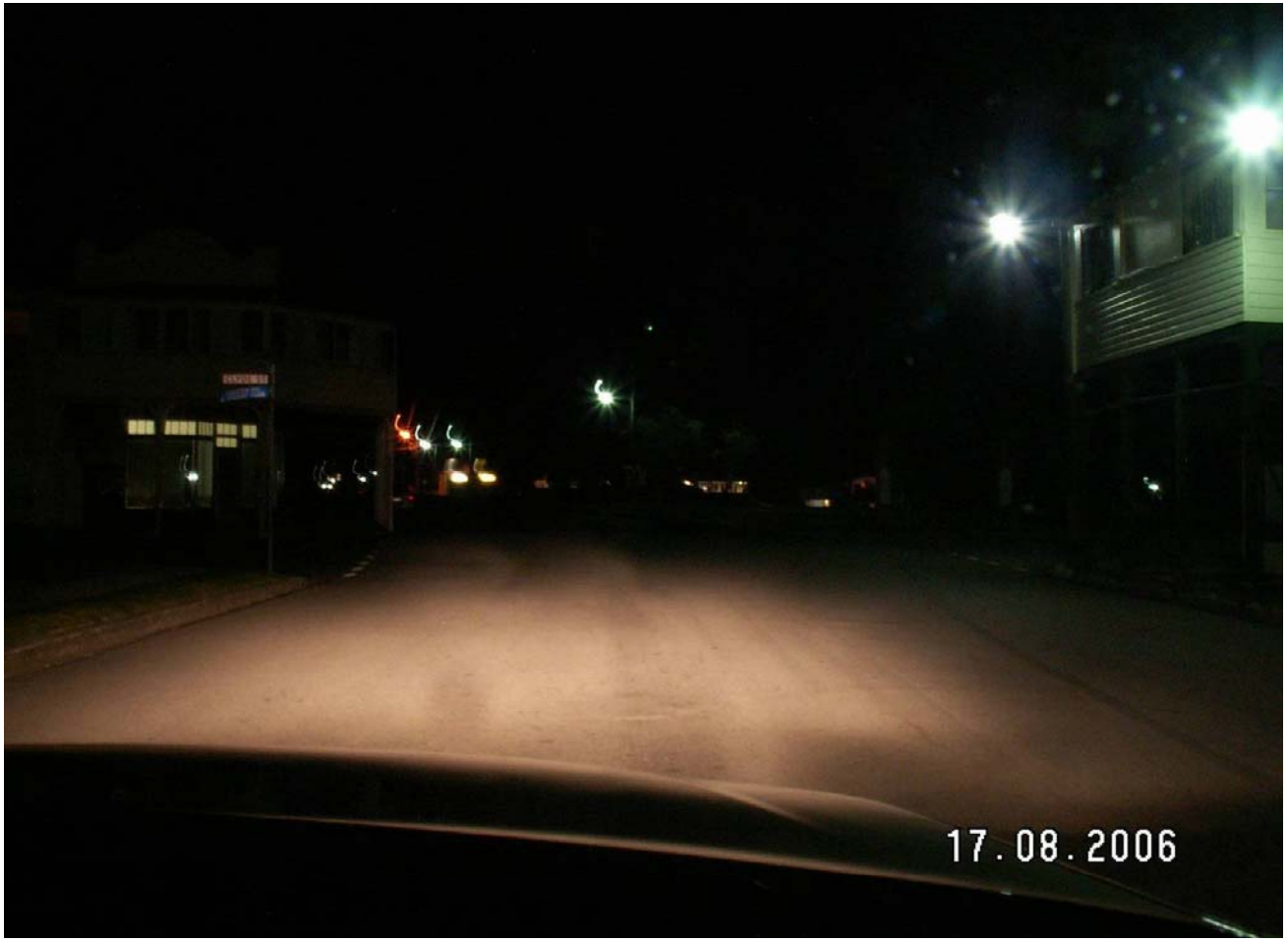
From skid marks and throw distance where pedestrian was found laying on the street (blood stains from head wound), estimated speed prior to braking around 50 km/h

Can a driver perceive, react and stop in time at this speed?

