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IN THE DRIVER'S SEAT

UNDERSTANDING YOUNG ADULTS' DRIVING BEHAVIOUR



A report on the ATP Young Drivers Study from the collaborative partnership between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria and the Transport Accident Commission of Victoria



Australian Government
Australian Institute of Family Studies

In the driver's seat

This report is the product of the collaboration between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria, and the Transport Accident Commission of Victoria. The study used data gathered from the Australian Temperament Project (ATP) to identify trends in young adult driving behaviour and factors associated with, and pathways to, unsafe driving behaviours among this age group.

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Australian Temperament Project

The Australian Temperament Project is a large longitudinal study of children's development which began in 1983 with the enrolment of a representative sample of 2443 infants and their families from urban and rural areas of Victoria. The study investigates pathways to psychosocial adjustment from childhood to adulthood and the influence of personal, family and environmental factors. Since early in 2000, the Australian Institute of Family Studies has been collaborating with researchers from the University of Melbourne and the Royal Children's Hospital in this ongoing research project.

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with

Ann Sanson, Samantha Cockfield, Anne Harris,
Warren Harrison and Allison McIntyre



AUSTRALIAN TEMPERAMENT PROJECT

A study of development from infancy to adulthood



Published by the Australian Institute of Family Studies

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Australian Institute of Family Studies
300 Queen Street, Melbourne 3000 Australia
Phone (03) 9214 7888; Fax (03) 9214 7839
Internet www.aifs.gov.au/

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*In the driver's seat: Understanding young adults'
driving behaviour*, by Diana Smart and Suzanne
Vassallo, with Ann Sanson, Samantha
Cockfield, Anne Harris, Warren Harrison
and Allison McIntyre, AIFS Research Report
No. 12, May 2005.

Bibliography
ISBN 0 642 39523 3

Designed by Double Jay Graphics
Printed by Impact Printing

ISSN 1447-1469 (Print)
ISSN 1477-1477 (Online)

Disclaimer

The research presented in this Report has been
funded by the Australian Institute of Family
Studies, the Royal Automobile Club of Victoria
and the Transport Accident Commission, and
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Foreword

Understanding the processes by which young Australians develop into safe or risky drivers is crucial in increasing road safety, minimising harm and maximising positive outcomes for our young people. This report focuses on the personal, family and social characteristics that are linked to differing patterns of driving behaviour, while acknowledging the salient role of situational, mechanical and legal factors that influence driving behaviour.

The report is the culmination of a collaborative project between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria, and the Transport Accident Commission of Victoria.

The focus of the collaboration was the longitudinal community study, the Australian Temperament Project (ATP), which itself is a collaboration between researchers from the Institute, the University of Melbourne and the Royal Children's Hospital. The ATP contains 13 waves of data covering many aspects of life from infancy to early adulthood, collected from a representative sample of 2,443 children and parents.

The collaborative project reported here began in 2001 with the realisation that the forthcoming ATP data collection at 19-20 years would provide a valuable opportunity to examine the learner driver and current driving experiences of young people who had recently become licensed drivers (the legal licensing age for most participants was 18 years of age). As a result, the *ATP Young Drivers Study* formed part of the ATP's 2002 data collection.

Among the major findings emerging from the ATP Young Drivers Study was that risky driving was still quite prevalent, with speeding and driving when tired found to be particularly common. These behaviours continue to be clear targets for road safety efforts. Encouragingly, certain behaviours such as drink driving and failure to use seatbelts were less common, suggesting that road safety efforts aimed at these behaviours have been effective.

The report also highlights the relevance of personal characteristics to driving behaviour. The small group who later became high risky drivers had been consistently more aggressive, hyperactive, and possessed poorer attention capacities and lower social skills from mid childhood than other young drivers. The report suggests that, in addition to concentrating on skill development, road safety initiatives and driver education programs could be extended to focus on the links between a person's individual style and driving behaviour.

Some high risky drivers had a history of problem behaviour, especially antisocial behaviour and substance use. For these young people, risky driving may be a manifestation of a risky lifestyle. These findings further reinforce current efforts to help children make the best start in life, which may curb the later development of a range of problem behaviours, including risky driving.

On behalf of the three organisations participating in this collaboration, I commend the report *In the Driver's Seat: Understanding Young Adults' Driving Behaviour*, and am confident that it will be of widespread interest, value and relevance to policy makers, practitioners, and the broader community.

Professor Alan Hayes

Director
Australian Institute of Family Studies

Acknowledgments

The authors of this report would like to thank the Royal Automobile Club of Victoria and the Transport Accident Commission of Victoria for providing the opportunity to undertake this collaborative project, which we believe has provided interesting and valuable Australian findings that can inform the development of more effective road safety strategies and policies in Australia.

The leadership and guidance provided over the lifetime of the Australian Temperament Project study by its leading investigators – Associate Professor Ann Sanson (Department of Psychology, University of Melbourne), Professor Margot Prior (Departments of Psychology and Paediatrics, University of Melbourne), Professor Frank Oberklaid (Centre for Community Child Health, Melbourne's Royal Children's Hospital) and Associate Professor John W. Toumbourou (Centre for Adolescent Health, Melbourne's Royal Children's Hospital, and Department of Paediatrics, University of Melbourne) – is particularly acknowledged.

Finally, the authors thank the young people, parents and teachers who have participated in the Australian Temperament Project. Without their loyalty and commitment, this research would not have been possible.

Contents

Foreword	v
Acknowledgments	vi
List of tables and figures	ix
About the authors	xii
Executive summary	xiii
1. Introduction	1
Over-representation of young drivers in traffic accidents	3
Factors associated with crash involvement	4
Crash type	4
Time and day at which crashes occur	4
Alcohol and marijuana use	4
Gender	5
Passengers	5
Speed	6
Fatigue	6
Seat-belt use	6
Explanations for the higher rate of crashes among young drivers	6
Inexperience	7
Age	7
Risk exposure	7
Risk-taking	8
Young problem drivers	8
ATP Young Drivers Study	9
Structure of the report	9
2. The Australian Temperament Project	11
Driver behaviour measures	15
Measures from the longitudinal data set	16
3. Driving behaviour and learner driver experiences	19
Total sample	21
Learner driver experiences	21
Driving behaviour	24
Summary	27
Gender differences	28
Learner driver experiences	28
Driving behaviour	30
Summary	31
Metropolitan, regional and rural differences	32
Learner driver experiences	32
Driving behaviour	32
Summary	33
Motorcyclists and other road users	34

4. Precursors and correlates of risky driving, crash involvement and speeding violations	35
Precursors and correlates of risky driving behaviour	37
Formation of groups	37
Group characteristics	38
Group differences by stage of development	39
Summary	46
Precursors and correlates of crash involvement	47
Formation of groups	47
Group characteristics	47
Group differences by stage of development	48
Summary	52
Precursors and correlates of speeding violations	52
Formation of groups	52
Group characteristics	53
Group differences by stage of development	54
Summary	59
Gender differences in the precursors and correlates of risky driving, crash involvement and speeding violations	61
5. Similarities and differences in the precursors of risky driving, crash involvement and speeding violations	63
Individual attributes	65
Summary of individual precursors	70
Social and environmental factors	71
Current circumstances	74
Summary of social and environmental precursors	75
Summary	76
Overlap in membership of the three most problematic driving groups	77
6. Relationship between unsafe driving and other problem behaviours	79
Overlap between the precursors of risky driving and other problem behaviours	81
Summary	84
The co-occurrence of problem behaviours at 19-20 years	85
Substance use	85
Antisocial behaviour	88
Summary	89
Connections between problem behaviours in adolescence and driving behaviour at 19-20 years	90
Substance use	90
Antisocial behaviour	92
Summary	93
Profile of risks of single-problem and multiple-problem groups	94
Correlates of risky driving and alcohol use	94
Correlates of risky driving and marijuana use	95
Correlates of risky driving and antisocial behaviour	97
Summary	97

7. Discussion of findings and implications	99
Experiences when learning to drive and subsequent driving behaviour	101
Precursors and correlates of risky driving behaviour, crash involvement and speeding violations	102
Relationship between unsafe driving behaviour and other problem behaviours	103
Conclusions and implications	104
References	116

List of tables

Executive summary

A. Size and gender composition of the risky driving, crash involvement and speeding violation groups	xvi
--	-----

Chapter 2

1. Data collection at 19-20 years: Driving-related questions and response categories in the young adult survey	14
2. Data collection at 19-20 years: Driving-related questions and response categories in the parent survey	15
3. Domains and dimensions investigated as precursors and correlates of differing driving behaviours	16

Chapter 3

4. Licence status (self and parent reports)	21
5. Circumstances surrounding, and outcomes of, crash involvement (self and parent reports)	25
6. Rates of unsafe driving behaviours during the previous 10 trips (self report)	26
7. Gender differences in rates of unsafe driving behaviours during the previous 10 trips	30

Chapter 4

8. Gender composition of risky driving groups	39
9. Crash involvement and speeding violation rates among the risky driving groups	39
10. Teacher-reported significant differences between the low, moderate and risky driving groups in mid and late childhood	41
11. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups in early adolescence	42
12. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups over mid/late adolescence	44
13. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups in early adulthood	45
14. Distribution of crashes across ATP sample	47
15. Gender composition of the no, single and multiple crash groups	48
16. Crash characteristics of the single and multiple crash groups	48
17. Parent-reported and self-reported significant differences between the no, single and multiple crash groups over mid/late adolescence	50
18. Parent-reported and self-reported significant differences between the no, single and multiple crash groups in early adulthood	51

19. Distribution of speeding violations among the ATP sample	53
20. Gender composition of the no, single and multiple speeding violation groups	53
21. Self-reported speeding behaviour of the no, single and multiple speeding violation groups during their past 10 trips	54
22. Parent-reported and teacher-reported significant differences between the no, single and multiple speeding violation groups in late childhood	55
23. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups in early adolescence	56
24. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups over mid/late adolescence	57
25. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups in early adulthood	58

Chapter 5

26. Summary of individual attributes associated with different problem driving outcomes	70
27. Summary of environmental aspects and current life circumstances associated with different problem driving outcomes	75
28. Overlap between the problem driving groups	77

Chapter 6

29. Overlap between the precursors of high risky driving behaviour, persistent adolescent antisocial behaviour and adolescent multi-substance use	83
30. Definition and composition of alcohol and marijuana use groups at 19-20 years	86
31. Definition and composition of combined substance use groups at 19-20 years	86
32. Definition and composition of antisocial behaviour groups at 19-20 years	89
33. Characteristics of adolescent substance use groups	91
34. Characteristics of adolescent antisocial groups	93
35. Significant differences between the high risky driving only (n=36), high alcohol use only (n=199), and dual problem (high risky driving and high alcohol use) (n=20) groups at 19-20 years	95
36. Significant differences between the high risky driving only, (n=53) high marijuana use only (n=46), and dual problem (high risky driving and high marijuana use) (n=8) groups at 19-20 years	96
37. Significant differences between the high risky driving only (n=47), high antisocial only (n=80), and dual problem (high risky driving and high antisocial) (n=27) groups at 19-20 years	96

List of figures

Chapter 3

1. Number of professional lessons (self report)	22
2. Frequency of driving practice (self report)	22
3. Frequency of driving practice with parents (self and parent reports)	23
4. Frequency of driving practice with others (self and parent reports)	23
5. Stress and conflict experienced during driving practice with parents (self and parent reports)	24

6. Stress and conflict experienced during driving practice with others (self report)	24
7. Number of hours typically spent driving by time of week	25
8. Self- and parent-reported frequency of unsafe driving behaviours	27
9. Number of professional lessons, by gender	29
10. Gender differences in the frequency of driving practice with others	29
11. Stress and conflict experienced during driving practice with parents, by gender	30
12. Number of times detected speeding, by gender	31
13. Number of professional lessons, by locality	32
14. Frequency of driving practice, by locality	33

Chapter 4

15. Frequency of risky driving behaviours, by cluster groups	38
--	----

Chapter 5

16. Teacher-reported differences in task orientation between the risky driving groups over time	66
17. Parent-reported differences in persistence between the speeding violation groups over time	66
18. Self-reported differences in antisocial behaviour between the risky driving groups across time	67
19. Self-reported differences in multi-substance use between the crash involvement groups across time	67
20. Parent-reported differences in hyperactivity between the speeding violation groups over time	68
21. Parent-reported differences in cooperation between the speeding violation groups over time	69
22. Self-reported differences in empathy between the risky driving groups over time	69
23. Parent-reported differences in school adjustment difficulties between the risky driving groups over time	71
24. Parent-reported differences in school adjustment difficulties between the speeding violation groups over time	72
25. Self-reported differences in association with antisocial peers between the risky driving groups over time	72
26. Self-reported differences in association with antisocial peers between the speeding violation groups over time	73
27. Self-reported differences in association with antisocial peers between the crash involvement groups over time	73

Chapter 6

28. Relationship between risky driving and alcohol use at 19-20 years	87
29. Relationship between risky driving and marijuana use at 19-20 years	88
30. Relationship between risky driving and combined alcohol and marijuana use at 19-20 years	88
31. Relationship between risky driving and antisocial behaviour at 19-20 years	89
32. Relationship between adolescent alcohol use and risky driving at 19-20 years	91
33. Relationship between adolescent marijuana use and risky driving at 19-20 years	92
34. Relationship between adolescent antisocial behaviour and risky driving at 19-20 years	93

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Executive summary

Young adults are consistently over-represented among those injured or killed in traffic accidents. Risky driving behaviours such as speeding, driving when fatigued, and driving under the influence of alcohol are often implicated in these crashes. In an effort to shed light on these road safety problems, considerable research has been devoted to examining the driving patterns and behaviours of this age group, as well as the situational, structural and legal factors that influence their driving behaviour. However, much less is known about the earlier circumstances or factors in young drivers' lives that may have influenced their current driving behaviour.

This report presents findings from the *ATP Young Drivers Study* – a collaboration between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria (RACV), and the Transport Accident Commission (TAC) of Victoria. The study used data gathered over the course of the Australian Temperament Project (ATP) to identify factors associated with, and pathways to, three different types of problematic driving behaviour (risky driving, crash involvement and speeding offences) among a large sample of young drivers aged 19 to 20 years. The report also examined the learner driver experiences and driving behaviours of these young adults, and the association between unsafe driving behaviours and other problem behaviours (substance use and antisocial behaviour). This Executive Summary highlights some of the most important findings emerging from this report.

Australian Temperament Project

The Australian Temperament Project (ATP) is a longitudinal community study that has followed the development and wellbeing of a large group of Victorian children from infancy to young adulthood. Upon recruitment, the sample consisted of 2443 infants (aged four to eight months) and their parents, who were representative of the Victorian population. Approximately two-thirds are still participating in the study. Thirteen waves of data have been collected, via annual or biennial mail surveys. Parents, teachers and the young people themselves have completed questionnaires at various stages. Information has been collected on temperament style, behavioural and emotional adjustment, school attachment and achievement, health, social skills, antisocial behaviour, substance use, civic engagement, road safety, peer and family relationships, as well as family functioning, parenting practices, family structure and family socio-economic background.

The findings presented here are based on a sample of 1135 young adults (56 per cent female) and their parents who participated in this most recent data collection wave when the young adults were aged 19-20 years. Self-, parent- and teacher-reported information collected over the course of the study were used in the longitudinal analyses.

In the following sections, ATP participants' learner driver experiences are first described, and are followed by an account of their current driving behaviour, including time spent on the road, risky driving behaviour, incidence of crashes

and apprehension for speeding. The precursors and correlates of risky driving, crash involvement and speeding violations are next discussed, and finally, the degree to which risky driving behaviour is associated with other problem behaviours such as antisocial behaviour and substance use is described.

Learning to drive experiences

When reflecting on their learner driver experiences, most young adults (about 80 per cent) recalled practising driving on at least a weekly basis. They typically practised with their parents. Many young adults (78 per cent) and parents (87 per cent) reported experiencing some stress or conflict when practising driving together, although this was minor for the majority. Driving practice with persons other than parents, while less common, was generally stress-free. While there was considerable diversity in the number of professional driving lessons young adults had undertaken, most commonly it was between one and five, and only approximately one-fourth of young people had taken more than ten lessons.

Young women tended to have taken more professional driving lessons, experienced higher levels of stress and conflict in their driving practice sessions with parents, and had practised driving more frequently with persons other than their parents, than young men.

Young adults living in metropolitan areas had undertaken more professional driving lessons than those in regional or rural areas, while those in regional areas recalled practising driving less frequently than rural or metropolitan drivers.

Discussion

These findings suggest that both parents and young adults are generally heeding the message communicated by road safety authorities that novice drivers should gain substantial driving experience before attaining their probationary licence. However, further efforts may be warranted to ensure that learner drivers living in regional and rural areas are provided with sufficient opportunities to acquire and practice driving skills.

While participants generally rated driving practice with persons other than parents as a stress-free experience, most young adults (especially young women) and their parents reported experiencing some stress or conflict during practice sessions. Hence, parents and learner drivers may benefit from advice or strategies to reduce the stressful nature of this experience.

Driving behaviour

Eighty-six per cent of young adults had obtained their probationary car driver's licence by 19-20 years of age. Very few (2 per cent) had gained a motorcycle licence. Most driving was reported to take place during the week in daylight hours. Night-time driving was less common.

Forty-three per cent of young drivers reported that they had been involved in a crash while driving a car or riding a motorcycle. Most crashes (95 per cent) had resulted in property damage only, and almost two-thirds (62 per cent) occurred when the driver was alone. Almost one-third of young drivers (31 per cent) had been detected speeding by police at least once.

Speeding was also one of the most common unsafe driving behaviours reported. Exceeding the speed limit by up to 10km/h was very common (80 per cent reported doing so on at least one of their last ten trips), and almost half reported exceeding the speed limit by 10-25 km/h on at least one of these occasions. Driving when fatigued was also relatively common, with 64 per cent of young drivers reporting that they had recently driven when very tired. Other unsafe driving behaviours, such as failing to wear a seat-belt or motorcycle helmet and driving when affected by alcohol or illegal drugs were less prevalent, ranging in incidence from 8 -14 per cent.

Young men reported engaging in most unsafe driving behaviours more frequently than young women (particularly speeding, driving when affected by alcohol, and non-seat-belt use). Young men were also more likely to have been detected speeding by police.

Individuals living in non-metropolitan areas were more likely to engage in certain unsafe driving behaviours such as driving when affected by alcohol (higher among regional drivers) and not wearing a seat-belt or motorcycle helmet when driving (higher among rural drivers).

Discussion

Consistent with other research, the findings from the *ATP Young Drivers Study* suggest that some level of unsafe driving behaviour is common among young adults, particularly young males. While the findings strongly reinforce the objectives of current initiatives targeting unsafe driving, especially speeding and driving when fatigued, they also suggest that the current range of initiatives may not be reaching some people. Further efforts may be needed to understand why these communications are not connecting with all young drivers and how they might be better targeted.

Precursors of risky driving, crashes and speeding

The precursors and correlates of three problematic driving outcomes were investigated: risky driving behaviour, crash involvement and speeding violations. For each outcome participants were divided into three separate groups on the basis of their self-reported driving behaviour:

For *risky driving behaviour*, young adults were assigned to low, moderate or high risky driving groups on the basis of their self-reported risky driving behaviour (for example, speeding, failure to wear a seat-belt or motorcycle helmet, driving when fatigued, or driving when affected by alcohol or illegal drugs), during their ten most recent trips.

For *crash involvement*, young adults were allocated to no, single or multiple crash groups depending upon the number of crashes they reported having been involved in when driving or riding a motorcycle.

For *speeding violations*, young adults were assigned to no, single or multiple speeding violation groups based on the number of times they reported having been detected speeding by police.

The composition of these groups is shown in Table A.

Table A. Size and gender composition of the risky driving, crash involvement and speeding violation groups				
Outcome	Groups	n	% sample	% male
<i>Risky driving</i>	Low	675	64	39
	Moderate	306	29	50
	High	74	7	77
<i>Crash involvement</i>	No	596	57	44
	Single	312	30	41
	Multiple	136	13	54
<i>Speeding violations</i>	No	712	69	39
	Single	209	20	52
	Multiple	113	11	68

The correlates and precursors of each outcome type were then investigated by comparing the relevant outcome groups (for example, for risky driving; the low, moderate and high risky driving groups) on characteristics assessed at 19-20 years (correlates) or earlier in life (precursors). When investigating the correlates and precursors of crash involvement and speeding violations, the amount of time young adults reported driving each week was statistically controlled.

While the precursors and correlates of risky driving, crash involvement and speeding violations were investigated separately (details may be found in the full report), only the general trends and common precursors across all three outcome types are presented here.

Young adults in the high risky driving, multiple crash and/or multiple speeding violations groups differed from other drivers on a wide range of domains. Most notably, in comparison to other drivers they tended to be more aggressive; engage more frequently in antisocial acts (for example, property offences or violence); have a less persistent temperament style (have difficulty in seeing tasks through to completion); use more licit and illicit substances; have friendships with peers who tended to be involved in antisocial activities; and have had more police contact for driving-related offences. In addition, those in the *high risky driving* and/or *multiple speeding violation* groups tended to be more hyperactive, less cooperative, and had experienced more school adjustment difficulties than other drivers. Common precursors shared by the *high risky driving* and *multiple crash* groups were a more difficult parent-child relationship and a tendency to use drugs or react explosively when stressed.

While there was considerable overlap between the predictors and correlates of risky driving, crash involvement and speeding violations, group differences among the risky driving and speeding violation groups tended to be more powerful, more consistent and emerge earlier (in mid to late childhood) than differences among the crash involvement groups (which emerged in mid to late adolescence). There were also some personal attributes and environmental characteristics that were uniquely associated with each driving outcome.

Some of the similarity in the profiles of the high risky driving and multiple speeding violation groups may have resulted from some overlap in the membership

of these two groups. Nevertheless, it is important to note that the majority of young adults in these groups displayed only one of these types of problem driving behaviour. Hence it is likely that other factors also contributed to the similarity in the group profiles, for example, shared risk factors.

Discussion

These findings have a number of important implications, which will now be discussed.

Risk factors could be identified from childhood

Looking back in life, high risky drivers and those with multiple speeding violations tended to be more aggressive, more hyperactive and less persistent than their counterparts from mid to late childhood. High risky drivers also tended to have experienced more difficulties adjusting to the routines and demands of school life, while those with multiple speeding violations were generally rated as less cooperative and self-controlled from this time. These findings suggest that some antecedents of problematic driving behaviour are noticeable as early as mid to late childhood, many years before a person first drives a car or motorcycle.

There are several ways in which characteristics which develop in childhood and adolescence might influence and contribute to unsafe driving behaviour in early adulthood. First, these characteristics may directly influence driving behaviour (for example, aggressive tendencies could lead to road rage). Second, childhood and adolescent factors may indirectly impact on later driving behaviour, by contributing to the development of cognitive, emotional or behavioural response styles that are associated with problematic driving behaviours (for example, cognitive deficits that underlie attentional difficulties may limit a young driver's ability to divide and switch attention between competing driving tasks). Finally, these factors may be a sign of the onset of a problematic developmental pathway, which may lead to a range of later difficulties, including problematic driving (for example, aggressive behaviour is a risk factor for antisocial behaviour, which may lead to the development of a constellation of other problem behaviours including unsafe driving).

