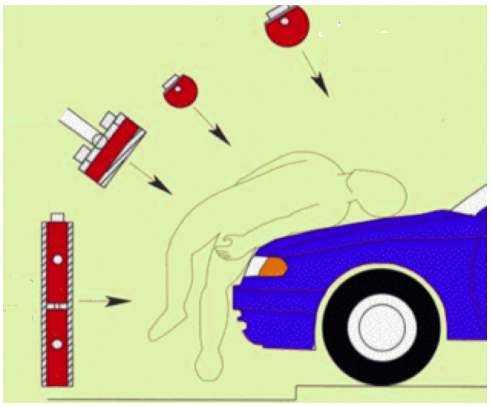
Trends in Pedestrian Protection: Australia 2001-2017



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Introduction

The Australasian New Car Assessment Program* (ANCAP) commenced rating pedestrian protection in 2000

Used same protocols as Euro NCAP

ANCAP published 610 ratings between 2001 and 2017, including about half from Euro NCAP

These have been analysed for trends and possible effects on serious injuries

Observations about improved design for pedestrian protection are also presented

* This study was conducted independently of ANCAP

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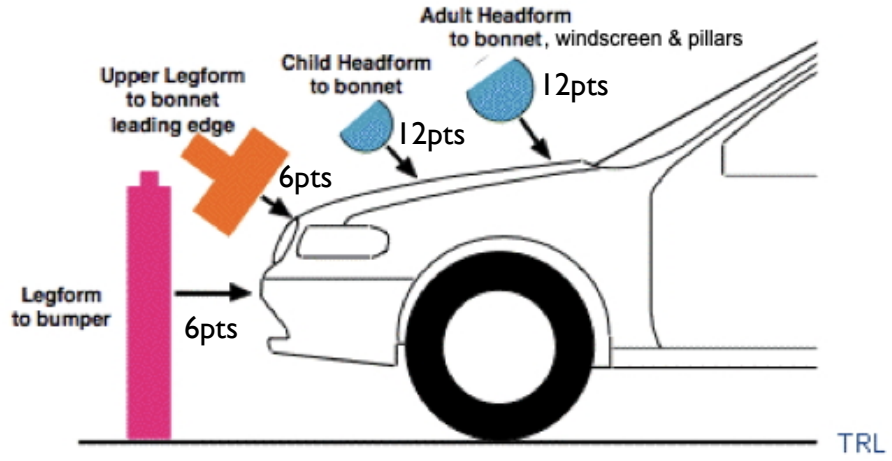
ANCAP Pedestrian Protection Ratings



Maximum points from sub-system tests:

6 + 6 + 12 + 12 = 36 points

(a further 12 pts now available for AEB)

ANCAP Pedestrian Protection Ratings

Score	2000-2010	2011+
27.5 or more	4 stars	Good
18.5 to 27.49	3 stars	Acceptable
9.5 to 18.49	2 stars	Marginal
0.5 to 9.49	1 Star	Poor
Less than 0.5	Zero stars	Poor

Although the scoring has stayed the same the protocols have changed (in 2002, 2010, 2012 & 2015)

Generally these changes have resulted in lower scores than previous protocols

No adjustments for this have been made in the analysis

In 2018 ANCAP added Pedestrian & Cyclist AEB to the score (excluded from this analysis)

AEB will not make pedestrian-friendly design unnecessary – it will likely bring more collisions into the impact speed range where good design is most effective

Other Influences on Vehicle Design

GTR9/UN R127 was published in 2009 and implemented in many regions, but not Australia

Improvements in Europe & Japan likely influenced cars imported into Australia

ANCAP's 2011 Road Map required minimum performance in pedestrian protection for a 5-star overall rating

In 2012 major fleets began requiring 5-star NCAP ratings for their vehicles and for contractor vehicles on worksites

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High-seat vehicles

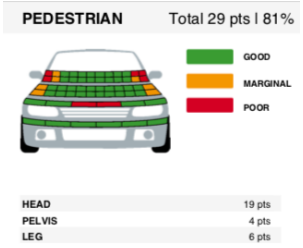
The 2011 ANCAP Road Map included more lenient pedestrian protection requirements for high-seat vehicles such as pickups and SUVs

This was partly based on industry claims of difficulty in designing for these tests

Shortly after the Road Map was published the Australian-designed Ford Ranger achieved the highest pedestrian score at that time from Euro NCAP!