IRMRC

Crash reconstruction

Visibility at night – Low Beam & street lighting



At 36 meters away from crossing pedestrian not perceivable

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Crash reconstruction

Visibility at night – High Beam & street lighting

At 36 meters away from crossing pedestrian clearly visible

IRMRC

Crash reconstruction

Visibility at night – Low Beam & street lighting

At 26 meters away from crossing pedestrian not perceivable

IRMRC

Crash reconstruction

Visibility at night – Low Beam & street lighting

At 20 meters away from crossing pedestrian just perceivable

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Crash reconstruction

Visibility at night – Low Beam & street lighting

At 14 meters away from crossing pedestrian now perceivable

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Crash reconstruction

Perception Reaction Time (PRT)

From around 1.0 second to up to 2.5 seconds depending on the experience and alertness of the driver but commonly adopt 1.5 seconds

- detect the presence of the pedestrian
- identify that the pedestrian represents a hazard
- decide action to be taken
- react or respond by taking action (e.g. apply brakes)
- Apply brakes and stop

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Crash reconstruction

Is it possible to brake in time at 50 km/h?

- Assuming 1.5 seconds PRT and speed of 50 km/h
- Pedestrian's lighter coloured jeans just perceivable at 20 metres (in all dark clothing maybe at 15 metres)
- Car traveling at around 14 m/sec
- In 1.5 seconds car travels around 21 metres

NOT POSSIBLE TO PERCEIVE AND REACT IN TIME!

IMPACT AT 50 km/h

= Jumping off a 5 storey building

Probability of fatality = 40%

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Crash reconstruction

Is it possible to brake in time at 40 km/h?

- Assuming 1.5 seconds PRT and speed of 40 km/h
- Pedestrian's lighter coloured jeans just perceivable at 20 metres (in all dark clothing maybe at 15 metres)
- Car traveling at around 11 m/sec
- In 1.5 seconds car travels around 17 metres and brakes for 3 meters (needs around 10 metres to stop on dry bitumen)

NOT POSSIBLE TO PERCEIVE, REACT AND STOP IN TIME!

IMPACT AT 33 km/h

= Jumping off a 1 storey building

Probability of fatality = 9%

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Crash reconstruction

Is it possible to brake in time at 40 km/h?

- Assuming 1.0 seconds PRT and speed of 40 km/h
- Pedestrian's lighter coloured jeans just perceivable at 20 metres (in all dark clothing maybe at 15 metres)
- Car traveling at around 11 m/sec
- In 1.0 second car travels around 11 metres and brakes for 9 meters (needs around 10 metres to stop on dry bitumen)

NOT POSSIBLE TO PERCEIVE, REACT AND STOP IN TIME!

IMPACT AT 15 km/h

= falling off a 1 metre high table

Probability of fatality = 2%

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Conclusions

- Survivability “speed of impact” limit for pedestrians struck by cars and buses is accepted as being around 40 km/h.
- At 40 km/hr - 15% probability of death or injury.
- In Europe speed limits in high activity pedestrian areas are set at 30 km/hr. 7% probability of death or injury for dart out incidents when no braking possible.

IRMRC

Conclusions

- Pedestrians dressed in some light and dark clothing in poorly lit streets cannot be perceived by drivers until around 20 metres away. In all dark clothing possibly 15 (or less) meters away
- Drivers travelling at 50 km/hr at night with low beam lighting will not have time to apply any braking if pedestrian is in path of travel.

IRMRC

Conclusions

- Pedestrians struck at 50 km/hr have a likelihood of dying or injury of around 40%. This is highly likely at night given poor visibility resulting from street lighting and low beam car lighting.
- Speed limit should be set at 40 km/h in pedestrian active areas. Value based on human perception reaction times and laws of physics.