Given the connections between childhood and adolescent factors and subsequent driving outcomes found here, intervention programs implemented at earlier stages of development could reduce the development of a number of problematic outcomes including unsafe driving, and thus may prove a useful addition to current road safety initiatives.

Individual attributes were important predictors

Across all types of problematic driving, the most problematic drivers could be distinguished from other drivers on a range of individual attributes and behaviours during adolescence and early adulthood. Common risk factors for all outcomes were a less persistent temperament style, higher aggression, and higher rates of involvement in antisocial behaviour and multi-substance use.

As well as focusing on skill development, road safety initiatives and driver education programs could be broadened to include a component highlighting the contribution of individual style and personal factors to driving behaviours and skills. For example, those who are impulsive or risk takers may be more prone to

take impetuous, potentially dangerous actions while those who have a highly reactive temperament style may be more prone to become upset or irritated by the actions of other drivers. Suggestions on how to manage such individual characteristics in the driving situations could be communicated to learner drivers via group workshops, road safety websites and/or information kits.

The role of social factors

Factors related to the peer and school environments were important predictors of all types of problematic driving outcomes. During adolescence (and even earlier among risky drivers) those who became the most problematic drivers had consistently experienced more school adjustment difficulties than other drivers and associated more often with peers who engaged in antisocial behaviour and/or multi-substance use. There was also a trend for individuals who engaged in high levels of risky driving and/or had been involved in multiple crashes to experience more difficulties than other young adults in their relationships with their parents.

Thus, it seemed that adolescents who did not feel connected to their school environment and experienced difficult interpersonal relationships more often traversed problematic developmental pathways leading to unsafe or illegal driving behaviours. As stated earlier, it is possible that intervening in these pathways may help to reduce or prevent the development of a number of later problem outcomes, including unsafe driving.

Predicting crash involvement is less easy

The findings suggest it is more difficult to predict crash involvement than risky driving or speeding offences, presumably because situational factors play a considerable role in whether crashes occur and because crashes are relatively infrequent events. Precursors of crash involvement were only apparent from mid adolescence on and were generally less powerful than those identified for risky driving and speeding violations. Nevertheless, this study did identify some personal and environmental characteristics that appeared to increase the risk that a young adult would be involved in a crash when driving. Those who had been involved in a crash tended to have greater difficulties remaining focused on tasks, react more intensely when frustrated or upset, exhibit more behaviour problems and engage in more antisocial behaviour and multi-substance use than those who had not been involved in a crash. Many of these characteristics are similar to those identified as precursors of risky driving or speeding offences.

Which drivers should be targeted?

While many young adults were found to engage in some unsafe driving behaviour, it should be noted that most did so only occasionally. Only a small number (approximately 7 per cent) exhibited a consistent pattern of highly unsafe driving. This small group would appear to represent a major road safety concern, and hence, interventions aimed at this type of driver would appear worthwhile.

These findings prompt an important intervention question. Namely, which group of young drivers is it more important to target – the large number who occasionally engage in high risky driving behaviour or the few who frequently engage in unsafe driving behaviour? Targeting the behaviour of which group will lead to the greatest gains for road safety, and will the same types of intervention be equally effective with both groups? Further research is needed to examine the efficacy of intervention approaches aimed at these two very different groups of young drivers.

Relationship between unsafe driving behaviour and other problem behaviours

The relationship between unsafe driving (as measured by risky driving), substance use and antisocial behaviour was examined to determine the extent to which these problem behaviours were interrelated. First, drawing upon previous ATP research, the longitudinal precursors of risky driving, persistent adolescent antisocial behaviour and adolescent multi-substance use were compared, to see if these three types of problem behaviour shared similar risk factors. Some overlap in the longitudinal precursors of risky driving, persistent adolescent antisocial behaviour and multi-substance use was found, with aspects of temperament style, behaviour problems, school adjustment and interpersonal relationships predicting all three outcomes.

Second, the co-occurrence of unsafe driving, substance use and antisocial behaviour was examined. While the overlap between these problem behaviours was far from complete, young adults who engaged in high levels of risky driving behaviour also tended to engage more frequently in antisocial activities and use alcohol, marijuana or both substances more often than less risky drivers. Furthermore, looking back in time, high risky drivers had displayed higher levels of these problem behaviours during adolescence. These trends were particularly notable for antisocial behaviour (40 per cent of risky drivers had consistently engaged in antisocial behaviour across adolescence) and for alcohol use (one-third had been consistently high alcohol users across adolescence).

Discussion

The findings of the *ATP Young Drivers Study* suggest that risky driving, substance use and antisocial behaviour are interrelated. These findings offer partial support for the view that problem behaviours are related to each other, and may be caused by a common underlying trait or propensity for problem behaviour. This view thus suggests a shift in focus from preventing specific problem behaviours to intervening in the development of individuals upon problematic pathways.

These findings have important implications, as they suggest that interventions targeted at a single type of problem behaviour (for example, substance use, antisocial behaviour or risky driving) may have broader benefits and impact on the development of other types of problem behaviours. Nevertheless, considerable variability was found among young adults who engaged in high levels of risky driving behaviour, highlighting the need for a range of prevention and intervention approaches.

Conclusion

It is clear from this research that some antecedents of problematic driving behaviours appear at early developmental stages, well before driving age. Consequently, initiatives aimed at early intervention and prevention that can be targeted at likely high risk groups should be supported. Ideally, these should be implemented in mid to late childhood.

It is also evident that there is some overlap between young drivers who engage in problematic driving behaviour and those who engage in other high-risk activities. As a result, broader initiatives that address common risk factors, such as aggressive

tendencies, attentional capacities and social skills, should be implemented in addition to single-issue initiatives that concentrate on a specific outcome – for example, road safety or substance use.

Some factors which consistently emerged as risk factors (for example, aggression, hyperactivity, attentional problems) were evident from mid childhood and are likely to be physiologically based. The findings of the ATP Young Drivers Study suggest that such underlying physiological propensities may be of greater concern than previously acknowledged in road safety. Further research is needed to investigate this issue, its relevance to the field and its intervention implications.

While this research has helped identify some of the characteristics of high-risk young drivers, it is important that future efforts are also channelled to trialling and evaluating various preventative interventions. Re-examination of road safety issues in the next ATP survey wave (scheduled to take place when participants are aged 24 years) would also be beneficial, to help determine whether any changes in these behaviours have occurred as this cohort of young drivers mature and gain increased driving experience.

Taken together, the findings from the ATP Young Drivers study have increased understanding of the development of “normal” and “problematic” driving patterns, and have implications for the nature and timing of interventions aimed at reducing or preventing risky driving, crash involvement and speeding behaviours among young novice drivers. The findings are a reminder that the attributes and capacities that young people bring to the task of driving influence their skills and effectiveness as drivers, together with situational, structural, and legal factors associated with the driving environment.

1

INTRODUCTION





1

Introduction

This report of the *ATP Young Drivers Study* is the product of a collaborative partnership between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria (RACV) and the Transport Accident Commission (TAC) of Victoria. The collaboration commenced in 2002 when the RACV and TAC commissioned the Institute to collect and analyse data concerning the nature and development of driving behaviour among a large group of Victorian young adults (aged 19-20 years) who were participating in the Australian Temperament Project (ATP). The RACV and TAC worked in close partnership with the Institute during all phases of the project, including the preparation of measurement instruments, determining the nature of the analyses undertaken, the interpretation of study findings, and the preparation of this report.

This report provides valuable new information relating to young adults' own reported driving behaviour and their experiences when learning to drive, as well as providing a detailed examination of factors, past and present, which may have contributed to their current driving behaviour. It is hoped that this information will be used to increase understanding of the factors that place a young person at risk of becoming involved in a crash, committing traffic violations, and/or engaging in "risky" driving practices and, in turn, inform road safety programs aimed at preventing young people from engaging in potentially dangerous driving behaviours.

Research concerning young novice drivers is now briefly reviewed.

Over-representation of young drivers in traffic accidents

According to the Australian Bureau of Statistics, the leading cause of death among young Australians aged between 15 and 24 years is injury, and transport accidents account for more injury-related deaths than any other cause (ABS 2003). Within Australia, young drivers are significantly over-represented among those killed or injured in road traffic accidents (Cavallo and Triggs 1996; Dunsire and Baldwin 1999; Palamara et al. 2001; TAC 2003). For example, in the State of Victoria, young drivers aged 18 to 25 years accounted for 28 per cent of all drivers killed in 2002, despite the fact that they represented only 14 per cent of the licenced population (TAC 2003). Crash involvement is particularly high for young novice drivers, with the TAC (2003) reporting that young Victorians are almost four times more likely to be involved in fatal or serious injury crashes during their first year of driving than more experienced drivers.

This trend for disproportionately high levels of crash involvement among young drivers is not unique to Australia. The same phenomenon has been observed in many other industrialised countries or regions including the United States, Canada, New Zealand, the United Kingdom, and Europe (Begg and Langley 2000; Clarke et al. 2002; Engström et al. 2003; Laapotti et al. 2001; Shope et al. 2001).

Considerable research has focused on the crash patterns of young adults and the situational factors associated with crash involvement among this group. However, much less is known about the circumstances, characteristics or factors in young drivers' earlier lives that may have contributed to their later risky or dangerous driving behaviour (Engström et al. 2003; Shope et al. 2001). While acknowledging the important influence of situational (such as traffic conditions, time-of-day), structural (such as road design, road conditions), and community (such as norms/laws regarding driving behaviour, enforcement of road laws) factors on driving behaviour, this report aims to address this research deficit by primarily focusing on young driver characteristics such as their past and present individual attributes, and features of their current and earlier family and social environments.

Factors associated with crash involvement

As noted, there is an over-representation of young drivers in road traffic accidents. A number of studies suggest that the crashes that young people are involved in tend to be different from those of other age groups. To provide some background on the nature of these differences, a brief review of some of these characteristics now follows.

Crash type

Young inexperienced drivers are over-represented in most types of crashes but particularly single-vehicle crashes (Cavallo and Triggs 1996; Clarke et al. 2002; Engström et al. 2003; Palamara et al. 2001; TAC 2003). These crashes typically involve a single vehicle colliding with a fixed object (such as a tree or pole), or rolling over. More than half of 18 to 25 year-old drivers killed on Victorian roads in 2002 were involved in a crash of this type (TAC 2003). Young men are more likely to be involved in crashes resulting from excessive speed, whereas inadequate driving skills are more likely to play a causal role in crashes involving young women (Cavallo and Triggs 1996; Triggs and Smith 1996).

Time and day at which crashes occur

While the risk of being involved in a crash is highest at night for all age groups (Cavallo and Triggs 1996; Clarke et al. 2002; Triggs and Smith 1996), this risk is particularly high for young drivers (Cavallo and Triggs 1996; Chen et al. 2000; Clarke et al. 2002; Engström et al. 2003; Palamara et al. 2003; Triggs and Smith 1996). Sixty per cent of young drivers killed in Victoria in 2002 were involved in crashes between the hours of 8 pm and 6 am (TAC 2003).

Young drivers are also particularly at risk of being involved in a crash on weekends (Engström et al. 2003). In Victoria in 2002, fatality crashes among young drivers most commonly occurred on Fridays (23 per cent), Saturdays (25 per cent) and Sundays (15 per cent) (TAC 2003).

Alcohol and marijuana use

Crashes involving alcohol are more common among young drivers (Cavallo and Triggs 1996; Dunsire and Baldwin 1999; Engström et al. 2003). While research suggests that young drivers do not drive under the influence of alcohol more frequently than older drivers, it appears that when they do, they are at higher risk of being involved in a crash (Cavallo and Triggs 1996; Engström et al. 2003). For example, Palamara and colleagues (2001) compared crash rates among three

cohorts of Western Australian drivers and found that a higher proportion of first year drivers were involved in crashes at low Blood Alcohol Concentration (BAC) levels (up to 0.099 gm per cent) than those with five or ten years licensure.

The relationship between crash involvement and marijuana is less clear. Although marijuana is the most common psychoactive substance after alcohol found in the blood of motorists involved in crashes (Begg et al. 2003), its role as a causal factor in these crashes is unclear (Begg et al. 2003; Fergusson and Horwood 2001). For example, Fergusson and Horwood (2001) examined the relationship between marijuana use and crash involvement among a large sample of young adults living in New Zealand. While they found a higher rate of “at-fault” crashes among regular marijuana users than non-users, they concluded that the elevated crash rate among this group appeared to be largely due to the characteristics of the marijuana users (that is, they were more prone to “drink-drive”, engage in other risky driving behaviours, and to have attitudes favourable to driving violations) rather than the effects of the drug itself. The findings of Begg and colleagues (2003) supported this conclusion.

Nevertheless, recent research suggests that there may be a direct connection between marijuana use and crash involvement. A large Australian study (Drummer et al. 2004) which examined the relationship between drug use and crash culpability among 3398 fatally injured drivers of a variety of ages (not just young drivers) found a significant association between THC (the main psychoactive agent found in marijuana) and crash responsibility. After taking into account a wide range of factors associated with each crash (the condition of the road and the vehicle, the driving conditions, crash type, witnesses’ observations, obedience of the road law, the difficulty of the task and level of fatigue), drivers with THC in their blood were significantly more likely to be found “responsible” for the crash that killed them, than drug-free drivers. This association was particularly apparent for drivers with THC concentrations of 5ng/ml or higher, with the likelihood that these drivers being found “culpable” being similar to drivers with BAC levels of at least 0.15g per cent. THC was also found to increase the likelihood of crash culpability in drivers who had been drinking alcohol.

Gender

Overall, young male drivers are involved in more crashes than young female drivers (Cavallo and Triggs 1996; Engström et al. 2003, Clarke et al. 2002; Vick 2003). For example, almost 80 per cent of young drivers (18-25 years old) who died in a motor vehicle crash in Australia in 2002 were male (Australian Transport Safety Bureau 2003). The proportion of young male traffic fatalities was even higher within Victoria during this time period (88 per cent) (Australian Transport Safety Bureau 2003).

However, males tend to drive more often than females (Kweon and Kockelman 2002; Richardson 2001). Consequently, once exposure (the number of kilometres driven) is taken into account, this gender difference in crash rates disappears, with the crash risk per kilometre for young Australian males and females generally being similar (Cavallo and Triggs 1996; Engström et al. 2003).

Passengers

Some research suggests that young drivers are at higher risk of being involved in a crash than older drivers if they are carrying passengers (Cavallo and Triggs

1996; Chen et al. 2000). For example, Chen and colleagues (2000) examined data relating to all fatal crashes within the United States between 1992 and 1997, and found that the risk of fatal injury increased for younger drivers (16-17 years) with the number of passengers carried in the vehicle. Compared to other drivers of the same age without passengers, the risk of fatal injury for a 16-year old driver with one passenger was 1.86 times higher; 2.58 times higher with two passengers; and 3.07 times higher with three passengers. In contrast, the risk of death for older drivers (30-59 years) decreased if there were passengers in the car.

Speed

Another factor that is often associated with crashes among young drivers is speed (Clarke et al. 2002; Engström et al. 2003). Speeding is the most common driving offence amongst young drivers, and excessive speed is implicated in many crashes among this age group (Clarke et al. 2002; Engström et al. 2003; Palamara et al. 2001). For example, excessive speed was judged to play a role in about 20 per cent of crashes involving first year licenced drivers in Western Australia in 1998, compared with only 10 per cent of crashes involving drivers who had held their licence for ten years (Palamara et al. 2001).

Fatigue

Research suggests that young drivers are involved in more fatigue-related crashes than older drivers (Clarke et al. 2002; Dobbie 2002; Engström et al. 2003). In an analysis of fatigue-related crashes in Australia between 1990 and 1998, Dobbie (2002) found that when the amount of driving exposure was taken into account, fatigued male drivers/riders aged between 17 and 24 years had the highest rate of single vehicle crashes, and were involved in more early morning (midnight to 6am) crashes than any other age group.

Seat-belt use

There is some research evidence that suggests that seat-belt use is less common in young drivers than other age groups, particularly young men (Begg and Langley 2000; Engström et al. 2003; Senserrick and Harrison 2000; Triggs and Smith 1996). For example, Senserrick and Harrison (2000) examined seat-belt-related attitudes and behaviours among 954 Victorian drivers, and found that young drivers (aged 17-25 years) were more likely than older drivers (aged 51-90 years) to display a poor road safety profile, characterised by inconsistent seat-belt use, less favourable attitudes towards seat-belt use and road safety, and a more negative perception of their own driving ability.

In another study, Begg and Langley (2000) examined rates of self-reported seat-belt use among 948 New Zealander young adults (aged 21 years) and found that only 70 per cent of young male drivers reported using a seat-belt at all times compared with 85 per cent of young female drivers. Forgetfulness, discomfort and a perceived low risk of injury were the most common reasons cited by participants in this study for not wearing a seat-belt.

Explanations for the higher rate of crashes among young drivers

A number of explanations have been posited for the high crash rate among young drivers. These include inexperience, age, risk-exposure, and risk-taking.

Inexperience

Inexperience seems to be a major contributor to the high crash rate among young drivers. Support for this conclusion can be found in the observation that crash risk decreases with driving experience, with the first few months of driving being considered the most dangerous (Cavallo and Triggs 1996; Engström et al. 2003).

New drivers tend to have poorly developed vehicle control skills and lack many of the cognitive and perceptual skills needed to make them safe and effective drivers (Cavallo and Triggs 1996; Triggs and Smith 1996). Research suggests that inexperienced drivers tend to underestimate the level of risk associated with certain types of driving behaviour or situations, and overestimate their own level of driving ability or capacity to deal with such situations. Furthermore, inexperienced drivers tend to have greater difficulties in anticipating and accommodating the behaviour of other road users and in dividing their attention between competing driving tasks than more experienced drivers. Vehicle control skills increase rapidly with experience, however, perceptual and cognitive skills are slower to develop (Cavallo and Triggs 1996; Triggs and Smith 1996).

Not surprisingly, research suggests that young drivers who gain high levels of supervised driving practice prior to attaining their driving licence are at less of risk of being involved in a crash than other young drivers (Engström et al. 2003). On the basis of this research, Victorian road safety authorities have introduced comprehensive road safety programs aimed at encouraging learner drivers to gain high levels of supervised driving experience (a minimum of 120 hours), on all types of road and in all types of conditions, prior to gaining their drivers' licence.

Age

Age-related factors are also seen as important. For most young drivers, the attainment of their driving license occurs a time when they are attempting to find their own identity and gain independence from their parents (Engström et al. 2003; Laapotti et al. 2001). At this developmental stage, conformity with perceived social norms is often of great importance, and as a consequence, peer influence is particularly potent (Engström et al. 2003). Research suggests that young drivers experience more pressure from their peers to engage in "risky" and/or illegal driving behaviours than older drivers (Engström et al. 2003). One way peer pressure may impact on driving behaviour is through the influence of passengers, which, as noted previously, has been shown to be a risk factor for crash involvement among young drivers (Cavallo and Triggs 1996; Chen et al. 2000). It has been suggested that the presence of passengers in the car (particularly those who are young and male) may encourage young people to engage in risky driving behaviours, such as speeding or following other vehicles too closely (Chen et al. 2000).

Risk exposure

Another factor that may impact on the high crash rate among young drivers is the type of driving experiences they are exposed to (Cavallo and Triggs 1996; Crettenden and Drummond 1994; Laapotti et al. 2001). While young drivers generally do not drive further than older drivers (Crettenden and Drummond 1994), their lifestyles often expose them to more driving risks than other drivers (Laapotti et al. 2001). For example, young drivers are more likely to drive at night or on weekends, when crash rates are higher (Cavallo and Triggs 1996; Crettenden and

Drummond 1994; Laapotti et al. 2001). Furthermore, young drivers tend to drive older vehicles, placing them at increased risk of serious injury if they are involved in a crash (Engström et al. 2003).

Risk-taking

Risk-taking has also been implicated in the over-representation of young drivers in traffic accidents. As Williams (1998: 21) notes: “Compared with older people, young drivers are more likely to drive fast, follow too closely, overtake in a risky manner, allow too little time to merge, and fail to yield to pedestrians.” However, it would appear that the majority of young drivers who engage in risky driving behaviour do not do so deliberately. Rather, inexperience and a tendency to underestimate risk and overestimate one’s own abilities is seen as being responsible for this type of driving behaviour in most of these young drivers (Cavallo and Triggs 1996; Williams 1998). Nevertheless, there is a small sub-group of young drivers for whom such risky driving behaviour appears to be intentional (Williams 1998). The characteristics of this group will now be discussed.

Young problem drivers

In the research focusing on young drivers, much attention has been paid to a small sub-group of “young problem drivers” who are excessive risk takers and deliberately engage in high-risk driving behaviours for the “thrill” they receive from them (Cavallo and Triggs 1996; Crettenden and Drummond 1994; Williams 1998). These drivers are seen as being at increased risk of being involved in a crash, and hence are perceived as an obvious target for interventions aimed at reducing crashes among young drivers (Crettenden and Drummond 1994; Williams 1998).

A wide range of characteristics have been associated with this group of young problem drivers (Cavallo and Triggs 1996; Crettenden and Drummond 1994). These include: *high levels of aggression or hostility* (Begg et al. 2003; Cavallo and Triggs 1996; Norris et al. 2000; Ulleberg and Rundmo 2003); *attentional difficulties* (Barkley et al. 2002; Woodward et al. 2000); *high alcohol, marijuana and other drug use* (Cavallo and Triggs 1996; Lang et al. 1996; Shope et al. 1997; Shope et al. 1996; Shope et al. 2001); *a sensation-seeking personality style* (Cavallo and Triggs 1996; Jonah 1997; Ulleberg and Rundmo 2003); *attitudes favourable to “norm-defying” behaviours* (Cavallo and Triggs 1996; Ulleberg and Rundmo 2000); *low parental supervision* (Hartos et al. 2000; Shope et al. 2001); *lenient parental attitudes towards young people’s alcohol use* (Shope et al. 1996; Shope et al. 1997; Shope et al. 2001); *limited/non-existent parent-imposed driving restrictions* (Beck et al. 2001; Hartos et al. 2000); and *high involvement with peers who misuse substances* (Lang et al. 1996; Shope et al. 1996; Shope et al. 1997; Shope et al. 2001).

Additionally, those who engage in high risk driving behaviour are often found to engage in a range of other risky or problematic behaviours (Cavallo and Triggs 1996; Williams 1998), leading to the suggestion that high risk driving behaviour is just one part of a broader problem behaviour syndrome (Williams 1998). This view is consistent with Problem Behaviour Theory (Jessor and Jessor 1977; Jessor 1987), which posits that problem behaviours are not isolated events, but are interrelated and reflect a general underlying trait. Hence, according to this view, risky driving represents just one component of a more general problematic lifestyle (Crettenden and Drummond 1994; Williams 1998).

ATP Young Drivers Study

As is clear from the above review, much of the road safety literature is concerned with documenting the driving behaviour of young adults (for example, their crash and traffic violation rates) and distinguishing risky drivers from other drivers on the basis of their attributes or behaviour at the time at which these crashes or violations occur. Since much of the research conducted to date has been cross-sectional, or covered restricted time spans, there is limited knowledge about the long-term (or “early”) social, educational and behavioural precursors of unsafe driving behaviours among new drivers (Engström et al. 2003; Williams 1999).