--- TABLE 1 --- ANCAP ROAD MAP 2011

Year	Minimum Frontal Offset Score	Minimum Side Impact Score	Minimum Side Pole Score	Minimum Combined Score[1]	Minimum Pedestrian Rating
			Requirements for 5-Star Rating		
2011	12.5	12.5	1	32.5	-
2012	12.5	12.5	1	32.5	Marginal[2]
2013	12.5	12.5	1	32.5	Marginal[3]
2014	12.5	12.5	1	32.5	Acceptable[3]



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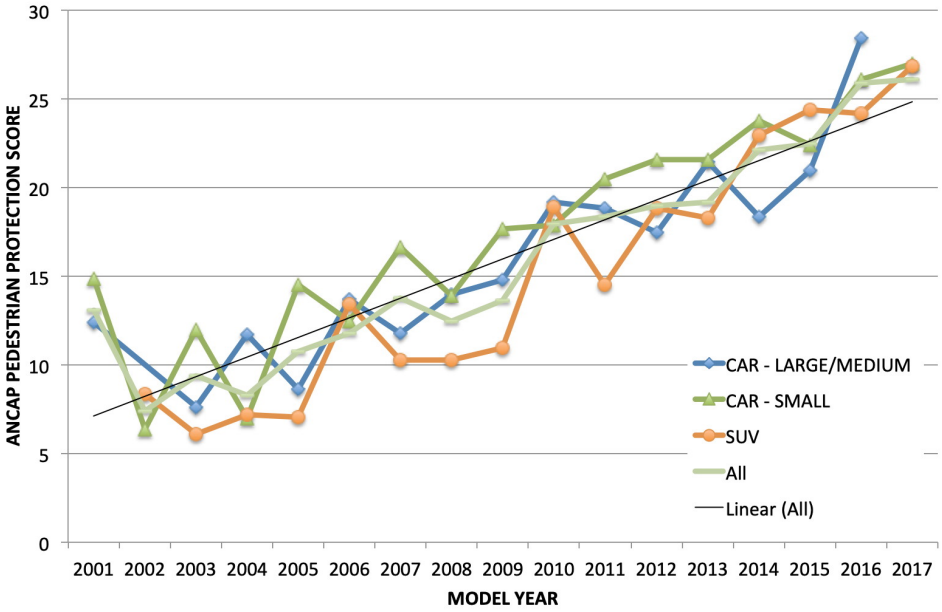
Trends in Pedestrian Protection Scores