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Conclusions

- **Prior to impacting pedestrian dressed in dark cloths at night, braking from 40km/hr to a range of between 15 to 33 km/hr is possible. This equates to a 2% - 9% probability of fatality or injury.**

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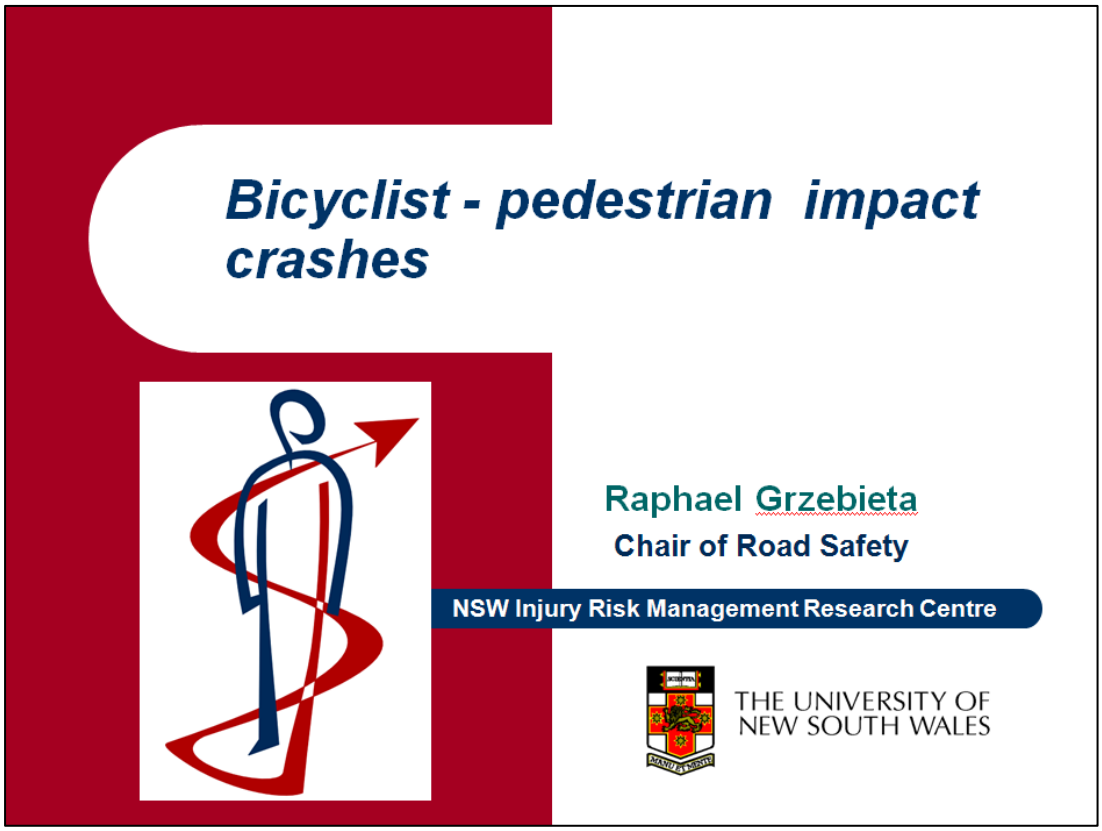
APPENDIX B Presentation regarding bicyclist-pedestrian impacts by Prof Grzebieta

(see attached PDF)



Shared pedestrian-cycling paths

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Shared pedestrian-cycling paths

Graw & Konig (2002) studied cyclist-pedestrian impacts of fatalities in Germany – cited 3 cases – all elderly people struck and died

- Cyclist usually travelling at around 30 km/h or higher
- Impact is survivable for young to average age but can result in serious brain damage
- Elderly Pedestrians may die from such an impact – falls to the ground and strikes head and later dies in hospital (not uncommon)

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Shared pedestrian-cycling paths

Issues

- Pedestrians and cyclists who do not pay attention to other path users or signs
- Wearing iPod's and walkman's increases the problem
- Narrow paths and blind intersections are an issue
- Painted signs on the path. Pedestrians and cyclists alike look down – not up!

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Shared bicycle – pedestrian footpath

Issue – hidden entry points

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Shared bicycle – pedestrian footpath

Issue – hidden entry points

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Shared bicycle – pedestrian footpath