Longitudinal studies provide an opportunity to better understand how differing driving styles develop and, in turn, assist policymakers and practitioners to identify intervention opportunities (Williams 1999). While some promising longitudinal research has been conducted into the development of problematic driving behaviour (see, for example, Caspi et al. 1997; Fergusson and Horwood 2001; Norris et al. 2000; Shope et al. 1997), longitudinal research in this area is limited. Furthermore, this research has generally been conducted outside Australia, making its applicability to the Australian context uncertain. For example, variations in the age at which driving licences may be legally obtained, and the age at which alcohol use is officially permitted, as well as cultural attitudes and values, may lessen the applicability of studies conducted outside Australia.

The *ATP Young Drivers Study* attempted to address this research deficit by using data from the longitudinal Australian Temperament Project (ATP) to explore the individual and environmental precursors of differing patterns of young driver behaviour. Drawing upon the expertise of the RACV and the TAC on road safety and driver education issues, the ATP dataset was examined in order to: identify risk factors linked to subsequent patterns of young adult driving behaviour; identify social and behavioural predictors of crash involvement and traffic violations among young drivers; and examine similarities between the profiles of “unsafe drivers” and those who demonstrate other “high risk” behaviours (for example, antisocial behaviour and substance use). In addition, young adults’ current driving behaviours and learner driver experiences were also examined.

It is hoped that this research will provide insights into the development of both “normal” and “problematic” driving behaviour among young drivers, which in turn can be used to inform road safety, education and prevention efforts within Victoria.

Structure of the report

The report begins with a brief description of the Australian Temperament Project, the measures used to assess learner driver experiences and young adult driving behaviour, and the measures contained in the longitudinal data set. This is followed by sections examining: the learner driver experiences and current driving behaviour of ATP participants; the longitudinal precursors of differing patterns of unsafe or unlawful driving behaviours (“risky” driving, crash involvement and speeding violations); and the association between “problem” driving behaviour and other problem behaviours (namely substance use and antisocial behaviour). The report concludes with a discussion of the theoretical and practical implications emerging from these findings.

2

The Australian Temperament Project





2 The Australian Temperament Project

The Australian Temperament Project (ATP) is a longitudinal study following the psychosocial development of a large group of children from infancy to adulthood (for a more detailed account see Prior et al. 2000). Broadly, the project aims to investigate the contribution of personal, familial and environmental factors to an individual's adjustment and wellbeing.

Commencing in 1983 at a child age of four to eight months, a representative sample of 2,443 infants and their families living in urban and rural areas of Victoria was recruited via the following process. First, following advice from the Australian Bureau of Statistics, a sub-set of Victorian local government areas was selected, which was representative of the State's population in terms of parental occupational and educational levels and ethnic background. Second, all families with an infant aged between four and eight months who visited their local Infant Welfare Centre in the selected local government areas during the first two weeks in May 1983 were invited to take part in the project. At that time, the Infant Welfare Centres (now called Maternal and Child Health Centres) made contact with 94 per cent of live births, and the service was very widely used. Finally, comparison of the characteristics of the recruited cohort to census data showed that the cohort was representative of the State's population.

In all, 13 waves of data have been collected over the first 20 years of the children's lives, using mail surveys. There has been some sample attrition over the time span of the project, with approximately 65 per cent of the sample still participating in the study after 20 years. More of the families who are no longer participating are from a lower socio-economic status background, or include parents who were not born in Australia. Nevertheless, the retained sample of children closely resembles the original cohort on all facets of infant functioning, with no significant differences between the retained and no-longer-participating sub-samples on any infancy characteristic. Hence, while the study continues to include young people with a wide range of attributes, it contains fewer families experiencing socio-economic disadvantage than at the commencement of the study.

The findings presented in this report are based on a sample of 1,135 young adults (499 males, 636 females), who participated in the most recent data collection wave in 2002.

A broad range of individual, family and environmental attributes and characteristics have been assessed during the life of the project. These include the child's temperament style, behavioural and emotional adjustment, social skills, health, academic progress, relationships with parents and peers, and the family's structure and demographic profile.

Parents have completed questionnaires about the child's functioning and aspects of family life at every survey wave. Teachers reported on the child's school and social progress, personal adjustment, and temperament style at the Preparatory Grade, Grade 2 and Grade 6 survey waves. From the age of 11 years (which for most was

Table 1. Data collection at 19-20 years: Driving-related questions and response categories in the young adult survey

Question	Response categories
Type of licence held	learner, car, and/or motor bike
Date obtained learner's permit	month and year
Date obtained probationary licence	month and year
Number of professional lessons	0; 1-5; 6-10; 11-15; 16-20; 21-25; or 26 or more
How often practised driving	rarely; once a month; once a fortnight; once a week; or more often
How often practised driving with parents	rarely; once a month; once a fortnight; once a week; or more often
How often practised driving with others	rarely; once a month; once a fortnight; once a week; or more often
Stress and conflict experienced when practising with parents	none; a little; a lot; or not applicable
Stress and conflict experienced when practising with others	none; a little; a lot; or not applicable
In a normal week, how much time spent driving/riding a motor bike on Monday-Friday in daylight hours	number of hours
In a normal week, how much time spent driving/riding a motor bike on Monday-Friday in night time hours	number of hours
In a normal week, how much time spent driving/riding a motor bike on Saturday-Sunday in daylight hours	number of hours
In a normal week, how much time spent driving/riding a motor bike on Saturday-Sunday in night time hours	number of hours
Experience of crash/accident when s/he was the driver	yes or no
Number of crashes/accidents when s/he was the driver	number of times
Crash circumstances and result: driving alone, damage but no-one injured/killed	number of times
Crash circumstances and result: carrying passengers, damage but no-one injured/killed	number of times
Crash circumstances and result: driving alone, someone injured/killed	number of times
Crash circumstances and result: carrying passengers, someone injured/killed	number of times
Number of times caught for speeding	number of times
In last 10 driving trips, how many times - drove up to 10 km/h over the limit	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - drove between 10 & 25 km/h over the limit	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - drove more than 25 km/h over the limit	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - drove when probably affected by alcohol	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - did not wear a seat belt/helmet at all	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - forgot seat belt/helmet for part of the trip	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - drove when very tired	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times
In last 10 driving trips, how many times - drove when probably affected by an illegal drug	0; 1; 2; 3; 4; 5; 6; 7; 8; 9; or 10 times

Grade 6), the children have reported on their own personal adjustment, relationships with others, and attitudes and beliefs, with a total of six survey waves completed by the young people thus far. A noteworthy aspect of the study is the availability of multiple sources of report for most domains and at most survey waves, thereby providing a rich and reliable account of this cohort of children as they progressed from infancy, through childhood and adolescence and into early adulthood.

Driver behaviour measures

In the latest data collection wave at 19-20 years of age in the year 2002, young adult participants and their parents completed questions about the young person's experiences as a learner driver, licensing status, current time spent driving, typical driving behaviour, and their crash and enforcement experiences. The measures used to assess these issues are shown in Tables 1 and 2.

Table 2. Data collection at 19-20 years: Driving-related questions and response categories in the parent survey	
Question	Response categories
Type of licence held by young adult	learner, car, and/or motor bike
How often s/he practised driving with parents	rarely; once a month; once a fortnight; once a week; or every few days
How often s/he practised driving with others	rarely; once a month; once a fortnight; once a week; or every few days
Stress and conflict experienced when parents practised with young adult	none; a little; a lot; or not applicable
Young adult's experience of crash/accident when s/he was the driver	yes or no
Number of crashes/accidents when s/he was the driver	number of times
Crash circumstances and result: driving alone, damage but no-one injured/killed	number of times
Crash circumstances and result: carrying passengers, damage but no-one injured/killed	number of times
Crash circumstances and result: driving alone, someone injured/killed	number of times
Crash circumstances and result: carrying passengers, someone injured/killed	number of times
Number of times young adult has been caught speeding	number of times
In general, how often does s/he drive up to 10 km/h over the limit	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he drive between 10 & 25 km/h over the limit	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he drive more than 25 km/h over the limit	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he drive when probably affected by alcohol	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he not wear a seat belt/(helmet if motor bike)	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he drive when very tired	never; rarely; sometimes; often; always; or don't know
In general, how often does s/he drive when probably affected by an illegal drug	never; rarely; sometimes; often; always; or don't know

Measures from the longitudinal data set

Data from the multi-wave data set was used to investigate the longitudinal precursors and concurrent correlates of differing patterns of driver behaviour. While a wealth of data was available from the 13 survey waves, in the interests of economy, some consolidation¹ across time points was undertaken. This consolidation was designed to parallel the major developmental stages. Thus, the following eight time points were employed:

- *infancy*, covering 4 to 8 months of age, survey wave 1
- *toddlerhood*, from 1 to 3 years of age, survey waves 2 and 3
- *early childhood*, 3-4 years of age, survey wave 4
- *mid childhood*, 5 to 8 years of age, survey waves 5 and 6
- *late childhood*, from 9 to 12 years, survey waves 7 and 8
- *early adolescence*, 12 to 14 years, survey waves 9 and 10
- *mid/late adolescence*, 15 to 18 years, survey waves 11 and 12
- *early adulthood* 19-20 years, survey wave 13

Table 3 displays the domains, variables and time points used in the longitudinal analyses. A more detailed description of the data collected at each survey wave may be found in Appendix 1.

Table 3. Domains and dimensions investigated as precursors and correlates of differing driving behaviours	
Domain	Time Point, Dimension, and Source of Report (P) = Parent report (IWN) = Infant Welfare Nurse report (T) = Teacher report (Ch) = Child/adolescent/adult self report
Temperament style	<i>In infancy</i> (4-8 months, survey wave 1) activity/reactivity, approach/sociability, cooperation/manageability, irritability (P); Global temperament rating - how easy/difficult the baby's temperament is (IWN)
	<i>In toddlerhood</i> (composite across 1-3 years, survey waves 2 & 3) reactivity; approach/sociability, irritability, persistence, cooperation/manageability (P)
	<i>In early and mid-childhood</i> (4 years of age, survey wave 4 (early childhood); composite across 5-8 years, survey waves 5 & 6 (mid childhood) inflexibility, approach/sociability, persistence (P); reactivity, task orientation (T - composite across 5-8 years, survey waves 5 & 6)
	<i>In late childhood, early adolescence and mid/late adolescence</i> (composite across 9-12 (late childhood); 13-14 (early adolescence); and 15-18 (mid/late adolescence, survey waves 7 to 12) negative reactivity, approach/sociability, persistence; activity (P); task orientation (T - in late childhood only)
	<i>In early adulthood</i> (20 years, survey wave 13) negative reactivity, approach/sociability, persistence (P & Ch)
Behaviour problems	<i>In Infancy</i> behaviour problems composite (sleeping problems, excessive crying, colic) (P)
	<i>In toddlerhood</i> behaviour problems composite (e.g. temper tantrums, attention problems, excessive shyness) (P)

Table 3 continued

¹ Where identical measures were available at adjacent time points, composite across-time variables were constructed, first standardising the original variables and then computing the average of the standardised variables. For example, the Rutter Child Behaviour Questionnaire (Rutter, Tizard & Whitmore 1970) was used to obtain parental ratings of aggression at 5-6 and 7-8 years, permitting the construction of a single, across-time estimate of parent-reported aggressive tendencies from 5-8 years of age

Table 3 continued

	<i>In early, mid and late childhood</i> aggression, hyperactivity, anxiety (P & T); depression added in late childhood (P & T); aggression, hyperactivity, anxiety, depression (Ch - in late childhood only)
	<i>In early and mid/late adolescence</i> aggression, attention problems, anxiety-withdrawal (P); oppositional behaviour, hyperactivity, anxiety, depression; multi-substance use; antisocial behaviour ¹ (Ch)
	<i>In early adulthood</i> aggression, anxiety-withdrawal (P); anxiety, depression; multi-substance use; antisocial behaviour (Ch)
Social skills	<i>In mid-childhood</i> popularity/social skills (T)
	<i>In late-childhood</i> assertiveness, cooperation, self control (T)
	<i>In late childhood, early adolescence, mid/late adolescence and early adulthood</i> assertiveness, cooperation, self control, responsibility, (P); assertiveness, cooperation, self control, empathy (Ch)
Other individual attributes	<i>From early adolescence onwards</i> emotional control (Ch)
	<i>In early and mid/late adolescence</i> sensation seeking (Ch)
	<i>In late adolescence</i> coping style - use of active adaptive strategies (e.g. seeking support), less adaptive: internally focused (e.g. wishful thinking); acting out strategies (e.g. react explosively); identity development - clarity, optimism about the future (Ch)
	<i>In early adulthood</i> life satisfaction (Ch); civic engagement and participation (P & Ch); social capital (Ch)
School adjustment and achievement	<i>In mid-childhood</i> school readiness; academic competence; reading skills (T)
	<i>In late-childhood</i> academic competence (T)
	<i>In early and mid/late adolescence</i> school achievement /adjustment difficulties (P); school achievement /adjustment difficulties in early to mid adolescence (Ch); school attachment/bonding in mid to late adolescence (Ch)
Peer relationships	<i>In late childhood</i> quality of peer relationships; antisocial peer friendships (P); quality of peer relationships (T); self concept about peer relationships (Ch)
	<i>In early and mid/late adolescence</i> peer involvement, participation in organised peer group activities, antisocial peer friendships (P); attachment to peers, friendship quality, antisocial peer friendships (Ch)
	<i>In early adulthood</i> number of close friends, antisocial peer friendships, in a romantic relationship (P & Ch); positive relationships with peers (Ch)
Parent-child relationship	<i>At all time points</i> rating of how easy/difficult the parent finds the child (P)
	<i>In infancy</i> how well the mother-baby pair was doing (IWV)
	<i>In late childhood</i> self concept about relationships with parents (Ch)
	<i>In early and mid/late adolescence</i> warmth of parent-adolescent relationship (P); attachment to parents (Ch)
	<i>In early adulthood</i> degree of conflict in parent-young adult relationship; positive parent-young adult relationship (P & Ch)
Parenting style	<i>In early and mid/late adolescence</i> degree of supervision/monitoring, use of inductive reasoning, use of harsh discipline (P)
Family environment	<i>At all time points</i> parents' occupational and educational levels, used to form a composite family socio-economic background index (P)
	<i>In infancy</i> parents' age and ethnic background (P)
	<i>From early childhood</i> family size (number of children in the family) (P)
	<i>From mid childhood</i> family stress (number of negative family stresses in past 12 months) (P)
	<i>In early adolescence</i> parental cigarette and alcohol use (P)

Table 3 continued

Table 3 continued

	<i>In late adolescence</i> family residential location (urban/rural), parental separation/divorce/death during child's lifetime (P)
	<i>In early adulthood</i> parental marital status, unemployment, financial strain (P)
Young adult current life circumstances	<i>In early adulthood</i> employment status, average number of hours employed per week, average weekly income, undertaking higher education, living at home/away from home, highest year of secondary school completed, (Ch)
Young adult criminal justice contacts and attitudes ¹	<i>In early adulthood</i> contact with the criminal justice system (P); perceived chance of apprehension for drink driving, contact with the police for a driving offence (Ch)

¹ Data relating to antisocial behaviour was collected as part of a collaborative project between the Australian Institute of Family Studies and Crime Prevention Victoria (CPV). The aspects of functioning measured as part of the collaboration with CPV included facets of antisocial behaviour, contact with the criminal justice system, experiences of being a victim of crime, perceptions of the fairness of the criminal justice system and perceptions of the risk of apprehension for committing an offence.

3

Driving behaviour and learner driver experiences



3 Driving behaviour and learner driver experiences

In this section, the range of learner driver experiences and typical driving behaviour of the 19-20 year old participants in the ATP Young Drivers Study are described, along with their history of crash involvement and speeding violations. This is followed by an examination of gender differences, and differences between young people living in urban, regional or rural localities, on these aspects. A brief discussion of differences between motorcyclists and other drivers is also included.

Total sample

Eighty-six per cent of the sample reported that they had obtained their car driver's licence, as shown in Table 4 below. Parent reports corroborated this finding. Only 6 per cent did not have a licence or learner's permit. Very few young people had gained a motorcycle licence (2 per cent). There was considerable diversity in the length of time licences had been held, which ranged from one month to 38 months, the average being 20.82 months (SD of 7.93 months).

Table 4. Licence status (self and parent reports)				
Types of licence	Source of report			
	Self (n = 1135)		Parent (n = 1066)	
	N	%	N	%
None	67	5.9	73	6.8
Learner's permit only	82	7.2	68	6.4
Car licence	983	86.2	922	86.5
Motorcycle licence	25	2.2	26	2.4

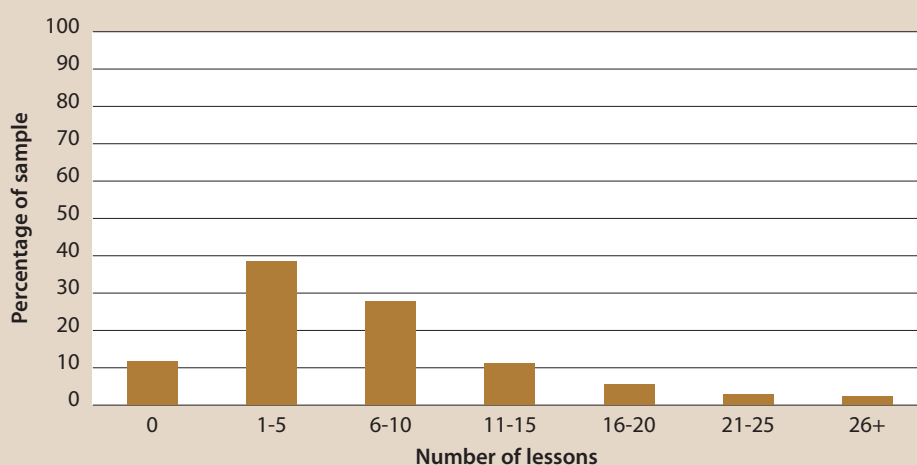
Note: Percentages do not add to 100 as some individuals fit more than one category. A small number of parent reports were of individuals for whom there was no corresponding young adult data; likewise, for some young adult reports there was no corresponding parent data. Thus young adult and parent report are not expected to be entirely consistent.

The following discussion focuses on all young adults who reported having a licence (for a car or motorcycle) or learner's permit at the time of data collection (19-20 years).

Learner driver experiences

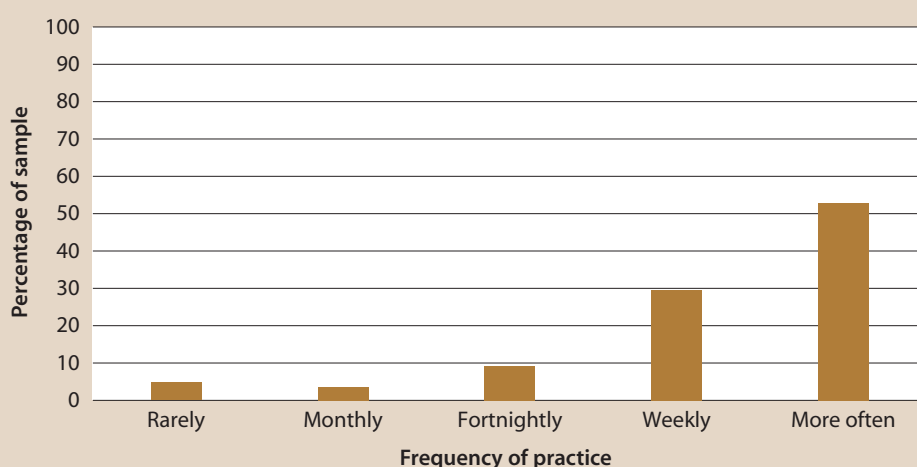
Young adults were asked to report how many professional driving lessons they had undertaken (that is, lessons with a professional driving instructor), using one of seven categories provided. This response format was designed to reduce the unreliability inherent in trying to recall a particular number of lessons, which could have been undertaken up to three years previously. Figure 1 displays the diversity in the number of lessons taken, which ranged from no lessons at all (12 per cent of young people) to 26 or more (2 per cent). Most commonly, between one and five lessons were undertaken, with a notable proportion receiving six to ten lessons. Overall, approximately three-quarters (78 per cent) had taken ten or fewer professional driving lessons when learning to drive.

Figure 1. Number of professional lessons (self report)



Most young adults reported taking part in frequent driving practice when learning to drive. For example, approximately half (53 per cent) reported practising more than once a week, while over 80 per cent reported practising on at least a weekly basis (see Figure 2). Only a small number of participants (5 per cent) reported “rarely” engaging in driving practice.

Figure 2. Frequency of driving practice (self report)



Young adults were questioned about who had assisted them with driving practice, and the amount of stress experienced when practising driving. Almost three-quarters had practised with their parents on at least a weekly basis, although a sizable number (17 per cent) reported practising monthly or less with parents (see Figure 3). About one-third (37 per cent) had practised driving on a regular basis (at least monthly) with persons other than their parents (Figure 4).

Parent reports provided a similar picture, although there was a trend for parents to report their sons/daughters had gained slightly more driving practice (both with themselves and others) than reported by the young people (see Figures 3 and 4).