Average score improved from 7.5 in 2001-2 to 25 in 2017

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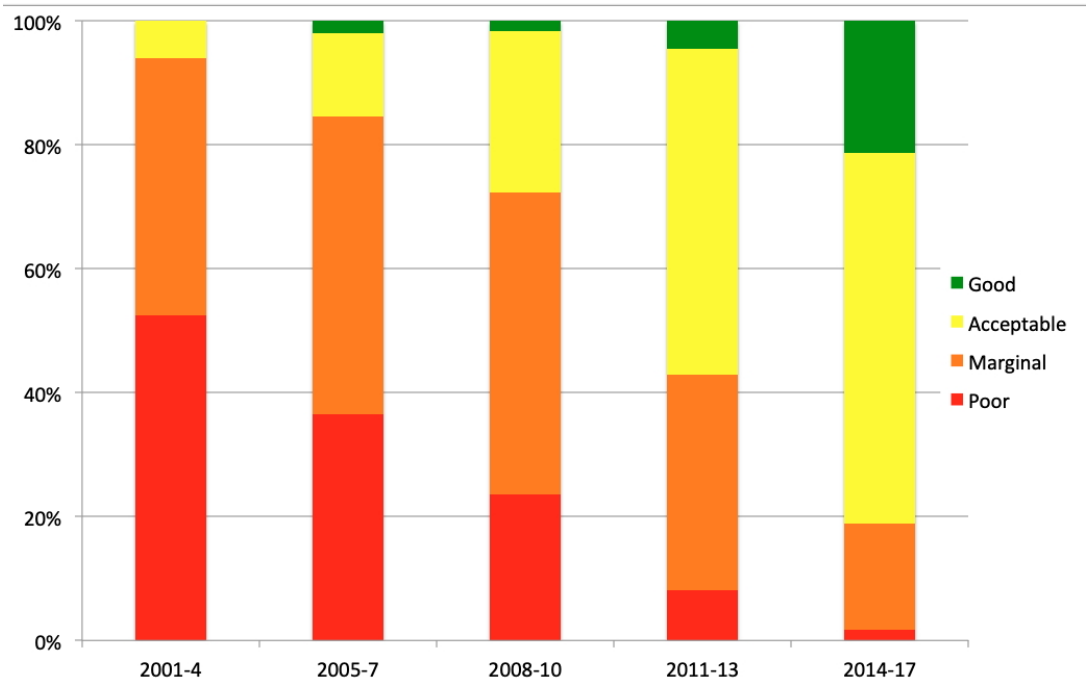
Trends in Pedestrian Protection Ratings



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Risk of Serious Injury

In 1998 Lawrence estimated that 21% of serious pedestrian injuries could be prevented through improved vehicle design

In 2006 Lawrence estimated that GTR9 would result in a 12% reduction in serious pedestrian injuries across Europe. It was estimated that just "passing" GTR9 is equivalent to a "marginal" NCAP rating ,(~18 points).

Several studies have looked for correlation between improved NCAP scores and reduced pedestrian injuries in the real-world

Risk of Serious Injury

Strandroth (2011) analysed 609 Swedish crashes. Average score was 6.24 for 1-star vehicles and 13.84 for 2-star vehicles (not enough 3-star vehicles for analysis). Serious injuries 17% lower with 2-star vehicles

Pastor (2013) analysed 7576 German crashes. Risk of serious injury reduced by 35% for a vehicle scoring 22, compared with a vehicle scoring 5.

Risk of Serious Injury

Keall (2018) analysed Australian and New Zealand crashes. Risk of serious pedestrian injury was 39.% for vehicles built 1997-2001 compared with 33.6% for vehicles built 2007-2012: a 15% reduction in risk

Combining Keall results with ANCAP (average score improved from 7.5 to 17) gives 15% reduction in serious injuries for a 10 point improvement in score

A recent unpublished study of pedestrian crashes in urban South Australia found that risk of serious injury was 19% less for vehicles built 2008-2016 compared with 1999-2007. Average ANCAP scores were 19 and 11 respectively