Issue – hidden entry points

IRMRC

Shared bicycle – pedestrian footpath

Issue – hidden entry points

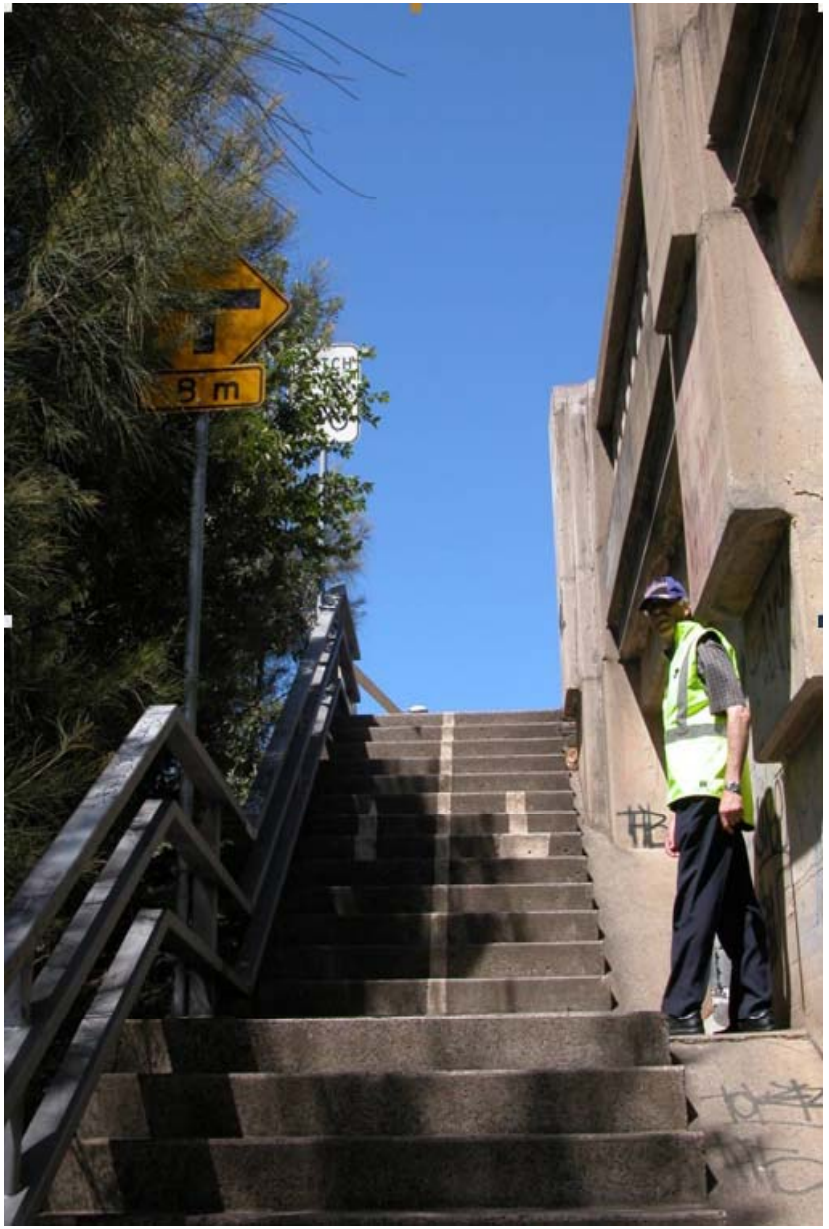
IRMRC

Shared bicycle – pedestrian footpath

Signs too high

-no-one looks up

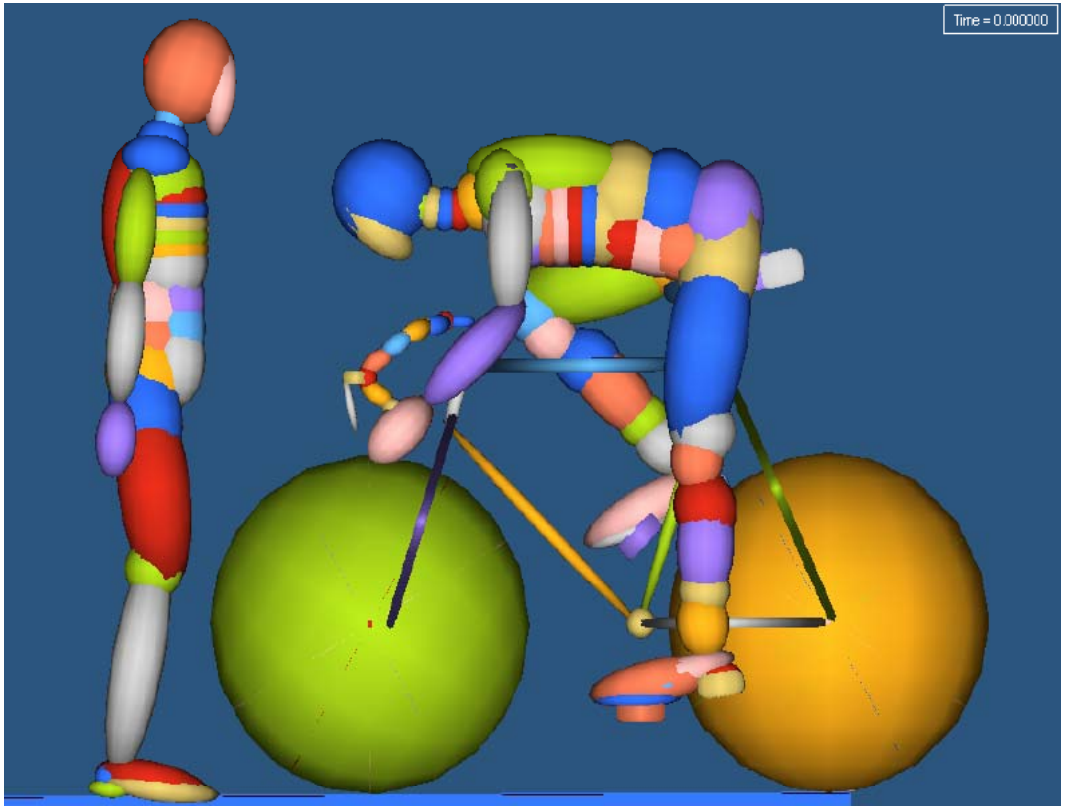
- shrubs covering signs



IRMRC

Crash reconstruction

Collision modeling of cyclist pedestrian impact