Figure 3. Frequency of driving practice with parents (self and parent reports)

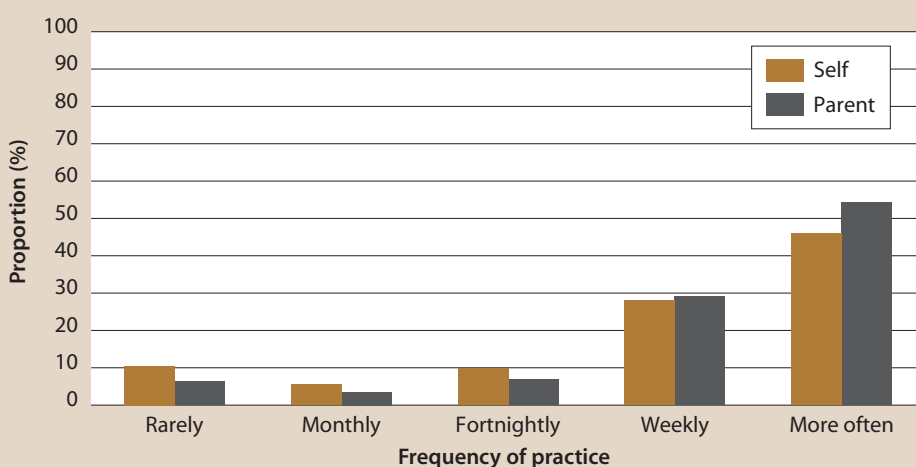
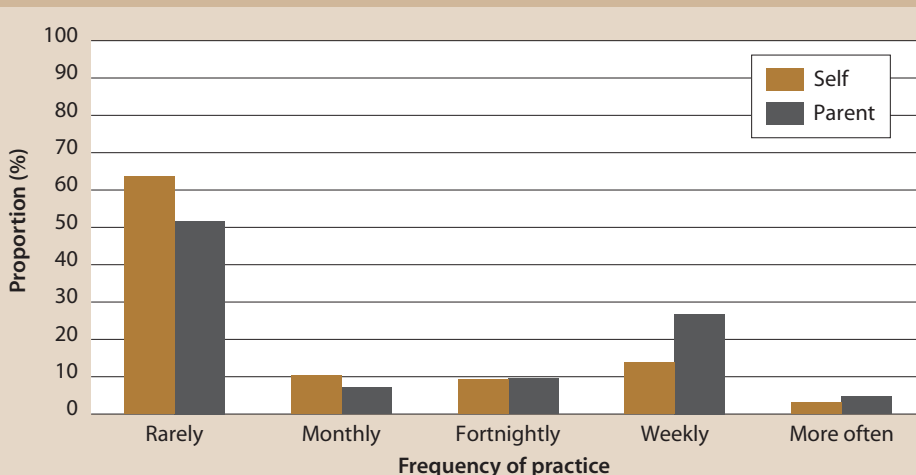


Figure 4. Frequency of driving practice with others (self and parent reports)

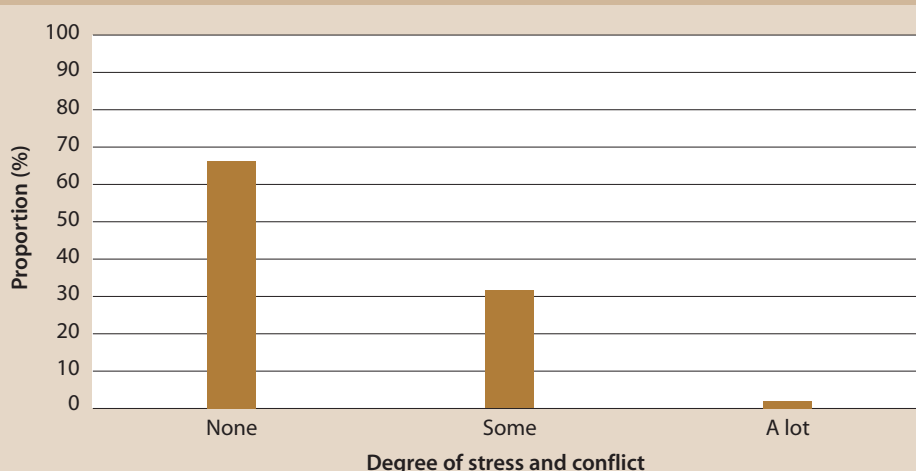


The majority of young adults and parents reported experiencing “some” stress or conflict during driving practice sessions (as shown in Figure 5). While parents were more likely to recall “a bit” of stress or conflict during practice sessions (74 per cent of parents, compared with 58 per cent of young people), young adults were somewhat more likely to rate the experience as highly stressful (20 per cent, compared with 12 per cent of parents). While fewer young people had gained regular driving practice with persons other than their parents, this was generally a less stressful experience (Figure 6). Only 30 per cent recalled some stress and conflict during such practice sessions and this was relatively mild for most, with only 2 per cent reporting high levels of stress.

Figure 5. Stress and conflict experienced during driving practice with parents (self and parent reports)



Figure 6. Stress and conflict experienced during driving practice with others (self report)



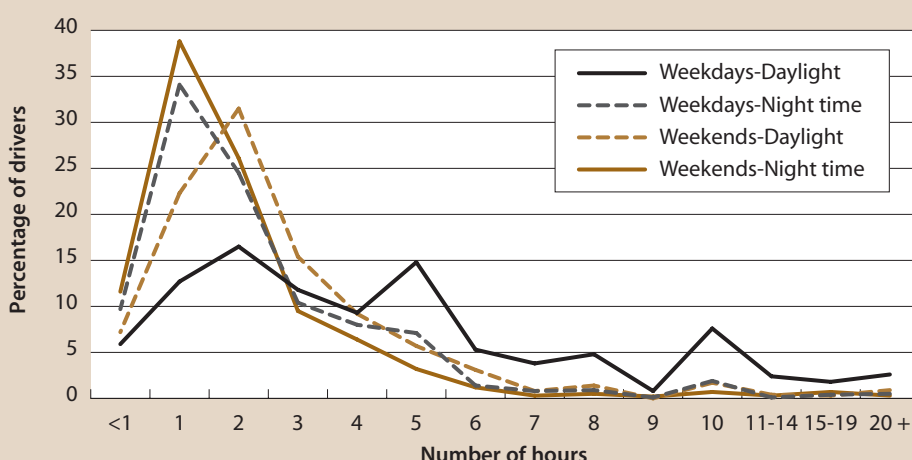
Driving behaviour

Time spent driving

There was considerable variability in the number of hours young adults spent driving at different times of the day (daylight hours, nighttime hours) and week (weekdays, weekends), as displayed in Figure 7.

For example, one in five reported driving less than two hours during the day on weekdays, while in contrast, approximately 14 per cent said that they usually drove for ten or more hours during these times. Overall, the average number of hours spent driving during the day on weekdays was almost five hours per week. Weekend daytime driving was also quite common, with young adults spending an average of 2.8 hours each weekend driving. Considerably less driving was undertaken at night time both during the week and at weekends, with almost half driving less than two hours and a further one-third driving two to three hours. The average number of hours spent on night-time driving was 2.4 during the week, and 2.1 at weekends.

Figure 7. Number of hours typically spent driving by time of week



Crash involvement

About four in ten young adults (43 per cent) reported that they had been involved in a crash when they had been the driver of a car or motorcycle. Of those who had been involved in a crash, 70 per cent had experienced one crash, 25 per cent had been involved in two crashes, and 5 per cent had been involved in three or more crashes, with the highest number of crashes experienced being seven. The average number of crashes reported by those who had been in a crash was 1.36.

Parent reports indicate a good awareness of young adults' crash involvement, with 39 per cent reporting that their son or daughter had been involved in a crash when driving a car or motorcycle. Furthermore, the average number of crashes reported by parents was almost identical to that reported by young adults (1.37).

Young adults and parents were also asked about the circumstances in which the crash/es had occurred, focusing particularly on whether or not passengers were present and the consequences of the crash in terms of property damage or injury/death. As Table 5 shows, the most frequent type of crashes reported by young adults were those in which the driver was alone, there was property damage, but no one was injured. Nevertheless, there was also a sizable number (approximately one-third) who were carrying passengers when involved in a crash of this type (resulting in property damage). Crashes involving death or injury to a person were extremely rare. Parent reports supported these trends.

Table 5. Circumstances surrounding, and outcomes of, crash involvement (self and parent reports)

Circumstances and outcome	Source of report					
	Self			Parent		
	N	Mean	S.D.	N	Mean	S.D.
Driving alone, property damage	292	1.12	0.68	257	1.27	0.64
With passengers, property damage	182	0.79	0.65	65	1.10	0.43
Driving alone, injury/death	15	0.09	0.29	7	0.36	0.58
With passengers, injury/death	8	0.06	0.27	7	0.44	0.62

Note: N denotes the number of young adults who had been in a crash of this type when driving.

Speeding

Just under 70 per cent of young adults had never been apprehended for speeding, 20 per cent had been apprehended once, and 11 per cent more than once. The highest number of speeding apprehensions was eight. Once again, parent reports were concordant with these trends, with 73 per cent reporting that their son or daughter had never been caught speeding. As parents were not asked about the number of times their son or daughter had been caught speeding, comparisons between young adults and parents cannot be made on this aspect.

Unsafe driving behaviour

Both young adults and parents were asked about the young people's engagement in various types of unsafe driving practices, such as speeding, failure to wear a seat belt (or helmet if driving a motorcycle), driving when affected by alcohol or an illegal drug, or driving when very tired. Young adults were asked to report on how many of their last ten trips they had engaged in the behaviour, while parents were asked to describe how often the behaviour occurred on a five-point scale ranging from "never" to "always" (with an option provided for "don't know"). Table 6 displays the number of young adults who reported engaging in each unsafe driving behaviour on one or more occasions in their last ten trips. It also shows the average number of trips in which young drivers reported engaging in each type of behaviour.

Table 6. Rates of unsafe driving behaviours during the previous 10 trips (self report)

Unsafe driving behaviours	Proportion of sample		Mean number of trips out of last ten
	N	%	
Up to 10 km/h over the limit	886	83.7	4.10
Drove when very tired	676	63.8	1.55
10 to 25 km/h over the limit	522	49.4	1.56
More than 25 km/h over the limit	203	19.2	0.50
Drove when probably affected by alcohol	151	14.2	0.23
Did not wear seat belt (or helmet) for part of the trip	127	12.0	0.28
Drove when probably affected by illegal drug	99	9.3	0.26
Did not wear seatbelt (or helmet) at all	91	8.6	0.23

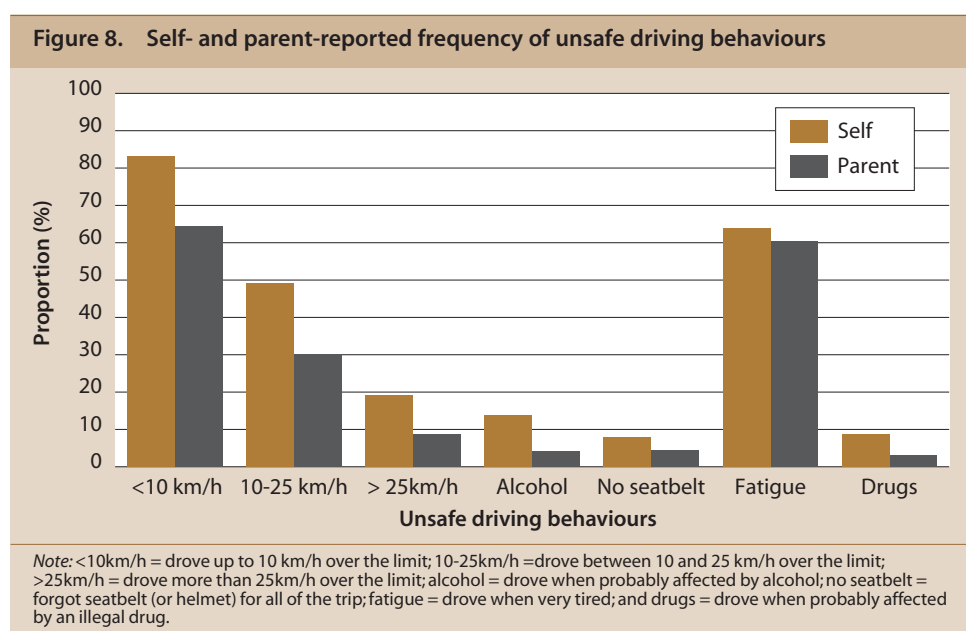
A very common type of unsafe driving behaviour was speeding up to 10 km/h above the limit, with more than four-fifths of young adults reporting such behaviour on at least one of their last ten trips. This occurred quite frequently (on average, on four of their past ten trips). In addition, almost half reported they had driven between 10 and 25 km/h above the limit at least once during their last ten trips, and close to 20 per cent reported driving more than 25 km/h above the limit on one or more occasion. However, these higher levels of speeding generally occurred less frequently.

Another common unsafe driving behaviour was driving when very tired, with almost two-thirds of the sample reporting this type of behaviour on at least one occasion. Across the sample, the average number of trips undertaken when very tired was 1.55 (in last ten trips). If young adults' driving behaviour over the past ten trips can be seen as indicative of their general driving behaviour, these findings suggest that young adults drive when very tired on 15 per cent of their driving trips.

Rates of other types of unsafe behaviours were lower, ranging from 9 per cent for failure to wear a seat-belt or helmet to 14 per cent for driving when affected by

alcohol. The average number of occasions on which these less common unsafe driving behaviours occurred was also very low.

Figure 8 compares young adults' and parents' ratings of the occurrence of each form of unsafe driving, using young adults' report of the occurrence of each type of behaviour on at least one of the past ten trips, and parent's reports of whether the behaviour had occurred (combining ratings of rarely, sometimes, often or always). There was a consistent trend for parents to underestimate the level of unsafe driving practices engaged in by young adults (see Figure 8). For example, while 84 per cent of young adults reported driving over the speed limit by up to 10 km/h on at least one occasion in their last ten trips, only 65 per cent of parents reported that this behaviour occurred. Similarly, while parent reports suggest that driving under the influence of alcohol was rare (4 per cent), young adult reports suggest that this behaviour was considerably more prevalent (14 per cent). The only unsafe driving behaviour on which parent reports were consistent with young adult reports was driving when fatigued (64 per cent of young adults compared with 60 per cent of parents).



Summary

More than four-fifths of young people had obtained a car licence by 19-20 years of age. Most young adults reported participating in frequent driving practice when learning to drive. For example, about 80 per cent reported that they had practised driving on at least a weekly basis. Parents predominantly provided driving practice, although some young adults also practised with others. Most young people experienced some stress and conflict when practising driving with parents, although this was minor for the majority. In contrast, driving practice with persons other than parents, while less common, was generally stress-free. While there was considerable diversity in the

number of professional driving lessons undertaken, it was most commonly between one and five. Almost 80 per cent had taken ten or fewer professional lessons while learning to drive.

Turning to the young adults' current pattern of driving, most driving was reported to take place during the week in daylight hours. The average time per week spent driving at such times was five hours. Day-time driving during the weekend was also relatively common, with an average of 3 hours spent on the road at this time. Night-time driving was somewhat less frequent, with an average of two-and-a-half-hours spent driving at night during the week and two hours at the weekend.

Over 40 per cent of the sample had been involved in a crash while driving a car or motorcycle. Most crashes resulted in property damage. Two-thirds of such crashes occurred when the young people were driving alone, and one-third when they were carrying passengers. Crashes resulting in injury or death were extremely rare.

Approximately 30 per cent had been apprehended for speeding. Additionally, speeding was one of the most common unsafe driving behaviours reported by young people, with over 80 per cent having driven up to 10 km/h above the limit at least once during their past ten trips and almost half at 10 to 25 km/h on one or more occasion. Driving while very tired was also relatively common, with 64 per cent having done so at least once in their most recent ten trips. Other types of unsafe driving behaviour, such as failure to wear a seat belt and driving when affected by alcohol or illegal drugs, were less common, and ranged in incidence from 8-14 per cent. Parents appeared to be less aware of the amount of unsafe driving engaged in by young adults, and generally reported lower rates of unsafe driving behaviours.

Gender differences

There were a number of significant differences between young men and women in both the type of learner driving experiences gained and in their current driving patterns.

There was a small, but significant difference in the number of young men and women who had obtained a motorcycle licence, with slightly more young men (3 per cent) than women (1 per cent) having a licence of this type.² There were no significant differences in the proportion of young men and women who had a car licence, learner's permit, or did not have a licence of any type.

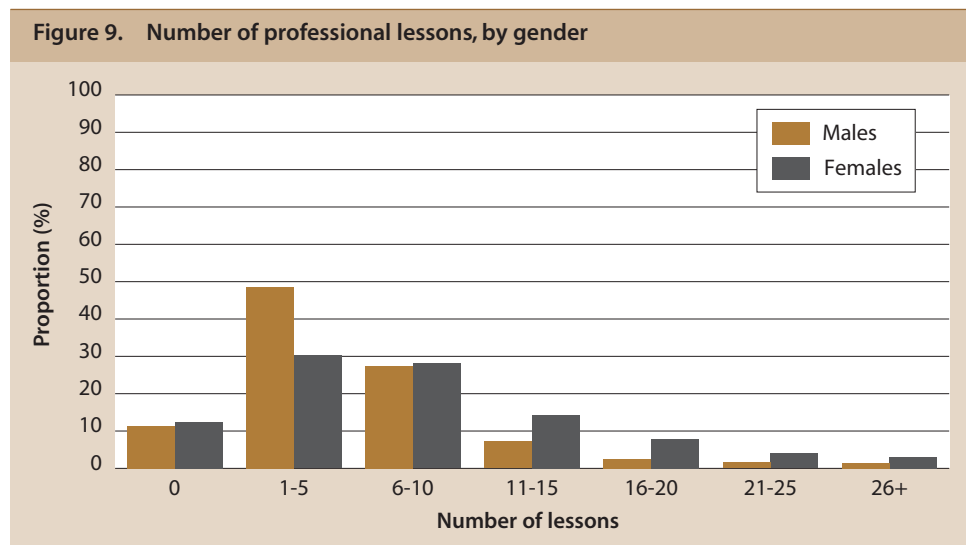
Learner driver experiences

Young men and women also significantly differed in the number of professional driving lessons undertaken when learning to drive.³ In general, young women

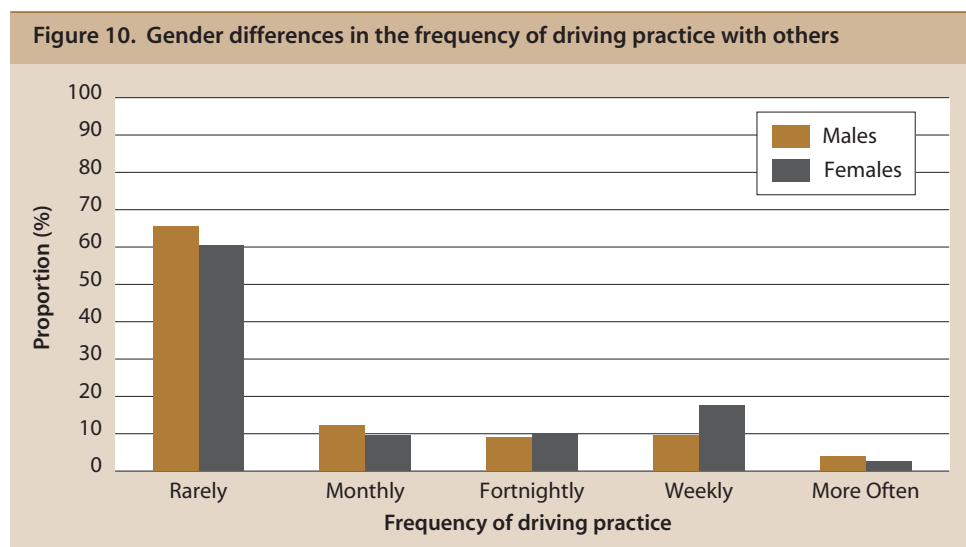
2 $\chi^2 (3) = 12.56, p < .01$.

3 $\chi^2 (7) = 60.94, p < .001$.

had taken more professional driving lessons than young men when learning to drive. More than half the young women (58 per cent) had taken six or more professional lessons, compared with 41 per cent of young men, as shown in Figure 9.



By their own report, young men and women did not significantly differ in the amount of driving practice provided by parents, or obtained overall. However, young women had more frequently practised driving with people other than parents, as shown in Figure 10.⁴



There was a significant gender difference in the degree of stress and conflict experienced when practising driving with parents.⁵ While most young drivers of both sexes reported “a little” stress, more young men reported that they experienced no stress or conflict during these practice sessions (28 per cent young men compared with 17 per cent young women), while young women more frequently reported

⁴ $\chi^2 (4) = 16.71, p < .01$.

⁵ $\chi^2 (3) = 59.41, p < .001$.

these sessions to be highly stressful and conflictual (22 per cent young women and 14 per cent young men). Figure 11 displays these differences. However, there were no gender differences in the stress experienced when practising with others.

Figure 11. Stress and conflict experienced during driving practice with parents, by gender



Driving behaviour

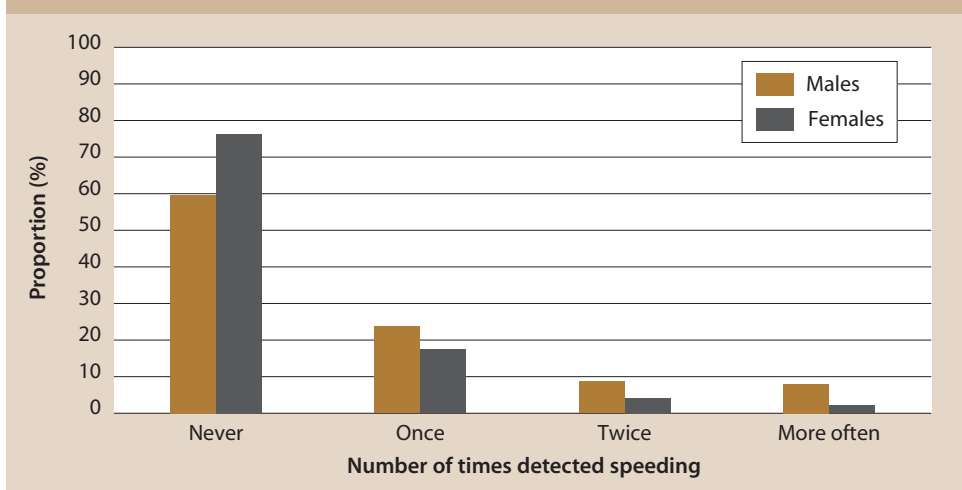
Young men and women did not significantly differ in the number of daylight or night-time hours spent driving during the week or at weekends. They reported similar rates of crashes when driving a car or motorcycle (42 per cent of both young men and women). Furthermore, among those individuals who had been involved in a crash, there was no significant gender difference in the number of crashes experienced (an average of 1.45 crashes among young men and 1.33 among young women). Likewise, there were no significant gender differences in the circumstances of the crash/es (that is, whether driving alone or with passengers), or the outcomes (that is, property damage or injury/death).

Turning to unsafe driving behaviours, young men reported speeding significantly more frequently than young women during their last ten trips (Table 7). This gender difference was evident across all degrees of speeding (up to 10 km/h over the limit; 10-25 km/h over the limit, and more than 25 km/h above the limit). Given

Table 7. Gender differences in rates of unsafe driving behaviours during the previous 10 trips

Unsafe driving behaviour	Mean number of trips out of last ten				T test result	
	Males		Females			
	Mean	S.D.	Mean	S.D.	t value	p <
Up to 10 km/h over the limit	4.79	3.60	3.54	3.14	5.89	.001
10-25 km/h over the limit	2.19	2.81	1.05	1.83	7.54	.001
More than 25 km/h over the limit	0.89	1.91	0.18	0.73	7.64	.001
Drove when affected by alcohol	0.33	1.00	0.16	0.73	3.29	.001
Did not wear seatbelt/helmet at all	0.31	1.21	0.16	0.76	2.33	.020
Did not wear seatbelt/helmet for part of trip	0.35	1.14	0.21	0.86	2.19	.029
Drove when very tired	1.44	1.78	1.64	1.94	-1.74	.086
Drove when affected by an illegal drug	0.33	1.25	0.20	1.02	1.73	.085

Figure 12. Number of times detected speeding, by gender



these findings, it is unsurprising that significantly more young men than young women had been apprehended for speeding (40 per cent young men compared with 24 per cent young women), and a higher proportion had been caught speeding on multiple occasions (17 per cent of young men and 6 per cent young women).⁶ These gender differences are shown in Figure 12.

While rates were low overall, more young men than women reported driving without a seat-belt or helmet for the duration of the trip, or for part of the trip. Young men also more frequently drove when under the influence of alcohol than young women, although again the overall rates were low. There were no gender differences in rates of driving when fatigued or when affected by an illegal drug.

SUMMARY

Summary

There were numerous differences between young men and women in their learner driving experiences and in current driving patterns. Slightly more young men than women currently held a car or motorcycle licence. Young women had taken more professional driving lessons when learning to drive than young men. Young women and men received a similar amount of driving practice overall, and practice with parents. However, young women more frequently received driving practice from people other than their parents, and reported significantly more stress when practising with parents than did young men. There were no significant gender differences in the hours spent driving in the day or at night-time during the week, or at weekends. Nor were there gender differences in the frequency of crash involvement, or in the circumstances or outcomes of crashes. However, young men engaged in unsafe driving behaviour significantly more often than young women, with higher rates of speeding and driving when affected by alcohol, and lower rates of seat belt or helmet use than young women (although it should be noted that the rates of driving under the influence of alcohol and failure to wear a seat belt or helmet were very low overall).