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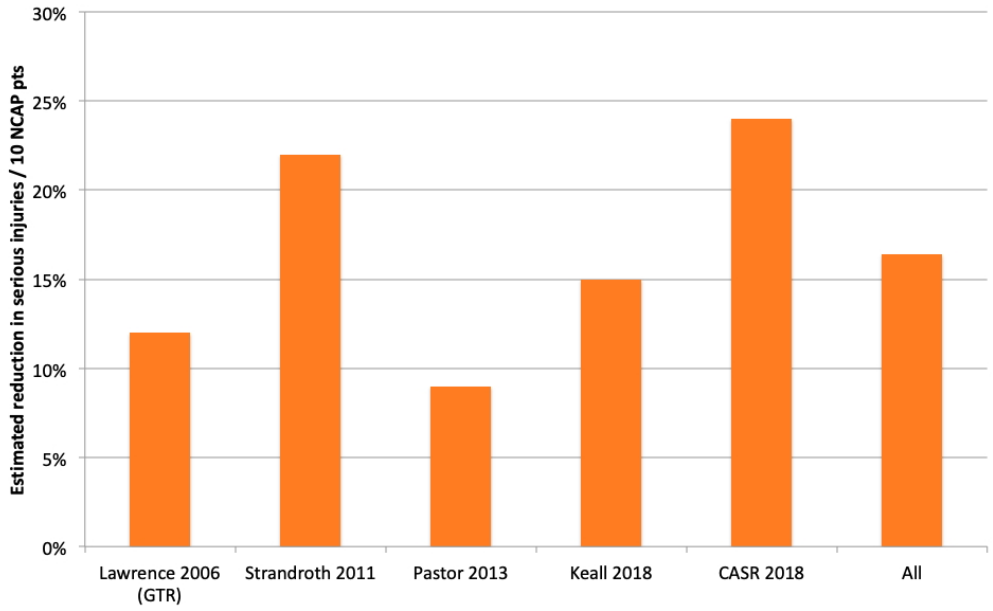
Risk of Serious Injury v NCAP Score



Assuming a linear relationship between NCAP score and risk of serious injury this graph shows the findings of the various studies - normalised to a reduction in risk of serious injury for a 10 point improvement in NCAP score. The overall average value is 16%.

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Potential Savings from Improved Design

Based on this analysis it is estimated that the observed 17.5 point improvement in average ANCAP score between 2001 and 2017 equates to a 29% reduction in risk of serious injury to pedestrians

2003 model
6.7 points

2013 model
23.8 points

Estimated 29% reduction in risk of serious injury to pedestrians

Improvements to Vehicle Design

The written paper contains a summary of some of the improvements to vehicle design that have been observed during pedestrian protection tests

Under-bonnet components

Mid-1980s: Stiff firewall and sides of engine bay supporting edge of bonnet. Minimal clearance between suspension tower/air cleaner and bonnet.

Early 2000s: Stiff firewall and sides of engine bay supporting edge of bonnet. Minimal clearance between suspension tower/engine cover and bonnet.

Recent: Firewall and sides of engine bay lowered with bonnet supported by collapsible elements. Suitable clearance is provided between suspension tower/other under bonnet structures and bonnet.

Top edge of fender

Traditional design: Wheel guard supported directly by stiff structure.

Recent design: Wheel guard supported by collapsible element.

Conclusions

ANCAP pedestrian protection ratings between 2001 and 2017 indicate a steady improvement in vehicle design over this period, with the average score improving from 7.5 to 25.

Based on several real- world crash studies, it is estimated that this improvement is associated with a 29% reduction in the risk of serious injury for pedestrians.

The improvement was likely driven by NCAP programs in Europe, Japan and Australia, the introduction of GTR9/UN127 in most developed nations (but not Australia) and, more recently, fleet demand for 5-star rated vehicles.

Pedestrian & Cyclist (VRU) Fatalities by Country

Country	GTR9/ UN R127	% of Fatalities that are VRU	Estimated VRU fatalities/year	Start of NCAP Ped. Tests/O'all rating
Australia	N#	16%	216	2000/2011
Brazil	N	21%	8611	2019/2019
China	N	34%*	87101	2018/2018
France	Y	21%	753	1997/2009
Germany	Y	27%	898	1997/2009
India	Y (2018)	10%	29909	Planned
Indonesia	N	19%	6028	-
Japan	Y	50%	2612	2003/2011
Malaysia	Y	9%*	664	-
S.Korea	Y	46%	2295	2007/2010
Russia	Y	31%	8050	-
S.Africa	Y	41%	5948	-
UK	Y	30%	606	1997/2009
USA	N	17%	6781	Planned

* Based on WHO 2015 # Signed agreement but not implemented

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