Short A., Grzebieta R.H. and Arndt N., Estimating bicyclist into pedestrian collision speed, International Journal of Crashworthiness, Vol. 12, No. 2, 2007.

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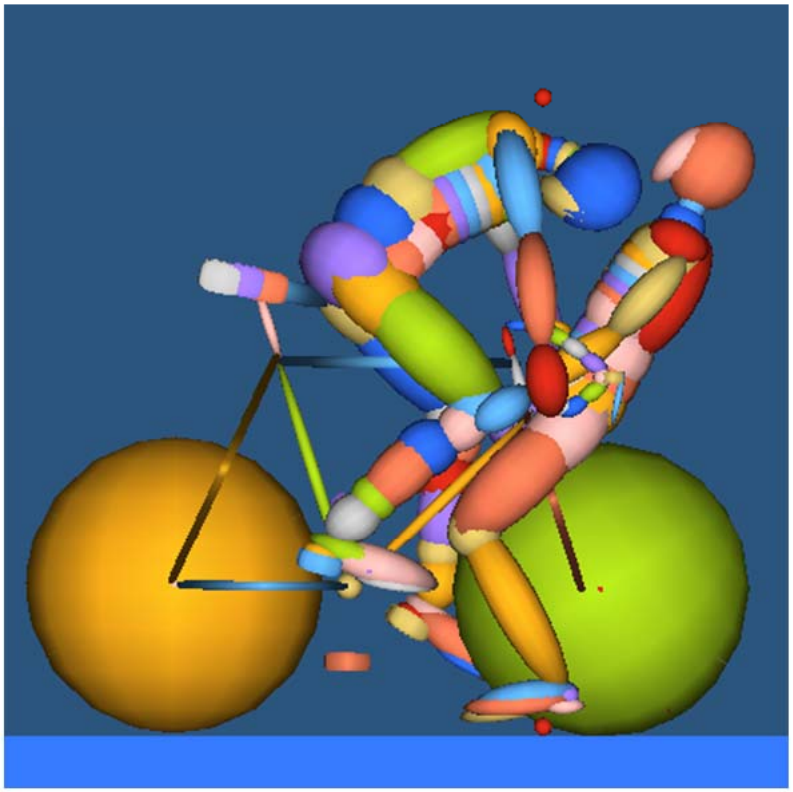
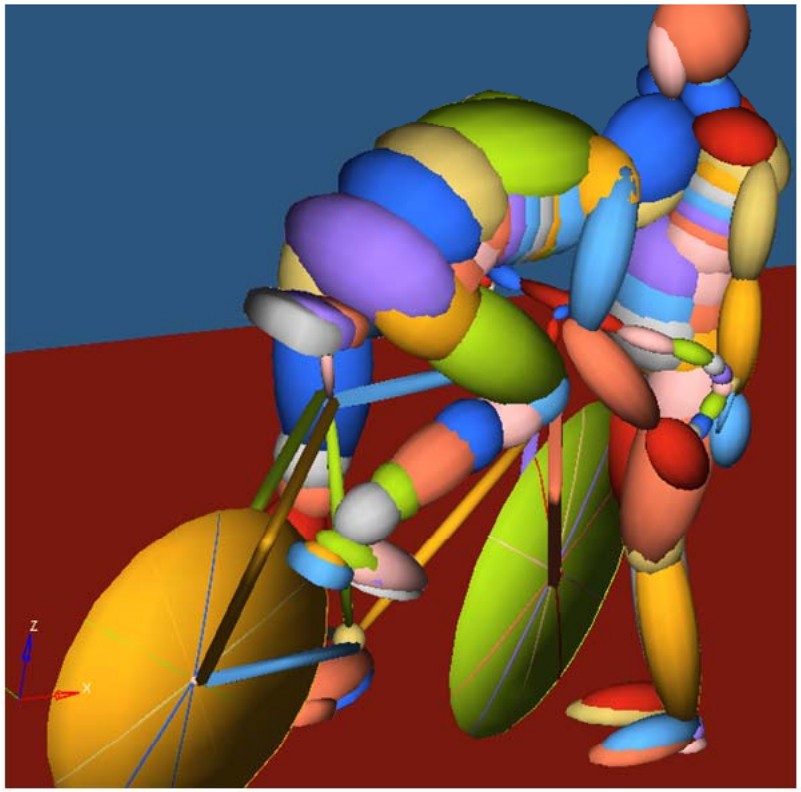
Cyclist - pedestrian impact