⁶ $\chi^2(4) = 46.02, p < .001$.

Metropolitan, regional and rural differences

In general, there were few significant differences in the learner driver experiences and current driving behaviour of young adults living in metropolitan, regional or rural localities.⁷

Similar proportions of young people from the different locality types had obtained a car or motorcycle licence, or a learner's permit.

Learner driver experiences

Individuals living in the Melbourne metropolitan area had received significantly more professional driving lessons than those living in regional or rural localities⁸ (see Figure 13). For example, 60 per cent of young Melburnians had received six or more professional lessons, compared with 40 per cent of young adults from regional centres and 21 per cent from rural areas.

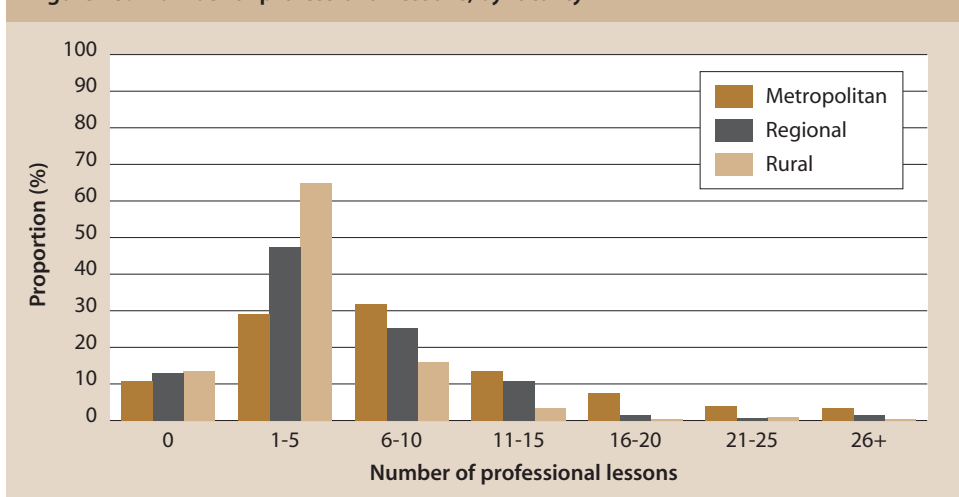
Significant differences were also found in the frequency with which young adults in metropolitan, regional and rural areas reported practising driving.⁹ While the majority reported practising on a regular basis, a higher proportion of those from regional centres (27 per cent) practiced driving less than monthly than those in rural (18 per cent) or metropolitan (15 per cent) localities (see Figure 14).

There were no differences in the frequency with which young adults from different locations practiced driving with parents or others. Nor were there any significant differences in the levels of stress and conflict experienced when practising driving with parents or others.

Driving behaviour

Individuals living in the different types of localities did not significantly differ in the number of daylight or night-time hours they spent driving during the

Figure 13. Number of professional lessons, by locality

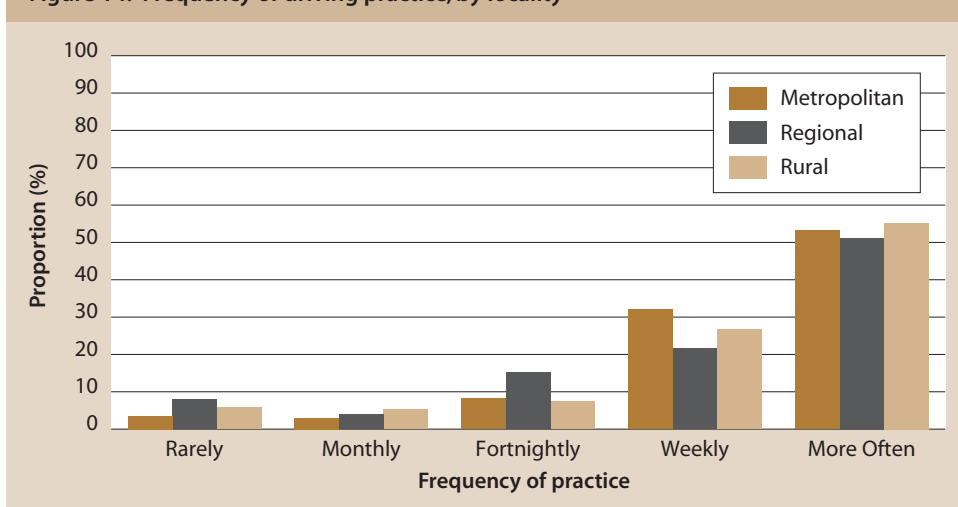


7 Participants were classified as living in metropolitan, regional or rural localities based upon their postcode at the time of completing the questionnaire "Metropolitan" = state capital city; "Regional" = large regional centre (for example, Geelong, Ballarat, Bendigo); "Rural" = other area of state.

8 χ^2 (12) = 117.82, $p < .001$.

9 χ^2 (8) = 18.30, $p < .05$.

Figure 14. Frequency of driving practice, by locality



week or at the weekend. While more young people living in the Melbourne metropolitan area (46 per cent) had been involved in a crash than those from regional (35 per cent) and rural areas (38 per cent)¹⁰, there were no significant differences between individuals from the different types of localities on the number of crashes experienced, or in the circumstances or outcomes of the crashes. Similarly, rates of apprehension for speeding were not significantly different among young people from metropolitan, regional or rural localities.

Several significant differences were found between young people from the different types of localities on the frequency of unsafe driving behaviours. Individuals from regional centres were significantly more likely than those from metropolitan localities to drive when affected by alcohol,¹¹ while young adults from rural areas were more likely to drive without a seat-belt or helmet for the whole duration of a trip¹² or part of a trip¹³ than those from metropolitan localities.

Summary

SUMMARY

Relatively few differences between young adults from metropolitan, regional or rural localities were found. These differences centred upon learner driver experiences (young adults in metropolitan areas had taken more professional driving lessons, while those in regional areas tended to practice driving less frequently), rates of crash involvement (higher among young adults living in metropolitan localities) and unsafe driving behaviours (higher rates of driving when affected by alcohol in regional areas and higher rates of failing to wear a seat-belt or helmet in rural areas).

¹⁰ $\chi^2 (2) = 6.90$, $p < .05$

¹¹ $F (2, 945) = 3.48$, $p < .05$

¹² $F (2, 945) = 6.40$, $p < .01$

¹³ $F (2, 944) = 6.42$, $p < .01$

Motorcyclists and other road users

While it would have been informative to examine the driving patterns of different classes of road users separately (for example, car drivers versus motorcyclists), the small number of motorcyclists in the ATP sample ($n=25$) precluded these more fine-grained analyses. Further limiting the feasibility of such analyses was the fact that the majority of motorcyclists in this sample (88 per cent) were also car drivers: only three young adults reported having a motorcycle licence alone. Hence, if such comparisons were conducted it would be difficult to determine whether motorcyclists were reporting on their driving experiences when driving a car, riding a motorcycle or both.

Nevertheless, while recognising these limitations, some exploratory analyses were conducted to determine whether the driving experiences of motorcyclists differed substantially from those who only drove cars. All motorcyclists (including those who had a car licence) were compared to those who only had a car licence.¹⁴ These comparisons revealed few significant differences in the learner driver experiences and current driving behaviour of motorcyclists and car drivers. For example, only one significant difference was found between the groups in their learner driver experiences (that is, motorcyclists tended to recall less stress in their driving practice sessions with parents than those who only drove cars).¹⁵ Most of the differences that did emerge centred on young adults' current driving behaviour. In comparison to car drivers, motorcyclists tended to spend more time driving,¹⁶ engage in more moderate (10-25 km/h over limit)¹⁷ to high (in excess of 25 km/h over limit)¹⁸ speeding behaviour, and were more likely to be involved in crashes which resulted in injury or death when not carrying passengers.¹⁹

Hence, it appeared that young adults with a motorcycle licence reported a somewhat different pattern of driving behaviour from those who only had a car licence. However, given the limitations previously discussed (small sample size, difficulties separating motorcyclists from car drivers), it was decided to combine both groups of road users in future analyses, as it was not anticipated that the inclusion of motorcyclists in these analyses would have a strong influence on overall results.

14 Learner drivers were excluded from these analyses as it could not be determined whether their learner's permit was for driving a car or motorcycle.

15 While almost half (46 per cent) of motorcyclists reported experiencing no stress or conflict during driving practice sessions with parents, the vast majority of car drivers (79 per cent) reporting experiencing at least "a little" stress when practicing driving with their parents ($\chi^2(3) = 8.87, p < .05$).

16 In comparison to young adults who only had a car licence, those with a motorcycle licence tended to spend more time driving during weekday daylight hours ($F(1, 950) = 12.00, p < .01$); weekend daylight hours ($F(1, 934) = 7.29, p < .01$); weekday night-time hours ($F(1, 924) = 8.05, p < .01$); and weekend night-time hours ($F(1, 910) = 5.99, p < .05$).

17 $F(1, 981) = 12.86, p < .001$.

18 $F(1, 981) = 14.63, p < .001$.

19 $F(1, 161) = 4.41, p < .05$.

4

Precursors and correlates of risky driving, crash involvement and speeding violations



4 Precursors and correlates of risky driving, crash involvement and speeding violations

Having examined young adults' learner driver experiences and current driving behaviour, the precursors of three different types of problematic driving outcomes were next investigated – risky driving behaviour, crash involvement, and speeding violations. The results of these analyses are presented in this section, beginning with separate descriptions of the longitudinal precursors and concurrent correlates of risky driving behaviour, crash involvement, and speeding violations. This is followed by a detailed discussion of the similarities and differences in the profile of precursors and correlates identified for each of the different driving outcomes (Section 5). Finally, the degree of overlap in the membership of the risky driving, crash involvement and speed violation groups is examined (Section 6). The theoretical, practical and policy implications of these findings are discussed in detail later in the report (Section 7).

As the amount of driving undertaken by an individual is associated with his/her chance of becoming involved in a crash (Diamantopoulou et al. 1996; Harrison and Christie 2003) or being apprehended by police for a speeding violation (Diamantopoulou et al. 1997), the effects of driving exposure (the average number of hours young adults reported driving each week) were controlled²⁰ when examining the correlates and precursors of crash involvement and speeding violations. However, as risky driving behaviour was measured over a predetermined period (participants' last ten trips), driving exposure was not controlled when examining this outcome.

Precursors and correlates of risky driving behaviour

To assist with the identification of precursors and correlates of risky driving, participants were grouped on the basis of their recent self-reported driving behaviour. Their level of risky driving was assessed by the frequency of engagement in the following risky driving behaviours during their previous ten trips: drove up to 10 km/h over the limit; drove between 10 and 25 km/h over the limit; drove more than 25km/h over the limit; did not wear a seat belt (or helmet) at all; forgot seat-belt (or helmet) for part of the trip; drove when very tired; drove when probably affected by alcohol; and drove when probably affected by an illegal drug.

Formation of groups

Cluster analysis was used to identify groups with differing levels of risky driving within the ATP sample. A three-cluster solution was seen as providing the best representation of the patterns of risky driving.²¹ The three clusters identified were:

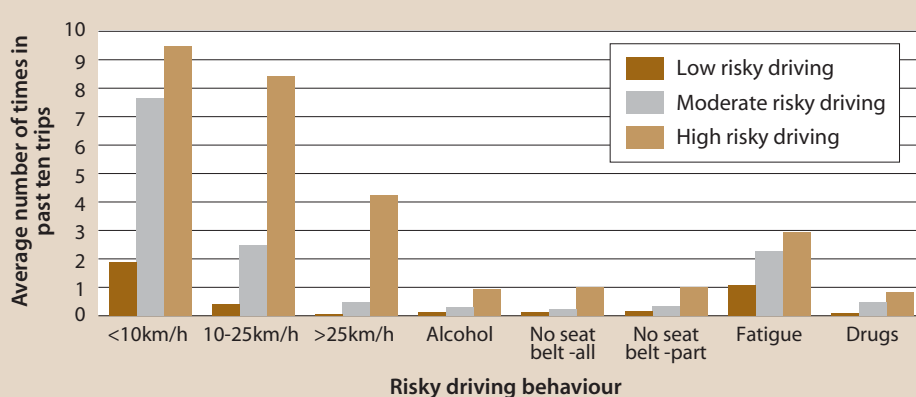
20 Analyses of Covariance (ANCOVAs) were performed, in which the effects of the covariate (driving exposure) were statistically controlled before group comparisons were undertaken.

21 A two-step clustering procedure was undertaken of young adults' responses to the eight risky driving items. The first step involved identifying the appropriate number of clusters in the data. Random samples of approximately 200 cases were hierarchically clustered using Ward's method, with squared Euclidean distance used to measure the inter-object similarity. Examination of dendograms showed that a three-cluster solution produced good differentiation between groups. However, solutions between two to five factors were also possible. Therefore, in the second step, K-means two to five cluster solutions were imposed on the whole sample, using SPSS QUICK CLUSTER, a procedure that groups cases into clusters once the number of clusters is provided. These different solutions were inspected to find the most meaningful one. The three-cluster solution using running means was selected as the most appropriate representation of the data (Hair et al. 1998; SPSS Inc. 2002).

- a “low risky driving” group (n=675, 64 per cent of the sample) – this cluster generally scored lowest on the risky driving behaviours examined;
- a “moderate risky driving” group (n=306, 29 per cent of the sample) – this cluster exhibited rates of risky driving behaviours that were intermediate to the low risky driving and high risky driving groups; and
- a “high risky driving” group (n=74, 7 per cent of the sample) – this cluster scored highest on all types of risky behaviour, but particularly speeding behaviour.

The profile of the three risky driving clusters on each of the eight risky driving measures is displayed in Figure 15, which shows that the high risky driving group reported the highest frequencies of all risky driving behaviours; the low risky driving group reported the lowest levels, and the moderate risky driving groups reported intermediate levels on most risky driving behaviours examined (the exception being driving without a seat-belt (or helmet) for the duration of the trip, on which the low and moderate groups were similar).²² Differences between the groups were most noticeable on levels of speeding behaviour.

Figure 15. Frequency of risky driving behaviours, by cluster groups



Note: <10km/h = drove up to 10 km/h over the limit; 10-25km/h = drove between 10 and 25 km/h over the limit; >25km/h = drove more than 25km/h over the limit; alcohol = drove when probably affected by alcohol; seatbelt-all = did not wear a seat belt (or helmet) at all; seatbelt-part = forgot seatbelt (or helmet) for part of the trip; fatigue = drove when very tired; and drugs = drove when probably affected by an illegal drug.

Group characteristics

Gender

The gender composition of the three groups (low, moderate and high risky driving groups) is shown in Table 8. From this Table it can be seen that there were significant differences in the gender composition of the low and high risky driving groups.²³ While there was an equal proportion of young men and women in the

22 The three risky driving groups significantly differed in the frequency with which they exceeded the speed limit by up to 10km/h ($F(2,1052)=1678.17, p<.001$); exceeded the speed limit by between 10 and 25km/h ($F(2, 1052) = 1834.61, p<.001$); exceeded the speed limit by over 25 km/h ($F(2, 1052) = 660.75, p<.001$), drove when probably affected by alcohol ($F(2, 1052) = 41.38, p<.001$); forgot to wear their seat-belt (or helmet) for part of the trip ($F(2, 1052) = 24.50, p<.001$); drove when very tired ($F(2, 1052) = 71.62, p<.001$); or drove when probably affected by an illegal drug ($F(2, 1052) = 23.80, p<.001$). The high risky driving group significantly differed from the other two groups in the frequency with which they forgot to wear a seat-belt (or helmet) for the entire duration of a trip ($F(2, 1052) = 27.75, p<.001$).

23 A chi-square test of independence revealed a significant difference in the proportion of the males and females in the risky driving groups, $\chi^2(2) = 44.71, p<.001$. An examination of the standardised residuals revealed a significantly higher proportion of males (and a lower number of females) in the high risky driving group than would be expected by chance; as well as a significantly higher proportion of females in the low risky driving group, and a lower number of males in this group, than would be expected by chance.

moderate risky driving group, there were significantly more young men in the high risky driving group (77 per cent of this group were young men, 23 per cent were young women), and significantly fewer young men in the low risky driving group (39 per cent of this group were young men and 61 per cent were young women).

Group	Males			Females		
	n	% males	% group	n	% females	% group
Low (n=675)	261	55.4	38.7	414	70.9	61.3
Moderate (n=306)	153	32.5	50.0	153	26.2	50.0
High (n=74)	57	12.1	77.0	17	2.9	23.0

Crash involvement and speeding violations

In order to assess whether the clusters accurately discriminated between types of risky drivers, the three groups were compared on two outcomes commonly associated with risky driving behaviour: crash involvement and speeding violations. The results of these comparisons are presented in Table 9.

As this Table shows, the groups differed significantly on these outcome measures in the manner expected,²⁴ with the high risky driving group reporting the highest crash involvement rate and highest number of speeding violations, and the low risky driving group reporting the lowest. Thus it seemed that the groups identified by cluster analysis were substantially different in terms of their driving behaviours. It should also be noted that there was considerable variability in the number of crashes and speeding violations reported by the young adults in each of the groups (as indicated by the large standard deviations). This within-group variability was particularly noticeable in the high risky driving group, which was much smaller than the other two cluster groups.

Group	Number of crashes		Number of speeding violations	
	Mean	SD	Mean	SD
Low (n=675)	.54	.79	.37	.82
Moderate (n=306)	.67	.84	.65	.98
High (n=74)	.83	1.12	1.41	2.65

Group differences by stage of development

Having examined young adults' learner driving experiences and current driving behaviour (Section 3), the factors (past and present) that were associated with a risky driving style were next investigated. Separate Multivariate Analyses of Variance (MANOVAs) were performed for each developmental stage²⁵ (infancy, toddlerhood, early childhood, mid childhood, late childhood, early adolescence, mid/late adolescence, and early adulthood) and source of report (parent, teacher, and self report). The strategy of examining each developmental stage

24 One-way Analyses of Variance (ANOVAs) revealed significant differences between the risky driving groups on rates of crash involvement ($F(2, 1032)=5.70, p<.01$) and speeding violations ($F(2, 1024)=32.04, p<.001$). Scheffe tests revealed that the high risky driving group was involved in significantly more crashes than those in the low risky driving group, while all three groups significantly differed in their number of speeding violations, with the high risky driving group, on average, reporting the highest number of speeding violations and the low risky driving group, the least.

25 As described in Section 2.

separately enables the identification of the stage of development at which significant group differences emerge. Furthermore, it maximises the number of participants included in the analyses, which is of importance to maintain power.

Due to the large number of variables being examined during adolescence and early adulthood, a number of MANOVAs were performed for each source of report from early adolescence on. For example, during adolescence, two MANOVAs were performed at each timepoint for each source of report (one focusing on individual attributes, the other examining environmental factors), while in early adulthood, three MANOVAs were performed for each source of report (examining individual attributes, environmental factors, and current life circumstances).

As a large number of analyses were performed, the Bonferroni adjustment procedure was used to adjust the significance level to reduce the possibility of Type 1 error (the likelihood of showing group differences of statistical significance when they are not actually there). Results are reported for differences at the Bonferroni adjusted level of 0.0023 or lower. However, when results were significant at a less stringent level of $p < .05$, this is noted as a trend. Scheffe post-hoc contrasts were used to identify significant differences between particular groups.

Effect sizes²⁶ were used to assess the strength of group differences across various domains of functioning. As a guide to interpreting these statistics, larger effect sizes indicate more powerful group differences, and hence, more powerful precursors.

The results of these analyses are summarised separately for each stage of development in Tables 10 through 13, as well as being described in the text below. When examining the Tables, it should be noted that variables displayed in CAPITALS showed significant group differences ($p < .0023$), while the other variables listed showed only trends ($p < .05$). The discussion that follows will generally focus on significant group differences.

Infancy, toddlerhood and early childhood (0-4 years)

No significant differences were found between the three risky driving groups (low, moderate and high) during the earliest years of life.

Mid childhood (5-8 years)

During *mid childhood*, significant differences emerged between the high risky driving group and the other two groups (moderate and low risky driving) in the areas of temperament style, behaviour problems and school adjustment and achievement (see Table 10). Teacher reports indicated that children in the high risky driving group were significantly more aggressive and hyperactive than other children, less task-oriented (less able to maintain their attention on tasks or activities), and had greater difficulty adjusting to the routines and demands of school life. These differences were all in the medium effect size range.

There was also a trend for multivariate group differences in parent reports. However, the strength of these differences did not reach the adjusted significance level ($p < .0023$).

Late childhood (9-12 years)

Significant differences were once again found between the high risky driving group and the other two groups during *late childhood* (see Table 10). Interestingly, as in mid

26 Cohen's (1988) effect size criteria were used to assess the strength of group differences across the various domains. For Analyses of Variance an effect size of .10 represents a small effect, .25 a medium effect, and .40 a large effect (Cohen 1988).

childhood, they were only apparent from teacher reports. As before, teachers rated the high risky driving group as less task-oriented than the moderate and low risky driving groups. At this time, teachers also noted group differences in social skills, with the high risky driving group being rated as less cooperative than the other two groups. These differences were in the medium effect size range.

There was a trend for multivariate group differences in mid childhood by parent report. In late childhood, no significant multivariate group differences were apparent by parent or self report.

Table 10. Teacher-reported significant differences between the low, moderate and risky driving groups in mid and late childhood		
Domain	Group differences	Effect size
MID CHILDHOOD [F (18, 1330) = 2.91***]		
Temperament style ■ TASK ORIENTATION	High group less task oriented than Moderate and Low groups	Medium
Behaviour problems ■ AGGRESSION	High group more aggressive than Moderate and Low groups	Medium
■ Anxiety	Moderate group less anxious than High and Low groups	Small
■ HYPERACTIVITY	High group more hyperactive than Moderate and Low groups	Medium
School adjustment and achievement ■ Academic competence	High group less academically competent than Moderate group	Small
■ SCHOOL READINESS	High group less ready for school than Moderate and Low groups	Medium
LATE CHILDHOOD [F (20, 1310) = 2.25 **]		
Temperament style ■ TASK ORIENTATION	High group less task oriented than Moderate and Low groups	Medium
Behaviour problems ■ Aggression	High group more aggressive than Moderate and Low groups	Small
■ Hyperactivity	High group more hyperactive than Moderate group	Small
Social skills ■ Assertiveness	High group less assertive than Moderate and Low groups	Medium
■ COOPERATION	High group less cooperative than Moderate and Low groups	Medium
■ Self control	High group less self controlled than Low group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance (p<.0023). All other variables are trends (p<.05), and included for reader interest. *** p<.001 ** p<.01 * p<.05		

Early adolescence (12-14 years)

By *early adolescence*, the high risky driving group was displaying significantly more difficulties than both the moderate and low risky driving groups over a range of domains according to parent and adolescent self reports (see Table 11). As before, many of these group differences centred on personal attributes (temperament style, behaviour problems and social skills); however, group differences were also evident in the areas of school adjustment and achievement, peer relationships and the parent-adolescent relationship.