Pedestrian struck in chest and thrown rearwards





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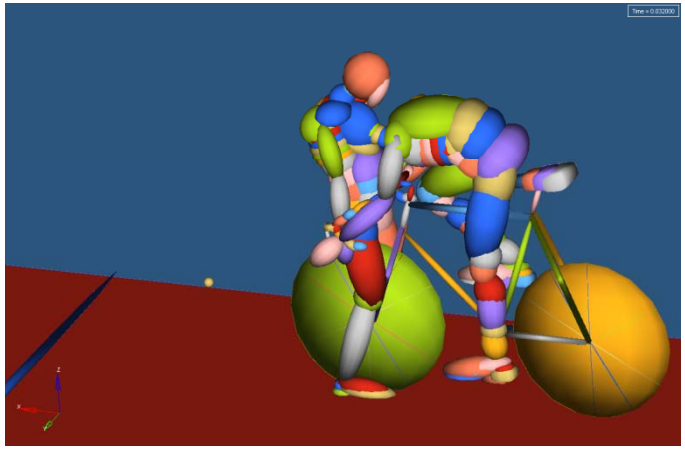
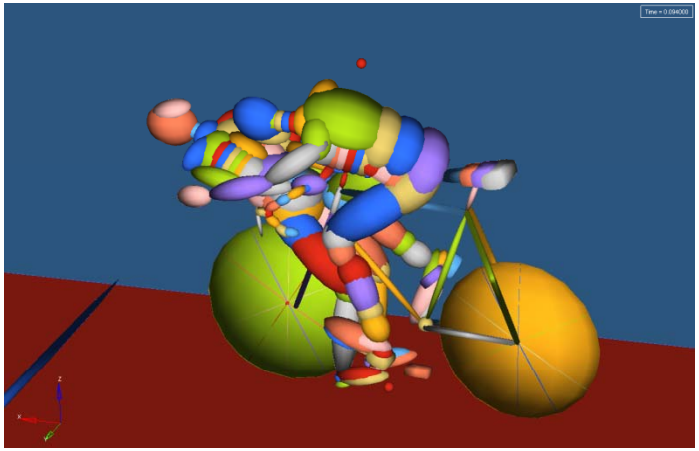
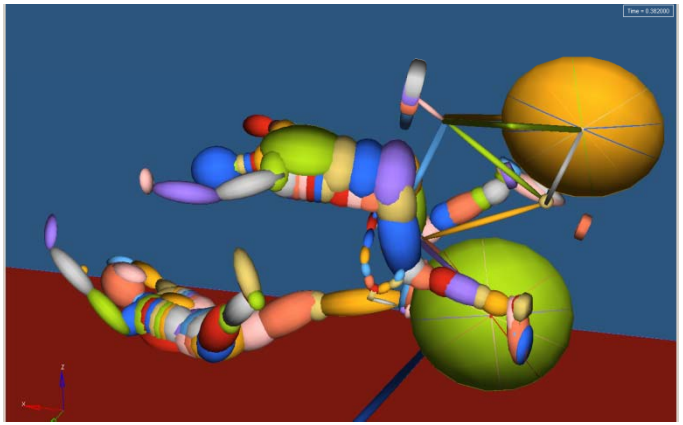
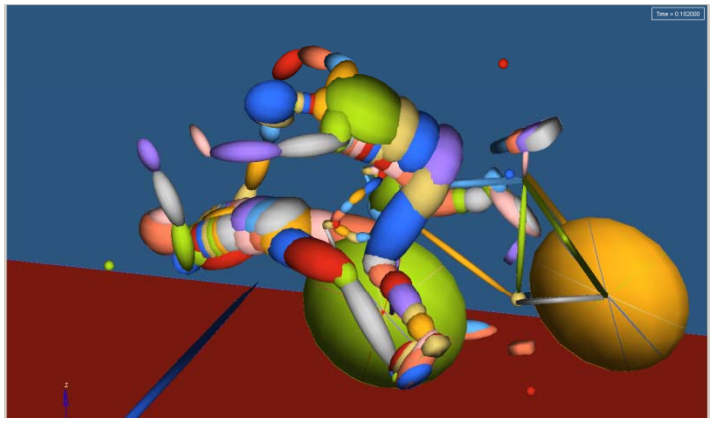
Cyclist - pedestrian impact

Pedestrian strikes rear of head on pavement
Cyclist thrown over bicycle – cyclist rarely injured









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Likelihood of severe head injury

- Pedestrian suffers serious head injury
- Bicyclist rarely injured in such incidents
- Older person (65+) can die
- Likely hood of survivability much higher at impact speeds of 10 km/hr.
- Speed limits should be set at 10 km/hr or bicyclist should be made to dismount

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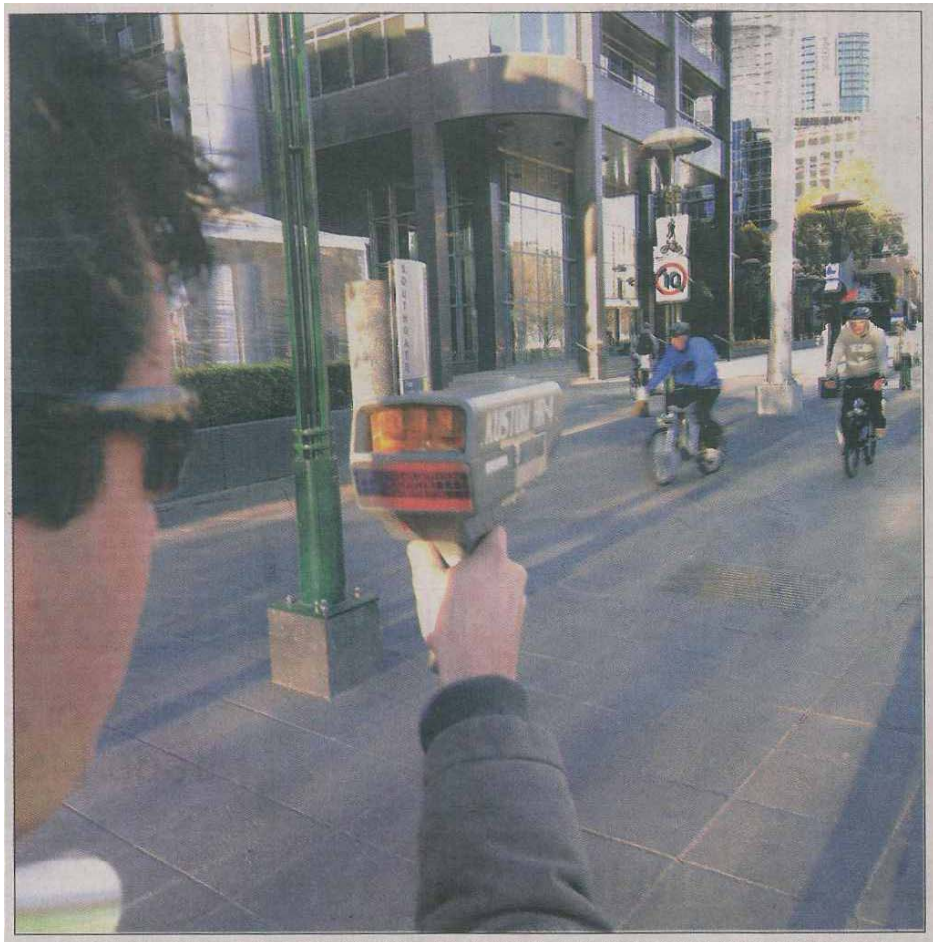
Cyclist speeds should be no greater than 10 km/hr on shared footpaths