In terms of individual attributes, the high risky driving group was rated by parents as less persistent (less able to remain focused on tasks or activities), as engaging more frequently in antisocial acts by their own report (such as violence, property offences, or the use or sale of illegal drugs), and as less cooperative (by parent and self report), less responsible (by parent report) and less empathic (by self report)

Table 11. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups in early adolescence

Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (24, 1648) = 2.05**]		
<i>Temperament style</i> ■ PERSISTENCE	High group less persistent than Moderate and Low groups	Medium
<i>Behaviour problems</i> ■ Hyperactivity	High group more hyperactive than Low group	Small
<i>Social skills</i> ■ COOPERATION ■ RESPONSIBILITY	High group less cooperative than Moderate and Low groups High group less responsible than Moderate and Low groups	Medium Medium
PARENT-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F (22, 1850) = 2.18**]		
<i>School achievement and adjustment</i> ■ SCHOOL ADJUSTMENT DIFFICULTIES	High group more school adjustment difficulties than Moderate and Low groups	Medium
<i>Peer relationships</i> ■ Antisocial peers	No two groups significantly differed	Small
<i>Parent-adolescent relationship</i> ■ Warmth of relationship	High group less warmth in the parent-adolescent relationship than Low group	Small
<i>Parenting style</i> ■ Use of harsh discipline	High group received more harsh discipline than Low group	Small
<i>Parental characteristics</i> ■ Parent cigarette & alcohol use	Moderate group more parental cigarette and alcohol use than Low group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (24, 1808) = 3.19***]		
<i>Behaviour problems</i> ■ AGGRESSION ■ ANTISOCIAL BEHAVIOUR ■ Hyperactivity ■ Multi-substance use	High and Moderate groups more aggressive than Low group High group more antisocial behaviour than Moderate group; High and Moderate groups more antisocial behaviour than Low group Moderate group more hyperactive than Low group High and Moderate groups more multi-substance use than Low group	Medium Medium Small Small
<i>Social skills</i> ■ COOPERATION ■ EMPATHY ■ SELF CONTROL	High group less cooperative than Moderate group; High and Moderate groups less cooperative than Low group High group less empathic than Moderate and Low groups High and Moderate groups less self controlled than Low group	Medium Medium Small
<i>Other individual attributes</i> ■ Sensation-seeking	No two groups significantly differed	Small
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F (10, 1762) = 4.44***]		
<i>School adjustment and achievement</i> ■ SCHOOL ADJUSTMENT DIFFICULTIES	High group more school adjustment difficulties than Moderate and Low groups	Medium
<i>Peer relationships</i> ■ ANTISOCIAL PEERS ■ FRIENDSHIP QUALITY ■ Peer attachment	High group more antisocial friends than Low group High group lower friendship quality than Moderate and Low groups High group less attached to peers than Low group	Medium Medium Small
<i>Parent-adolescent relationship</i> ■ QUALITY OF RELATIONSHIP	High and Moderate groups more difficult parent-adolescent relationship than Low group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

than the other two groups. In relation to environmental factors, parent and adolescent reports suggested that the high risky driving group was experiencing more school adjustment difficulties and poorer quality friendships (by self report) than the moderate and low risky driving groups, and associated more often with anti-social peers (by self-report) than those in the low risky driving group.

The first signs of differences among the moderate and low risky driving groups emerged at this age. Thus, while the majority of group differences at this time were between the high risky driving group and the other two groups, self reports suggested that both the high and moderate risky driving groups were more aggressive, less self-controlled and had a more difficult relationship with parents than the low risky driving group. Furthermore, while not as problematic as the high risky driving group, the moderate risky driving group was also significantly more antisocial and less cooperative than the low risky driving group. Almost all group differences were within the medium effect size range.

Mid/late adolescence (15-18 years)

There were fewer significant group differences at *mid/late adolescence*, with only adolescent-reported differences reaching significance (see Table 12). While there was an overall significant multivariate group difference on individual attributes by parent report, none of the variables contributing to this difference reached the adjusted significance level. On parent-reported environmental factors there was a trend for multivariate group differences, but these differences did not reach the adjusted significance level.

Group differences were found on levels of behaviour problems, use of coping strategies and interpersonal relationships, and in contrast to previous developmental stages, many of these differences were between both the high and moderate risky driving groups and the low risky driving groups. For example, while the self reports of the high risky driving group revealed them to be more hyperactive, more antisocial and to experience less warmth in their relationships with their parents than other drivers, both the moderate and high risky driving groups were more aggressive, more reliant on acting out, less adaptive coping strategies (such as using drugs or reacting explosively), and reported socialising with antisocial peers more frequently than low risky drivers. Furthermore, the moderate risky driving group was more hyperactive and antisocial than the low risky driving group (although they were less problematic on these characteristics than the high risky driving group).

Most group differences were in the small to medium effect size range, with the exception of self-reported antisocial behaviour, which had a large effect size.

Early adulthood (19-20 years)

By *early adulthood*, group differences were evident on a wide range of domains (refer to Table 13). Both parents and young adults rated the high risky driving group as displaying more externalising behaviour problems (higher parent-reported aggression and self-reported antisocial behaviour), lower social skills (lower empathy and responsibility by parent and self report), more problematic peer relationships (greater association with antisocial peers by self report), and as having had more police contact for driving offences (by self report) than the other two groups. In addition, the high-risky driving group was less involved in community activities (lower civic engagement) than the low risky driving group, by their own report.

The moderate risky driving group continued to be increasingly differentiated from the other two groups. For example, there were a number of aspects on which the moderate risky driving group was more problematic than the low risky driving group,

Table 12. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups over mid/late adolescence		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (20, 1864) = 2.45***]		
Temperament style		
■ Persistence	High group less persistent than Low group	Small
■ Sociability	Moderate group more sociable than Low group	Small
Behaviour problems		
■ Aggression	High group more aggressive than Low group	Small
■ Anxiety	Moderate group less anxious than Low group	Small
■ Hyperactivity	High group more hyperactive than Moderate group	Small
Social skills		
■ Assertiveness	High group less assertive than Moderate group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (28, 1722) = 3.55***]		
Behaviour problems		
■ AGGRESSION	High and Moderate groups more aggressive than Low group	Medium
■ ANTISOCIAL BEHAVIOUR	High group more antisocial behaviour than Moderate group; High and Moderate groups more antisocial behaviour than Low group	Large
■ HYPERACTIVITY	High group more hyperactive than Moderate group; High and Moderate groups more hyperactive than Low group	Medium
■ Multi-substance use	No two groups significantly differed	Small
Other individual attributes		
■ ACTING OUT COPING STRATEGIES	High and Moderate groups greater use of acting out coping strategies than Low group	Small
■ Sensation-seeking	High group more sensation seeking than Low group	Small
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F (16, 1634) = 3.46***]		
Peer relationships		
■ ANTISOCIAL PEERS	High and Moderate groups more antisocial friends than Low group	Small
■ Friendship quality	High group lower friendship quality than Moderate group	Small
■ Peer attachment-communication	High group less communication with peers than Moderate and Low groups	Small
■ Peer attachment - trust	No two groups significantly differed	Small
Parent-adolescent relationship		
■ Attachment to parents - trust	High group less trust in the parent-adolescent relationship than Low group	Small
■ ATTACHMENT TO PARENTS - WARMTH	High group less warmth in the parent-adolescent relationship than Moderate and Low groups	Medium
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance (p<.0023). All other variables are trends (p<.05), and included for reader interest. *** p<.001 ** p<.01 * p<.05		

but less problematic than the high risky driving group, (self-reported antisocial behaviour, responsibility, association with antisocial peers and police contact for driving offences) and others on which both the moderate and high risk driving groups were higher than the low risky driving group (multi-substance use, time spent driving per week). In addition, young adults in the moderate risky driving group were rated by parents as less anxious and more assertive than both the other groups.

Interestingly, the three groups did not significantly differ in their family characteristics (parental marital or employment status; educational level; level of financial strain by parent report); or their learner driver experiences and their own current life circumstances (employment and educational status, living arrangements, highest year of completed schooling etc) by self report.

More than two-thirds of the group differences were in the medium to large effect size range. The most powerful differences were found for antisocial behaviour, association with antisocial peers and unsurprisingly, police contact for driving offences.

Table 13. Parent-reported and self-reported significant differences between the low, moderate and high risky driving groups in early adulthood		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F(22, 1436) = 3.60***]		
Behaviour problems		
■ AGGRESSION	High group more aggressive than Moderate and Low groups	Medium
■ ANXIETY	Moderate group less anxious than High and Low groups	Medium
Social skills		
■ ASSERTIVENESS	Moderate group more assertive than High and Low groups	Medium
■ EMPATHY	High group less empathic than Moderate and Low groups	Medium
■ RESPONSIBILITY	High group less responsible than Moderate and Low groups	Medium
■ Self control	No two groups significantly differed	Small
PARENT-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(18, 1052) = 2.35***]		
Peer relationships		
■ Antisocial peers	High group more antisocial friends than Low group	Medium
Community participation		
■ Civic engagement	High group less civic engagement than Low group	Medium
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F(30, 2026) = 5.41***]		
Behaviour problems		
■ ANTISOCIAL BEHAVIOUR	High group more antisocial behaviour than Moderate group; High and Moderate groups more antisocial behaviour than Low group	Large
■ MULTI-SUBSTANCE USE	High and Moderate groups more multi-substance use than Low group	Small
Social skills		
■ EMPATHY	High group less empathic than Moderate and Low groups	Small
■ RESPONSIBILITY	High group less responsible than Moderate group; High and Moderate groups less responsible than Low group	Medium
Criminal justice contacts and attitudes		
■ POLICE CONTACTS FOR DRIVING OFFENCES	High group more police contact for driving offences than Moderate group; High and Moderate groups more police contact for driving offences than Low group	Large
■ Perceived risk of apprehension for drink driving	No two groups significantly differed	Small
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(22, 1836) = 5.45***]		
Peer relationships		
■ ANTISOCIAL PEERS	High group more antisocial friends than Moderate group; High and Moderate groups more antisocial friends than Low group	Large
■ Friendship quality	Moderate group higher friendship quality than Low group	Weaker than Small
Parent-young adult relationship		
■ Conflict in the relationship	Moderate group more conflictual relationship than Low group	Small
■ Quality of the relationship	High group more difficult parent-young adult relationship than Low group	Small
Community participation		
■ CIVIC ENGAGEMENT	High group less civic engagement than Low group	Small
Driving behaviour		
■ HOURS SPENT DRIVING PER WEEK	High and Moderate groups spend more hours driving per week than Low group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

Summary

The three groups (low, moderate, and high risky driving) could not be distinguished during *infancy, toddlerhood* and *early childhood*. The first significant group differences were reported by teachers in *mid childhood*, and centred on temperament style (task orientation), behaviour problems (aggression and hyperactivity), and school adjustment difficulties. During *late childhood*, teachers noted similar differences and also reported significant group differences in levels of social competence (cooperation). All significant group differences were between the high risky driving group and both the moderate and low risky driving groups, with the former group exhibiting more difficulties than the other two groups. Group differences during mid and late childhood were in the medium effect size range.

By *early adolescence*, the first parent- and self-reported differences emerged. Parent and adolescent reports suggested that the high risky driving group was displaying significantly more difficulties than the moderate and low risky driving groups over a range of domains. As before, many of these group differences centred on personal attributes (temperament style, behaviour problems, social competence). However, group differences were also evident in the areas of school adjustment and achievement, peer relationships and the quality of the parent–adolescent relationship. While the majority of group differences were between the high risky driving group and the other two groups, some differentiation between the low and moderate risky driving groups became evident.

This differentiation continued into *mid/late adolescence*, with the moderate risky driving group significantly differing from one or both of the other groups (but particularly the low risky driving group) on a number of aspects. Group differences in coping styles (greater use of less adaptive, acting out strategies by the high and moderate groups) were also found at this developmental stage. Group differences during adolescence ranged in strength from small to large effect sizes. The most powerful group difference was found for self-reported antisocial behaviour during mid/late adolescence.

By *early adulthood*, group differences were evident on a wide range of domains. In addition to those problematic characteristics described previously, the high risky driving group also reported lower levels of civic engagement than the low risky driving group and more police contact for driving offences, while both the high and moderate risky driving groups reported engaging in more multi-substance use, and spending more time driving than the low risky driving group. At this time, the moderate risky driving group continued to become more distinct from the other two groups, being rated as more problematic than the low risky driving group, but less problematic than the high risky driving group, on many variables. Furthermore, the moderate risky driving group was rated as more assertive and less anxious than both other groups during early adulthood. The majority of group differences were in the moderate to large effect size range, with the most powerful differences evident on antisocial behaviour, association with antisocial peers and police contact for driving offences.

Precursors and correlates of crash involvement

In order to identify predictors of crash involvement, young adults were grouped according to number of crashes they had been involved in as a driver or rider since commencing driving a car or riding a motorcycle.

Formation of groups

Table 14 displays the distribution of crashes among the ATP sample. As the Table shows, while the majority (57 per cent) had not been involved in a crash, approximately one-third had been in one crash, and about one-in-ten had been involved in two crashes. Very few (less than 3 per cent) reported that they had been involved in more than two crashes as a driver.

Individuals were classified into three groups:

- a “no crash” group (n=596, 57 per cent of the sample) – this group reported that they had not been involved in a crash as a driver or rider
- a “single crash” group (n=312, 30 per cent of the sample) – this group had been involved in one crash as a driver or rider, and
- a “multiple crash” group (n=136, 13 per cent of the sample) – this group reported that they had been involved in two or more crashes as a driver or rider.

Table 14. Distribution of crashes across ATP sample			
Number of crashes	N		%
0	596		57.1
1	312		29.9
2	112		10.7
3	17		1.6
4	3		0.3
5	2		0.2
6	1		0.1
7	1		0.1

Group characteristics

Gender composition

The gender composition of the three groups (no, single, and multiple crash groups) is shown in Table 15. From this Table it can be seen that there was a weak but significant difference in the gender composition.²⁷ For example, there was a trend for more young men than women to be members of the multiple crash group (54 per cent of this group were male). Hence, while young men and women did not significantly differ in their overall rates of crash involvement, when they were grouped according to the number of crashes they had been involved in, a weak but significant gender difference emerged.

²⁷ A chi-square test of independence revealed a significant difference in the proportion of the males and females in the crash involvement groups, $\chi^2(2) = 6.54$, $p < .05$. An examination of the standardised residuals revealed a trend for a higher number of males (and a smaller number of females) in the multiple crash group than would be expected by chance.

Table 15. Gender composition of the no, single and multiple crash groups

Group	Males			Females		
	n	% males	% group	n	% females	% group
No (n=596)	261	56.6	43.8	335	57.5	56.2
Single (n=312)	127	27.5	40.7	185	31.7	59.3
Multiple (n=136)	73	15.8	53.7	63	10.8	46.3

Crash characteristics

The single and multiple crash groups were compared to determine whether the two groups differed in the circumstances surrounding their crashes (whether they were alone or with passengers) and/or the consequences of these crashes (whether the crash resulted in property damage, or injury or death). These comparisons revealed that a higher proportion of the multiple crash group had been involved in crashes resulting in property damage (regardless of whether they were alone²⁸ or had passengers when the crash occurred²⁹) than the single crash group (see Table 16).

Table 16. Crash characteristics of the single and multiple crash groups

Group	Resulted in property damage				Resulted in injury or death			
	Driver only		Driver + passengers		Driver only		Driver + passengers	
	n	%	n	%	n	%	n	%
Single (n=312)	178	57.1	109	34.9	9	2.9	5	1.6
Multiple (n=136)	112	82.4	72	52.9	5	3.7	3	2.2

Group differences by stage of development

The precursors and correlates of crash involvement were next examined. Using a similar strategy to that employed previously, separate analyses were performed for each developmental stage and source of report.³⁰ However, unlike the previous analyses of risky driving, participants' level of driving exposure (number of hours driving per week) was controlled in this next set of analyses.

The results of these analyses are summarised separately for each stage of development in Tables 17 and 18, as well as being described in the text below. As described previously, variables displayed in CAPITALS showed significant group differences ($p < .0023$), while the other variables listed showed only trends ($p < .05$). The subsequent discussion will focus on significant group differences.

Infancy, toddlerhood, and early childhood (0-4 years)

The no, single and multiple crash groups did not significantly differ during *infancy, toddlerhood and early childhood*.

Mid childhood (5-8 years)

There was a trend for multivariate group differences in parent reports at *mid childhood*. However, the strength of these differences was not sufficient to reach the

²⁸ $\chi^2 (1) = 26.56, p < .001$.

²⁹ $\chi^2 (1) = 12.75, p < .001$.

³⁰ As before, several analyses (in this case, Multivariate Analyses of Covariance - MANCOVAs) were performed for each source of report from early adolescence on, due to the large number of variables under investigation during adolescence and early adulthood.

adjusted significance level of $p < .0023$.³¹ No significant group differences were evident by teacher reports at this age.

Late childhood (9-12 years)

Parent-, teacher- and self-reports indicated no significant differences between the groups during *late childhood*.

Early adolescence (12-14 years)

There were trends for multivariate group differences on parent- and self-reported individual attributes and parent-reported environmental characteristics during *early adolescence*. However, these differences did not reach the adjusted significance level of $p < .0023$. No significant differences were evident on self-reported environmental factors at this age.

Mid/late adolescence (15-18 years)

Significant group differences first emerged during *mid/late adolescence*. These differences were apparent on a wide range of domains, namely, temperament style, behaviour problems, social skills, coping styles, and peer relationships (see Table 17). Only on parent-reported environmental factors were no significant multivariate group differences found, although there was a trend for such differences ($p < .05$).

The majority of group differences were between the two crash groups (single and multiple crashes) and the no crash group. For example, the two crash groups were rated as more aggressive (by parents and adolescents), more antisocial (by adolescents), and as more reliant on less adaptive acting out coping strategies such as reacting explosively or using drugs (by adolescents), than the no crash group. In addition, the multiple crash group (but not the single crash group) was rated as less persistent (by parents), and as using more licit and illicit substances (by adolescents) than the no crash group.

There were also some aspects reflecting interpersonal skills on which the single crash group was rated more positively than either the multiple and no crash groups (self-reported level of communication with peers) or the no crash group alone (parent-reported assertiveness).

Group differences were generally quite modest at this stage, typically falling in the small effect size range. The most powerful group differences were found for self-reported antisocial behaviour and use of less adaptive, acting out coping strategies, which both were in the medium effect size range.

Early adulthood (19-20 years)

The majority of group differences during *early adulthood* emerged from self reports, with only one parent-reported difference (conflict in parent–young adult relationship) evident at this stage (see Table 18). There was a trend for multivariate group differences on parent-reported individual attributes, but this did not reach the adjusted significance level.

Similar to the previous stage, many of the group differences were between the two crash groups (single and multiple crashes) and the no crash group, with those who had been involved in a crash displaying a more “difficult” temperament style (lower persistence and higher reactivity, by self report) engaging in more

31 As a large number of analyses were performed, the Bonferroni adjustment procedure was used to adjust the significance level to reduce the possibility of Type 1 error (the likelihood of showing group differences of statistical significance when they are not actually there). Results are reported for differences at the Bonferroni adjusted level of 0.0023 or lower.

antisocial behaviour and multi-substance use (as reported by young adults); having more police contact for driving offences; and associating more frequently with antisocial peers than those in the no crash group.

However, as in mid/late adolescence, there were also some aspects on which the multiple crash group alone was reported to experience more difficulties than the no crash group (parent-reported conflict in their relationship with their ATP young adult, self-reported stress experienced during driving practice), and others on which the multiple crash group reported more difficulties than the single crash group (self-reported antisocial behaviour, police contact for driving offences, and association with antisocial peers).

Table 17. Parent-reported and self-reported significant differences between the no, single and multiple crash groups over mid/late adolescence		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (20, 1784) = 2.93***]		
Temperament style		
■ PERSISTENCE	Multiple crash group less persistent than No crash group	Small
■ Sociability	Single crash group more sociable than No crash group	Small
Behaviour problems		
■ AGGRESSION	Multiple and Single crash groups more aggressive than No crash group	Small
■ Depression	No two groups significantly differed	Weaker than Small
Social skills		
■ ASSERTIVENESS	Single crash group more assertive than No crash group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (28, 1648) = 2.57***]		
Behaviour problems		
■ AGGRESSION	Multiple and Single crash groups more aggressive than No crash group	Small
■ ANTISOCIAL BEHAVIOUR	Multiple and Single crash groups more antisocial behaviour than No crash group	Medium
■ Hyperactivity	Multiple and Single crash groups more hyperactive than No crash group	Small
■ MULTI-SUBSTANCE USE	Multiple crash group more multi-substance use than No crash group	Small
Other individual attributes		
■ Emotional control	Single crash group less emotional control than No crash group	Small
■ ACTING OUT COPING STRATEGIES	Multiple and Single crash groups greater use of acting out coping strategies than No crash group	Medium
■ Optimism about the future	Multiple crash group less optimistic about the future than No crash group	Small
■ Sensation-seeking	Multiple crash group more sensation seeking than No crash group	Small
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(16,1562) = 3.38***]		
School adjustment and achievement		
■ School adjustment difficulties	No two groups significantly differed	Small
Peer relationships		
■ Antisocial peers	Multiple and Single crash groups more antisocial friends than No crash group	Small
■ PEER ATTACHMENT-COMMUNICATION	Single crash group more communication with peers than Multiple and No crash groups	Small
Parent-adolescent relationship		
■ Parental attachment - alienation	No two groups significantly differed	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

The three groups did not significantly differ in their family characteristics according to parent reports (parental marital or employment status, educational level, level of financial strain) or the young adults' current life circumstances (employment and educational status, living arrangements, highest year of completed schooling) by self reports.

As before, most group differences were in the small effect size range. However, medium effect sizes were observed for the degree of conflict between parents and young adults (parent-report), antisocial behaviour (self-report), and police contact for driving offences (self-report).

Table 18. Parent-reported and self-reported significant differences between the no, single and multiple crash groups in early adulthood		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(18,1014) = 2.50**]		
<i>Driving practice</i>		
■ Stress during practice	Multiple crash group more stress during driving practice than No crash group	Small
<i>Peer relationships</i>		
■ Group participation	Multiple crash group less participation in social/community group activities than Single crash group	Small
<i>Parent-young adult relationship</i>		
■ PARENT-YOUNG ADULT CONFLICT	Multiple crash group more conflictual parent-young adult relationship than No crash group	Medium
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F(30, 1942)=3.08***]		
<i>Temperament style</i>		
■ PERSISTENCE	Multiple and Single crash groups less persistent than No crash group	Small
■ REACTIVITY	Multiple and Single crash groups more reactive than No crash group	Small
<i>Behaviour problems</i>		
■ ANTISOCIAL BEHAVIOUR	Multiple crash group more antisocial behaviour than Single crash group; Multiple and Single crash groups more antisocial behaviour than No crash group	Medium
■ MULTI-SUBSTANCE USE	Multiple and Single crash groups more multi-substance use than No crash group	Small
<i>Social skills</i>		
■ Responsibility	Multiple crash group less responsible than No crash group	Small
<i>Criminal justice contacts and attitudes</i>		
■ POLICE CONTACT - DRIVING OFFENCE/S	Multiple crash group more police contact for driving offence/s than Single crash group, Multiple and Single crash groups more police contact for driving offence/s than No crash group	Medium
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(20, 1830) = 2.74***]		
<i>Driving practice</i>		
■ Amount of practice	No two groups significantly differed	Small
■ STRESS DURING PRACTICE	Multiple crash group more stress during driving practice than No crash group	Small
<i>Peer relationships</i>		
■ ANTISOCIAL PEERS	Multiple crash group more antisocial friends than Single crash group; Multiple and Single crash groups more antisocial friends than No crash group	Small
<i>Parent-young adult relationship</i>		
■ Parent-young adult conflict	Multiple and Single crash groups more conflict between parents and young adults than No crash group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance (p<.0023). All other variables are trends (p<.05), and included for reader interest. *** p<.001 ** p<.01 * p<.05		

Summary

The three crash groups (no, single, and multiple) did not significantly differ during *infancy*, *toddlerhood*, *childhood* and *early adolescence*. The first group differences emerged in *mid/late adolescence*. Group differences were apparent on a wide range of domains at this time (temperament style, behaviour problems, social skills, coping styles, and peer relationships) and were generally between the two groups that had experienced crashes and the no crash group. Parent and self reports suggested that those who had been involved in a crash displayed more problematic characteristics than those who had not. Group differences were generally in the small effect size range, with the most powerful group differences found for antisocial behaviour and a less adaptive, acting out coping style, which were both in the medium effect size range.

While there were few parent-reported differences in *early adulthood*, self reports indicated differences between the groups across a range of domains (temperament style, behaviour problems, peer relationships, learner driver experiences and contact with the criminal justice system). Similar to mid to late-adolescence, many group differences emerged between the two crash groups and the no crash group, with the two crash groups being rated as more problematic than the no crash group in these areas of functioning. There were also some aspects (antisocial behaviour, police contact for driving offences, association with antisocial peers) on which the two crash groups were clearly differentiated from each other, with single crash group being rated as more problematic than the no crash group, but less problematic than the multiple crash group. Once again, most group differences were in the small effect size range. The most powerful group differences were found for antisocial behaviour, police contact for driving offences and the amount of conflict in the relationship between parents and young adults.

Precursors and correlates of speeding violations

To assist with identifying predictors of speeding violations, young adults were grouped according to the number of times they had been apprehended by police for exceeding the speed limit, according to self report.

Formation of groups

Table 19 displays the distribution of speeding violations among the ATP sample.

As this Table shows, the majority of participants (69 per cent) had never been detected speeding. About one-in-five had been caught speeding once, and just over one-in-ten reported multiple speeding violations. Very few participants reported having been caught speeding more than twice (less than 5 per cent). Consequently, participants were divided into three groups:

Table 19. Distribution of speeding violations among the ATP sample		
Number of times caught speeding	N	%
0	712	68.9
1	209	20.2
2	64	6.2
3	29	2.8
4	12	1.2
5	2	0.2
6	4	0.4
7	0	0.0
8	1	0.1

- a *no speeding violation* group (n=712, 69 per cent of the sample) – this group reported that they had never been caught speeding by the police;
- a *single speeding violation* group (n=209, 20 per cent of the sample) – this group reported they had been caught speeding by police on one occasion; and
- a *multiple speeding violation* group (n=113, 11 per cent of the sample) – this group had been apprehended by police for speeding offences on two or more occasions.

Group characteristics

Gender composition

The gender composition of the three groups (no, single, and multiple speeding violations) is shown in Table 20, which shows that there was a significant difference in the gender composition of the no and multiple speeding violation groups.³² While there was a similar proportion of young men and women in the single speeding violation group, there was a higher proportion of males in the multiple speeding violation group (68 per cent of this group were young men and 32 per cent were young women), and significantly more females in the no speeding violation group (62 per cent of this group were young women and 38 per cent were young men).

Table 20. Gender composition of the no, single and multiple speeding violation groups						
Group	Males			Females		
	n	% males	% group	n	% females	% group
No (n=712)	274	59.6	38.5	438	76.3	61.5
Single (n=209)	109	23.7	52.2	100	17.4	47.8
Multiple (n=113)	77	16.7	68.1	36	6.3	31.9

Self-reported speeding behaviour

In order to determine whether the three speeding violation groups differed in their levels of speeding behaviour (and not just their propensity to attract police attention), the frequency of engagement in different levels of speeding behaviour across the three groups was examined. The results of these comparisons are displayed in Table 21.

32 A chi-square test of independence revealed a significant difference in the proportion of the males and females in the speeding violation groups, $\chi^2 (2) = 40.97$, $p < .001$. An examination of the standardised residuals revealed a significantly higher proportion of males (and a lower proportion of females) in the multiple speeding violations group than would be expected by chance; as well as a significantly higher proportion of females in the no violations group (and a lower number of males in this group) than would be expected by chance.

As this Table shows, the three groups significantly differed in their levels of self-reported speeding behaviour.³³ As expected, the multiple speeding violation group reported speeding more often (at all levels) than the no speeding violation group, while the single speeding violation group fell between these two groups, reporting more low to moderate speeding behaviour (up to 25km/h over the limit) than the no speeding violation group, but less high-level speeding (in excess of 25km/h above the limit) than the multiple speeding violation group.

Table 21. Self-reported speeding behaviour of the no, single and multiple speeding violation groups during their past 10 trips

Group	≥10km/h over limit		10-25km/h over limit		> 25km/h over limit	
	Mean	SD	Mean	SD	Mean	SD
No	3.57	3.25	1.18	2.07	0.28	1.07
Single	5.11	3.57	2.18	2.68	0.65	1.32
Multiple	5.66	3.37	2.70	3.01	1.50	2.57

Group differences by stage of development

The correlates and precursors of speeding violations are examined in this next section. Using the same strategy as employed in the previous section, separate Multivariate Analyses of Covariance (MANCOVAs) were performed for each developmental stage and source of report, with driving exposure included as a covariate to control for its influence on speeding behaviour.³⁴

Tables 22 through 25 summarise the results of these analyses. As a guide to interpreting these tables, variables displayed in CAPITALS indicate significant group differences ($p < .0023$),³⁵ while the other variables listed indicate group trends ($p < .05$). The following discussion will focus only on significant differences.

Infancy, toddlerhood and early childhood (0-4 years)

The no, single, and multiple speeding violation groups did not significantly differ from each other during *infancy, toddlerhood, and early childhood*.

Mid childhood (5-8 years)

There were trends for multivariate group differences in parent and teacher reports during *mid childhood*. However, these differences were not strong enough to reach the adjusted significance level ($p < .0023$).

Late childhood (9-12 years)

The first significant group differences emerged during *late childhood* (see Table 22). These differences were between the multiple speeding violation group and the other two groups (single and no speeding violations) and all but one were teacher-reported. Both teachers and parents rated the multiple speeding violation group as more hyperactive than the single and no speeding violation groups, while teachers also rated the multiple speeding violation group as more aggressive, less

33 One-way Analyses of Variance revealed significant differences between the no, single and multiple speeding violation groups in the frequency with which they drove up to 10km/h above the speed limit, $F(2,1028)=31.2$, $p < .001$; drove between 10-25 km/h over the speed limit, $F(2, 1026)=30.5$, $p < .001$; and drove more than 25km/h over the speed limit, $F(2,1027)=41.2$, $p < .001$.

34 As before, multiple MANCOVAs were performed for each informant (parent, adolescent/young adult) during adolescence and early adulthood, due to the large number of variables under investigation during this period.

35 Due to the large number of analyses performed, the Bonferroni adjustment procedure was used to adjust the significance level to reduce the possibility of Type 1 error (the likelihood of showing group differences of statistical significance when they are not actually there). Results are reported for differences at the Bonferroni adjusted level of 0.0023 or lower.

cooperative, less self-controlled and less task-oriented than other children. Most group differences were within the medium effect size range.

There was a trend for multivariate group differences in self reports during late-childhood. However, these differences were not sufficiently strong to reach statistical significance (at the adjusted significance level of $p < .0023$).

Table 22. Parent-reported and teacher-reported significant differences between the no, single and multiple speeding violation groups in late childhood		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES [F (32, 1716) = 1.87**]		
Temperament style ■ Persistence	Multiple violation group less persistent than Single violation group	Small
Behaviour problems ■ HYPERACTIVITY	Multiple violation group more hyperactive than Single and No violation groups	Small
Social skills ■ Cooperation	Multiple violation group less cooperative than Single and No violation groups	Small
Peer relationships ■ Antisocial peers	Multiple violation group more antisocial friends than Single and No violation groups	Small
TEACHER-REPORTED DIFFERENCES [F (20, 1234) = 2.59***]		
Temperament style ■ TASK ORIENTATION	Multiple violation group less task oriented than Single and No violation groups	Medium
Behaviour problems ■ AGGRESSION	Multiple violation group more aggressive than Single and No violation groups	Medium
■ HYPERACTIVITY	Multiple violation group more hyperactive than Single and No violation groups	Medium
Social skills ■ COOPERATION	Multiple violation group less cooperative than Single and No violation groups	Medium
■ SELF CONTROL	Multiple violation group less self controlled than Single and No violation groups	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

Early adolescence (12-14 years)

By *early adolescence*, numerous differences were apparent between the speeding violation groups (Table 23). As before, the majority of group differences were between the multiple speeding violation group and the other two groups, with the multiple speeding violation group appearing more problematic than the single and no speeding violation groups across a wide range of domains. For instance, the multiple speeding violation group exhibited a less persistent temperament style (as reported by parents), higher levels of hyperactivity (as reported by parents), lower social skills (lower parent-reported cooperation and self-reported empathy) and more school adjustment difficulties (as reported by parents and adolescents) than the single and no speeding violation groups. There were also some characteristics on which only the multiple and no speeding violation groups differed (parent- and self-reported association with anti-social peers, self-reported aggression), to the disadvantage of the former group.

The first sign of differences between the single speeding violation group and the no speeding violation group was found at this age, with participants in both the multiple and single speeding violation groups rating themselves as more antisocial than those in the no speeding violation group.

Table 23. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups in early adolescence

Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (24, 1556) = 3.04***]		
<i>Temperament style</i> ■ PERSISTENCE	Multiple violation group less persistent than Single and No violation groups	Medium
<i>Behaviour problems</i> ■ Aggression	Multiple violation group more aggressive than Single and No violation groups	Small
■ Anxiety	Single violation group less anxious than No violation group	Small
■ HYPERACTIVITY	Multiple violation group more hyperactive than Single and No violation groups	Medium
<i>Social skills</i> ■ COOPERATION	Multiple violation group less cooperative than Single and No violation groups	Small
■ Responsibility	No two groups significantly differed	Small
■ Self control	Multiple violation group less self controlled than No violation group	Small
PARENT-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F(22, 1756) = 2.63***]		
<i>School adjustment & achievement</i> ■ SCHOOL ADJUSTMENT DIFFICULTIES	Multiple violation group more school adjustment difficulties than Single and No violation groups	Medium
<i>Peer relationships</i> ■ ANTISOCIAL PEERS	Multiple violation group more antisocial friends than No violation group	Small
<i>Parenting style</i> ■ Use of harsh discipline	Multiple violation group received more harsh discipline than No violation group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (24, 1718) = 2.66***]		
<i>Behaviour problems</i> ■ AGGRESSION	Multiple violation group more aggressive than No violation group	Small
■ ANTISOCIAL BEHAVIOUR	Multiple and Single violation groups more antisocial behaviour than No violation group	Medium
■ Hyperactivity	Multiple violation group more hyperactive than No violation group	Small
<i>Social skills</i> ■ Cooperation	Multiple violation group less cooperative than No violation group	Small
■ EMPATHY	Multiple violation group less empathic than Single and No violation groups	Medium
<i>Other individual attributes</i> ■ Sensation-seeking	Multiple and Single violation groups more sensation seeking than No violation group	Small
SELF-REPORTED DIFFERENCES ON ENVIRONMENTAL FACTORS [F (10, 1672) = 2.89**]		
<i>School adjustment and achievement</i> ■ SCHOOL ADJUSTMENT DIFFICULTIES	Multiple violation group more school adjustment difficulties than Single and No violation groups	Small
<i>Peer relationships</i> ■ ANTISOCIAL PEERS	Multiple violation group more antisocial friends than No violation group	Small
■ Friendship quality	Multiple violation group lower friendship quality than No violation group	Small
<i>Parent-adolescent relationship</i> ■ Quality of relationship	No two groups significantly differed	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

Group differences ranged in strength from small to medium effect sizes. The most powerful group differences were found on persistence (parent report), hyperactivity (parent report), antisocial behaviour (adolescent report), empathy (adolescent report), and school adjustment (parent report).

Mid/late adolescence (15-18 years)

Few significant group differences were found during *mid/late adolescence* (Table 24). The only significant differences that emerged at this time were in the areas of temperament style and behaviour problems. For example, the multiple speeding violation group was found to be more aggressive (according to parent reports) and more antisocial (by self reports) than the other two groups.

The single violation group showed further signs of differentiation from the no speeding violation group at this age. For example, like the multiple violation group, parents rated the single violation group as more sociable than the no violation group, and self reports indicated that they more often engaged in antisocial behaviour than the no violation group (although the single speeding violation group was not rated as highly on this aspect as the multiple violation group).

Group differences were generally in the small effect size range at this developmental stage. However, a medium effect size was found for differences on self-reported antisocial behaviour. There were trends for significant multivariate group differences on environmental factors by both parent and self reports ($p < .05$), but they did not reach the adjusted significance level.

Table 24. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups over mid/late adolescence		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F(20, 1766) = 2.46***]		
Temperament style		
■ Persistence	Multiple violation group less persistent than Single and No violation groups	Small
■ SOCIABILITY	Multiple violation and Single violation groups more sociable than No violation group	Small
Behaviour problems		
■ AGGRESSION	Multiple violation group more aggressive than Single and No violation groups	Small
■ Anxiety	Single violation group less anxious than No violation group	Small
■ Hyperactivity	Multiple violation group more hyperactive than Single and No violation groups	Small
Social skills		
■ Assertiveness	Single violation group more assertive than No violation group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F(28, 1632) = 2.89***]		
Behaviour problems		
■ ANTISOCIAL BEHAVIOUR	Multiple violation group more antisocial behaviour than Single violation group; Multiple and Single violation groups more antisocial behaviour than No violation group	Medium
Social skills		
■ Assertiveness	Single violation group more assertive than No violation group	Small
Other individual attributes		
■ Optimism about the future	Multiple violation group less optimistic than Single violation group	Small
■ Active adaptive coping strategies	Single violation group more use of active adaptive coping strategies than Multiple and No violation groups	Small
■ Sensation-seeking	Multiple and Single violation groups more sensation seeking than No violation group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

Early adulthood (19-20 years)

The domains in which group differences appeared became more varied by *early adulthood* (Table 25). Group differences emerged in some areas of functioning in which differences had been found in earlier developmental stages (behaviour

Table 25. Parent-reported and self-reported significant differences between the no, single and multiple speeding violation groups in early adulthood		
Domain	Group differences	Effect size
PARENT-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (22, 1352) = 2.57***]		
Behaviour problems		
■ Anxiety	Single violation group less anxious than No violation group	Small
■ CRIMINAL JUSTICE SYSTEM CONTACT	Multiple and Single violation groups more criminal justice contact than No violation group	Small
SELF-REPORTED DIFFERENCES ON INDIVIDUAL ATTRIBUTES [F (30, 1920) = 14.99***]		
Behaviour problems		
■ ANTISOCIAL BEHAVIOUR	Multiple and Single violation groups more antisocial behaviour than No violation group	Medium
■ ANXIETY	Multiple and Single violation groups less anxious than No violation group	Small
■ DEPRESSION	Multiple violation group less depressed than No violation group	Small
■ MULTI-SUBSTANCE USE	Multiple violation group more multi-substance use than Single and No violation groups	Small
Social skills		
■ Empathy	Multiple violation group less empathic than No violation group	Small
■ Responsibility	Multiple violation group less responsible than No violation group	Small
Other individual attributes		
■ Life satisfaction	Single violation group more life satisfaction than No violation group	Small
Criminal justice contacts and attitudes		
■ POLICE CONTACT-DRIVING OFFENCE/S	Multiple violation group more police contact for driving offences than Single violation group; Multiple and Single violation groups more police contact for driving offences than No violation group	Large
SELF-REPORTED DIFFERENCES ON ENVIRONMENT FACTORS [F (20, 1804) = 3.08***]		
Peer relationships		
■ ANTISOCIAL PEERS	Multiple violation group more antisocial friends than Single and No violation groups	Medium
■ Quality of peer relationships	No two groups significantly differed	Weaker than Small
Community participation		
■ Civic engagement	Multiple violation group less civic engagement than No violation group	Small
Learner driver experiences		
■ Amount of practice	Multiple violation group more driving practice than No violation group	Small
SELF-REPORTED DIFFERENCES ON OWN LIFE SITUATION [F (10, 1832) = 7.07***]		
Current life circumstances		
■ CURRENTLY EMPLOYED	Multiple violation group young adults: more currently employed than Single and No violation group young adults	Medium
■ CURRENTLY STUDYING	Multiple violation group young adults: fewer currently studying than Single and No violation group young adults	Medium
■ LEVEL OF SCHOOLING COMPLETED	Multiple violation group less schooling completed than Single and No violation groups	Medium
■ History of unemployment	Multiple violation group less often unemployed since leaving school than No violation group	Small
Note: Variables that are displayed in CAPITALS are significant at the Bonferroni adjusted level of significance ($p < .0023$). All other variables are trends ($p < .05$), and included for reader interest. *** $p < .001$ ** $p < .01$ * $p < .05$		

problems, peer relationships), as well as domains that had not been examined before (current life circumstances, contact with the criminal justice system).

While many group differences were between the multiple speeding violation group and the other two groups, there were also some characteristics on which both the single and multiple speeding violation group differed from the no speeding violation group; the multiple speeding violation group alone differed from the no speeding violation group; or all three groups differed from each other.

In terms of behavioural and emotional difficulties, self reports indicated that multiple speeding violation group engaged in more multi-substance use than other young adults, and both the single and multiple speeding violation groups were more antisocial (by self report) and had experienced more contact with the criminal justice system (by parent report) than the no speeding violation group. Furthermore, both speeding violation groups also reported experiencing more police contact for driving offences than the no violation group, although the single speeding violation group was not as problematic as the multiple speeding violation group on this aspect. While the two speeding violation groups exhibited higher levels of behaviour problems, the no speeding violation group reported more emotional adjustment difficulties, with self reports indicating that the no speeding violation group was more depressed than the multiple speeding violation group, and more anxious than the other two groups.

In relation to current life circumstances, the multiple speeding violation group was less likely to have completed school than the other two groups, and less likely to be currently undertaking a course of study (according to their own reports). Perhaps as a result, the multiple speeding violation group was more likely to be in paid employment than the other two groups.

The multiple speeding violation group also differed from the other groups in terms of their peer relationships, with young people in the multiple speeding violation group associating more frequently with antisocial peers (by self report).

No significant differences were found between the groups in their parent-reported family characteristics (parental marital, educational or occupational status; financial strain) or their self-reported learner driver experiences, although there was a trend for group differences on the amount of driving practice young adults received when learning to drive.

Most group differences were in the small to medium effect size range with the exception of police contact for driving offences, for which a large effect size was found.

SUMMARY

Summary

The three speeding violation groups (no, single and multiple violations) could not be distinguished from each other during the earliest years of life. While there were trends for multivariate group differences in *mid childhood*, the first significant group differences did not emerge until *late childhood*. At this time, significant group differences were found between the multiple speeding violation group and both the single and no speeding violation groups on temperament style (task orientation), behaviour problems (hyperactivity and aggression) and social skills (cooperation and self-control), with the former group exhibiting more difficulties

than the other two groups. Most group differences were teacher-reported, and were within the medium effect size range.

By *early adolescence*, numerous differences were evident between the speeding violation groups. Consistent with earlier findings, the majority of group differences were between the multiple speeding violation group and the other two groups, with the multiple speeding violation group exhibiting more difficulties than the single and no speeding violation groups across a wide range of domains (exhibiting a more difficult temperament style, more behaviour problems, lower social skills, and more school adjustment difficulties). Group differences ranged in strength from small to medium effect sizes, with the most powerful group differences being found for persistence, hyperactivity, antisocial behaviour, empathy and school adjustment.

Interestingly, there were few significant group differences between the speeding violation groups during *mid/late adolescence*. The only significant group differences emerged in the areas of temperament style and behaviour problems. Furthermore, the pattern of group differences was not as consistent as at previous time points. While the multiple speeding violation group was still more problematic than both the other groups on some characteristics (aggression and antisocial behaviour), the single speeding violation group showed some differentiation from the no speeding violation group at this age. For example, like the multiple speeding violation group, the single speeding violation group was found to be more sociable than the no speeding violation group and to engage in higher levels of antisocial behaviour (although not as high as in the multiple speeding violation group). Group differences were relatively small at this developmental stage. However, a medium effect size was found for differences on self-reported antisocial behaviour.

The differentiation of the single speeding violation group from the no speeding violation group continued in *early adulthood*. While the multiple speeding violation group was still generally the most problematic group, the single speeding violation group also exhibited higher levels of antisocial behaviour and higher rates of contact with the criminal justice system than the no speeding violation group. Interestingly, the no speeding violation group displayed more emotional adjustment difficulties (anxiety and depression) than one or both of the other groups at this time.

The domains in which group differences appeared also became more varied at this time. Group differences emerged in some areas of functioning in which differences had been found in earlier developmental stages (behaviour problems, peer relationships), as well as domains that had not been examined before (current life circumstances, contact with the criminal justice system). Most group differences were in the small to medium effect size range, with the exception of police contact for driving offences, which, not surprisingly, was large.

Gender differences in the precursors and correlates of risky driving, crash involvement and speeding violations

As noted earlier, the risky driving, crash involvement and speeding violation groups differed significantly in gender composition. More specifically, young men tended to be over-represented in the most problematic driving groups (high risky driving, multiple crash and multiple speeding violations), while a higher proportion of young women tended to be members of the low problem driving groups (particularly the low risky driving and no speeding violation groups). This gender difference was particularly notable in the high risky driving and multiple speeding violation groups, with more than three-quarters of high risky drivers, and two-thirds of the multiple speeding violation group being young men. These gender differences may have contributed to the group differences found.

While it would have been interesting to examine the precursors and correlates of risky driving, crash involvement and speeding violations separately for young men and women, the small number of women in these groups, particularly in the high risky driving ($n=17$) and multiple speeding violation groups ($n=36$), would have meant that the statistical power of such analyses would have been severely limited, and hence, meaningful results would have been difficult to obtain. Consequently, it was decided not to perform gender-specific analyses.

An alternative approach would have been to statistically control for the influence of gender on risky driving, crash involvement and speeding violations. However, given the clear interconnectedness between gender and the three problematic driving outcomes (particularly risky driving and speeding violations), controlling for the effects of gender was not considered sensible, since this would have effectively cancelled out the very real contribution of gender, and may have resulted in findings of limited relevance to real world settings (Tabachnick and Fidell 1996), where young males are in fact more likely to engage in risky driving behaviour and speeding (Beirness and Simpson 1988; Shope, Lang and Waller 1997). Hence, the effects of gender on risky driving, crash involvement and speeding violations were not controlled in the ATP Young Drivers Study.