Speeding: a radar gun catches cyclists riding at more than the posted 10km/h limit. Picture: JOHN HART

Cyclists flout speed limit

Mike Edmonds

CYCLE hoons blatantly ignoring speed limits are endangering the lives of pedestrians.

A *Herald Sun* survey yesterday found fewer than 3 per cent of bike riders along Southbank Promenade obeyed the speed limit signs restricting them to 10km/h.

Bike riders were weaving between peak-hour pedestrians at speeds of up to 29km/h, despite the prominent speed restriction signs.

"They're just up as a warning thing. It's like 'Please don't feed the birds' signs," a city-based police officer said.

"It's a commonsense thing. Police ride along there many times a day and if someone is doing the wrong thing they're given a talking to.

"It's a separate offence for cyclists not wearing a helmet or running a red light. But there isn't one for cyclists and speeding."

Influential Melbourne City councillor and chair of the planning committee, Catherine Ng, said bike behaviour must improve.

"Speed does kill, and no one would like to face the fact that they kill or injure someone with a bike," Cr Ng said.

"I checked with our engineers, who checked the Road Safety Act, and according to them the speed limit signs do apply, and can be enforced.

"There are some aggressive cyclists. They need to understand their impact on others."

The *Herald Sun* survey, carried out using a carefully calibrated radar gun and an expert operator from Australasian Traffic Surveys, found the average speed of bike riders in the 10km/h zone was 18.5km/h.

More than 77 per cent of riders were travelling faster than 15km/h; 40 per cent of bikes checked were doing more than 20km/h.

One man wobbled through walkers at 17km/h with one hand controlling his bike while talking on a mobile phone.

A female rider was dodging pedestrians one-handed while drinking from her water bottle with the other.

And another male rider cruised through the crowds entirely hands-free.

Pedestrian Peter Treagus, on his way to work at the Nyrstar office on Southbank Boulevard, labelled the bike hoons dangerous. "Someone will have to get seriously hurt before they start enforcing the speed limit," he said.

Rider Rowan Lamont, who was clocked at 18km/h, pedals into work every day from Footscray.

"The alternative is to ride on the roads," he said.

"I've never hit a pedestrian, but I have been hit by a car and the result wasn't pretty."

Few of the cyclists appeared to slow down yesterday, even after seeing the radar gun, but only one became abusive and suggested pedestrians should get out of his way.

The general manager of Bicycle Victoria, Harry Barber, said it was unacceptable for riders to speed through the area.

"If anyone is going through there at 30km/h they need to be booked," he said.

"We've got no problem with the police booking riders who are behaving outrageously."

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Conclusions

- Cyclist pedestrian impacts can result in serious brain injury for both pedestrian and cyclist. For elderly pedestrian it is often fatal.
- Speed limits on shared roadways with pedestrians for both cars and bicyclists should be set at 10 km/hr.

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