5

Similarities and differences in the precursors of risky driving, crash involvement and speeding violations



5 Similarities and differences in the precursors of risky driving, crash involvement and speeding violations

Following the description of group differences at different stages of development, the similarities and differences in the correlates and precursors of risky driving, crash involvement and speeding violations are now examined to determine whether a particular profile may be identified for different types of problematic young drivers. This discussion draws on data already presented in Tables 10-13, 17-18, and 22-25. To aid description of group trends, differences between the risky driving, crash involvement and speeding violation groups are presented pictorially on selected characteristics. Figures 16 through 27 present the mean standardised scores (z-scores³⁶ or adjusted z-scores³⁷) for each of the groups on specific characteristics measured over time.

Group differences in domains relating to individual attributes will be discussed first, followed by domains relating to environmental factors, family characteristics and current life circumstances.

When examining these findings, it is important to remember that risk factors, by themselves, may not be powerfully predictive of problematic outcomes. It is the cumulative impact of multiple risk factors that is often important, and research suggests that the likelihood of an individual exhibiting an adverse outcome increases with the number of risk factors he or she is exposed to (Bond et al. 2000; Loeber and Farrington 2000). However, for those who are interested in determining the relative importance of different attributes or characteristics in predicting problem driving outcomes, the effect sizes provided in the earlier Tables may be used as a guide, with larger effect sizes indicating more powerful predictors.

Individual attributes

Temperament style

Task orientation/persistence difficulties appeared to be characteristic of all types of problem drivers, but particularly those who engaged in high levels of risky driving and/or had been apprehended for speeding on multiple occasions. These difficulties generally first emerged during *mid and late childhood* and persisted into adolescence (Figures 16 and 17), and group differences on this characteristic were moderate in strength.

While individuals who reported having been involved in multiple crashes also tended to be less persistent than those in the single and no crash groups, significant differences on this characteristic did not emerge until adolescence and were within the small effect size range.

36 The z-score transformation makes variables comparable, as it creates new variables which all have a mean of 0 and a standard deviation of 1.

36 The scores presented for the speeding violation and crash involvement groups are adjusted to control for amount of driving exposure.

Figure 16. Teacher-reported differences in task orientation between the risky driving groups over time

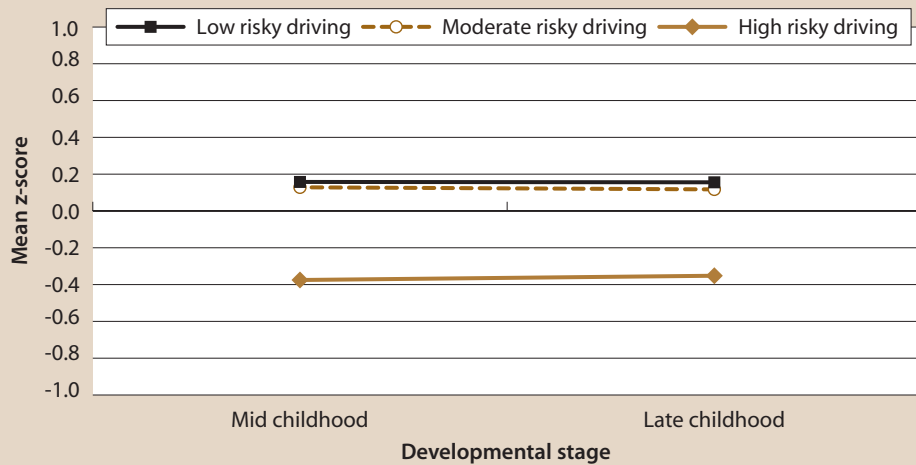
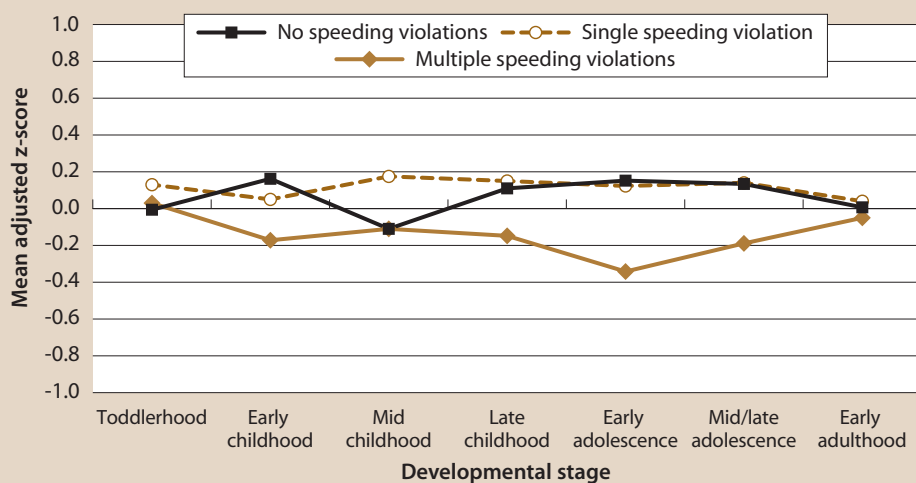


Figure 17. Parent-reported differences in persistence between the speeding violation groups over time



There were also some temperament characteristics that were uniquely associated with particular problem driving outcomes. For example, individuals who had been apprehended for speeding were more likely to be characterised by a sociable temperament style (during *mid/late adolescence*) than other drivers, while those who had been involved in a crash were more reactive (moody, volatile) in *early adulthood* than those who had not. Group differences on sociability were moderate in strength, while those on reactivity were small.

Sensation-seeking and risk-taking

Young adults who engaged in high levels of risky driving behaviour, had been involved in multiple crashes, and/or had been apprehended for speeding on multiple occasions, were not found to be more sensation seeking or attracted to risk taking during adolescence than less problematic drivers.

Behavioural and emotional problems

Rates of externalising (“acting out”) behaviour problems were higher across all types of problem drivers. Thus, the high risky driving group, the multiple crash group and the multiple speeding violation group were all consistently more aggressive and more frequently engaged in antisocial behaviour and multi-substance use than other driver groups (see Figures 18 to 19 for examples). In addition, the moderate risky driving, single crash and single violation groups also exhibited elevated levels of many of these externalising behaviour problems during adolescence and early adulthood, although they were generally less problematic than the high problem driving groups.

Figure 18. Self-reported differences in antisocial behaviour between the risky driving groups across time

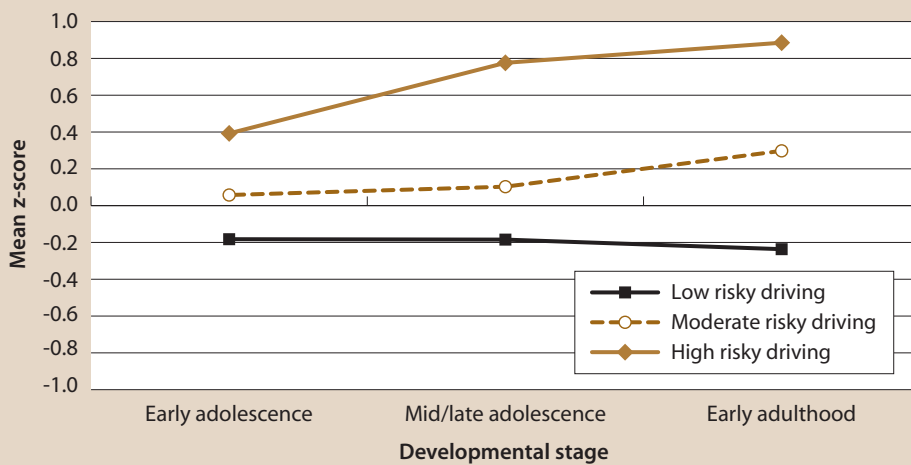
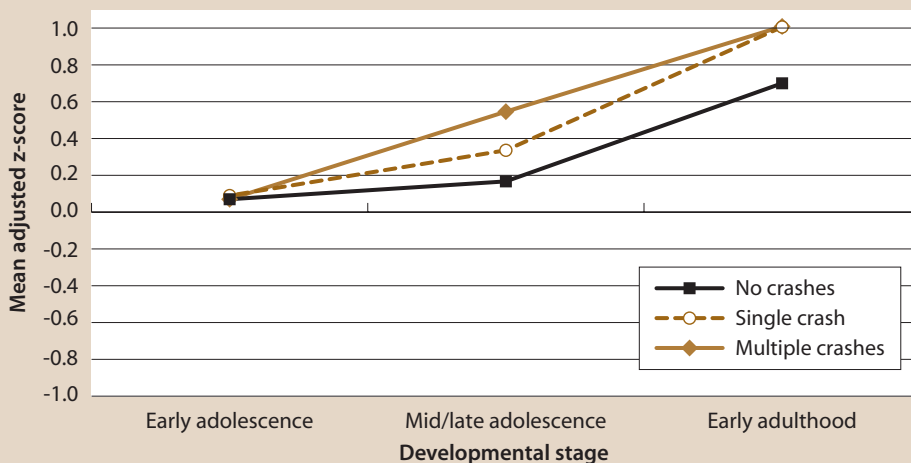
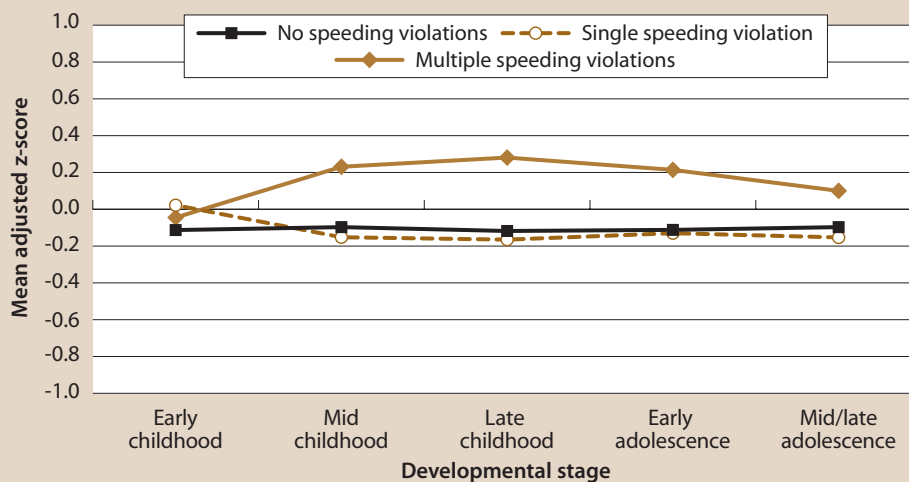


Figure 19. Self-reported differences in multi-substance use between the crash involvement groups across time



High risky drivers and those with multiple speeding violations were typically more hyperactive during childhood (see Figure 20 for an example). However, hyperactivity problems were not associated with crash involvement at any developmental stage, suggesting hyperactivity was an important precursor only for risky driving or speeding violations.

Figure 20. Parent-reported differences in hyperactivity between the speeding violation groups over time



The developmental stages at which group differences on behavioural problems first emerged differed greatly for the three problem driving outcomes. Furthermore, group differences were generally most powerful among the risky driving groups. Group differences ranged in strength from small to large effect sizes, with the strongest differences found on antisocial behaviour.

In general, problem drivers did not differ from other drivers in their levels of internalising behaviour problems (depression, anxiety). However, the moderate risky driving group displayed lower anxiety levels during *early adulthood*, while the multiple violation group was found to be less depressed and less anxious than other drivers at this same developmental stage, perhaps suggesting a more “outgoing” style. Group differences were generally small.

Criminal justice contacts and attitudes

Not surprisingly, higher rates of police contact for driving offences were associated with all types of problem driving outcomes. For each outcome, the most problematic group (the high risky driving, multiple crash and multiple speeding violation groups) reported the highest rate of driving offences during *early adulthood*, while the least problematic groups (the low risky driving, no crash, and no speeding violation groups) reported the lowest number of offences. Group differences on this characteristic were moderate to large in strength.

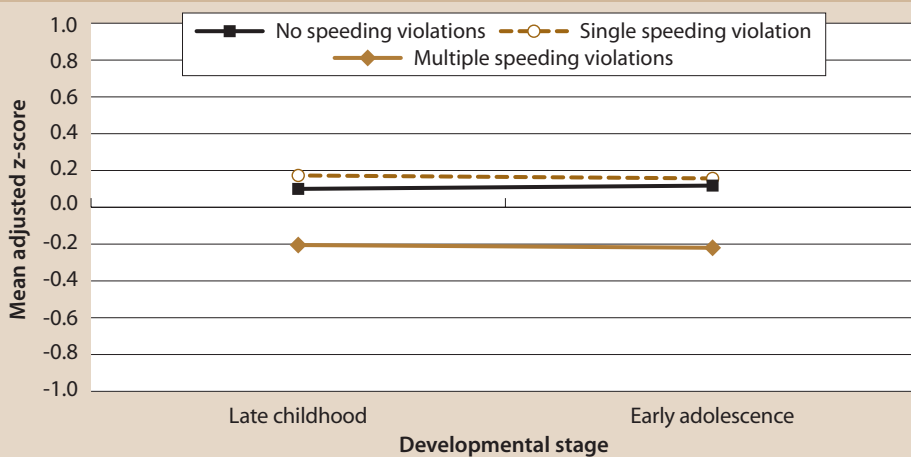
Additionally, individuals who had been apprehended for speeding were more likely than those who had not to have had contact with criminal justice agencies for offences other than driving (as assessed in *early adulthood*). Group differences on this characteristic were small.

Social competence

Both the high risky driving and multiple speeding violation groups appeared to have less well developed social skills than other drivers. However, these deficiencies were more widespread and more consistently evident among high risky drivers than those with multiple speeding offences. For example, while both groups were consistently less cooperative during *late childhood* and *early adolescence* (see example in Figure 21), the high risky driving group was also consistently less responsible and less empathic across adolescence and early adulthood than less risky drivers (see Figure 22).

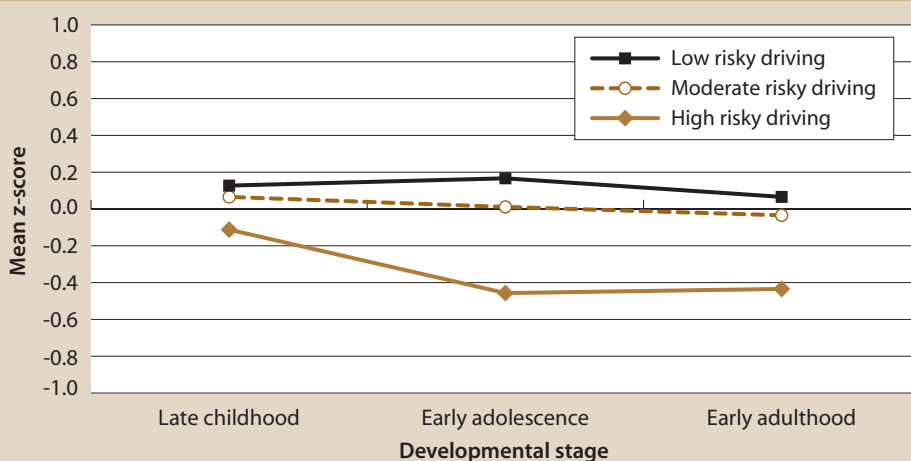
Occasional differences were found between the risky driving and speeding violation groups on other aspects of social competence (self-control, assertiveness among the risky driving groups; self-control and empathy among the speeding violation groups). Group differences were generally small to moderate in size. No aspects of social competence consistently differentiated the crash involvement groups.

Figure 21. Parent-reported differences in cooperation between the speeding violation groups over time



Note: Cooperation was only measured during late childhood and early adolescence.

Figure 22. Self-reported differences in empathy between the risky driving groups over time



Note: Empathy was not measured during mid/late adolescence.

Coping strategies

During *mid/late adolescence*, young adults were asked to indicate how frequently they used certain coping strategies when faced with a problem. Young people who engaged in moderate or high levels of risky driving were more likely to use less adaptive acting out, strategies to cope with problems (for example, using drugs or reacting explosively) than other drivers who were less risky. Similar differences were found between the crash involvement groups. Group differences were within the small to medium effect size range. However, problem drivers did not differ from other drivers in their propensity to use less adaptive coping strategies

that were internally focused (such as wishful thinking or self blame) or more adaptive strategies (for example, seeking support from others, using humour to cope). The speeding violation groups did not differ on this characteristic.

Emotional control

There were no significant differences on this aspect when measured in adolescence and early adulthood.

Civic engagement

Lower levels of civic engagement were associated with risky driving, but not crash involvement or speeding violations. In comparison to low risky drivers, the high risky driving group reported being less involved in their community – they were less likely to attend a public meeting, undertake voluntary or charitable work, sign a petition, or take part in a demonstration) during *early adulthood*. This difference was small in magnitude.

Future aspirations

Problem drivers did not differ significantly from other drivers in their hopes and desires for the future, when this aspect was assessed in *mid/late adolescence*.

Summary of individual precursors

Table 26 provides a summary of the precursors of each of the three problem driving outcomes. As a guide to interpreting this table, a “tick” (✓) indicates that a particular

Table 26. Summary of individual attributes associated with different problem driving outcomes			
Aspect	High risky driving	Multiple crashes	Multiple speeding violations
Temperament style			
Less task persistent	✓	✓	✓
More negatively reactive	✗	✓	✗
More sociable	✗	✗	✓
Behavioural problems			
More aggressive	✓	✓	✓
More hyperactive	✓	✗	✓
More antisocial behaviour	✓	✓	✓
More multi-substance use	✓	✓	✓
Emotional problems			
Less anxious	✗	✗	✓
Less depressed	✗	✗	✓
Social competence			
Less cooperative	✓	✗	✓
Less responsible	✓	✗	✗
Less empathic	✓	✗	✓
Less self-controlled	✓	✗	✓
Coping strategies			
More acting out, less adaptive coping	✓	✓	✗
Criminal justice contacts			
More driving offences	✓	✓	✓
More offences (general)	✗	✗	✓
Civic engagement			
Lower civic engagement	✓	✗	✗

individual characteristic (for example, lower task persistence) was found to be associated with a particular driving outcome (for example, risky driving) at a minimum of one developmental stage, while a cross (✕) indicates that this characteristic was not associated with a particular outcome at any time at which it was assessed.

As Table 26 shows, a greater number of individual attributes were associated with high risky driving and multiple speeding violations, than multiple crash involvement. Furthermore, there were more shared risk factors between the high risky driving and multiple speeding violation groups than between the multiple crash group and the other two groups. While the timing at which these aspects were associated with the different outcomes is not shown, as previously noted, group differences tended to emerge earlier and be more consistent among the risky driving and speeding violation groups than the crash involvement groups.

Social and environmental factors

School adjustment and achievement

Young drivers who engaged in high levels of risky driving and/or had multiple speeding violations were more likely to report experiencing school adjustment difficulties than other drivers. That is, when they were at school, these groups were found to experience more difficulties adhering to school rules and routines, understanding school work, completing assigned work on time and getting along with teachers and classmates, than other students (see Figures 23 and 24). In contrast, school adjustment difficulties did not significantly differentiate young people who reported different levels of crash involvement. School adjustment difficulties emerged earlier among the high risky driving group (*mid childhood*) than the multiple speeding violation group (*early adolescence*), but group differences for both outcomes were equally strong (that is, moderate in strength).

Despite these adjustment difficulties, problem drivers did not significantly differ from other drivers in their actual levels of school achievement (for example, reading ability, overall level of academic competence) when this aspect was assessed in *mid* and *late childhood*.

In addition, a lower level of completed secondary education was uniquely characteristic of those in the multiple speeding violation group. Group differences on this characteristic were moderately strong.

Figure 23. Parent-reported differences in school adjustment difficulties between the risky driving groups over time

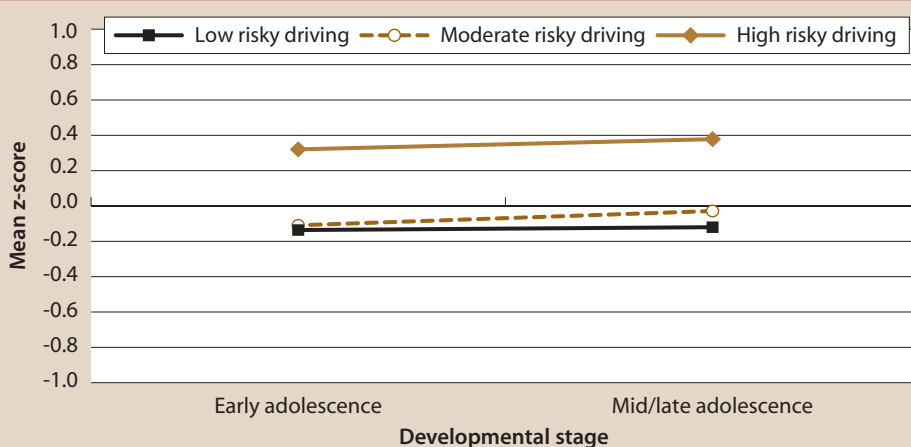
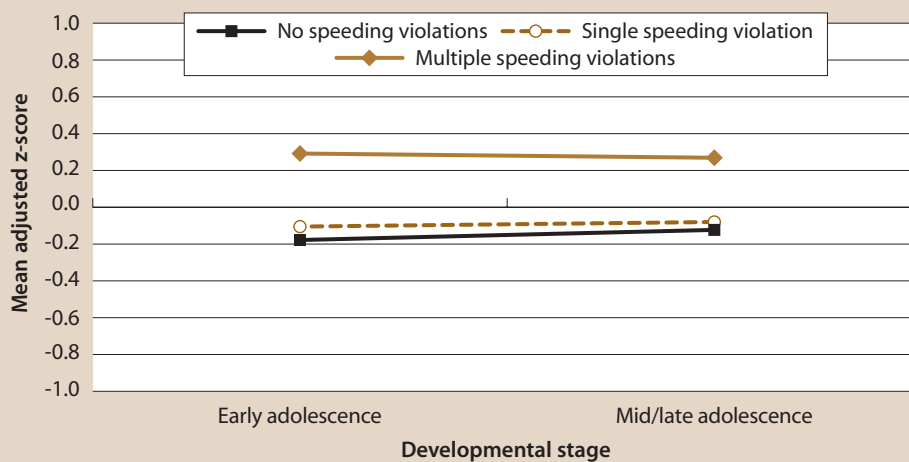


Figure 24. Parent-reported differences in school adjustment difficulties between the speeding violation groups over time



Peer relationships

A tendency to affiliate with peers who were antisocial and/or engaged in substance use was characteristic of all problem drivers, but particularly those who engaged in high levels of risky driving behaviour (see Figures 25 to 27). These friendships were generally evident during adolescence and early adulthood, and group differences ranged in strength from small to large effect sizes.

In terms of other peer-relationship characteristics, poorer quality peer relationships (during early adolescence) were uniquely associated with high risky driving, while high levels of peer communication (during mid/late adolescence) characterised the friendships of the single crash group. Group differences on these characteristics ranged from small (peer communication) to moderate (friendship quality) effect sizes.

Problem drivers did not significantly differ from other drivers in their overall levels of peer attachment, trust, or participation in structured group activities (for example, community clubs, sporting groups).

Figure 25. Self-reported differences in association with antisocial peers between the risky driving groups over time

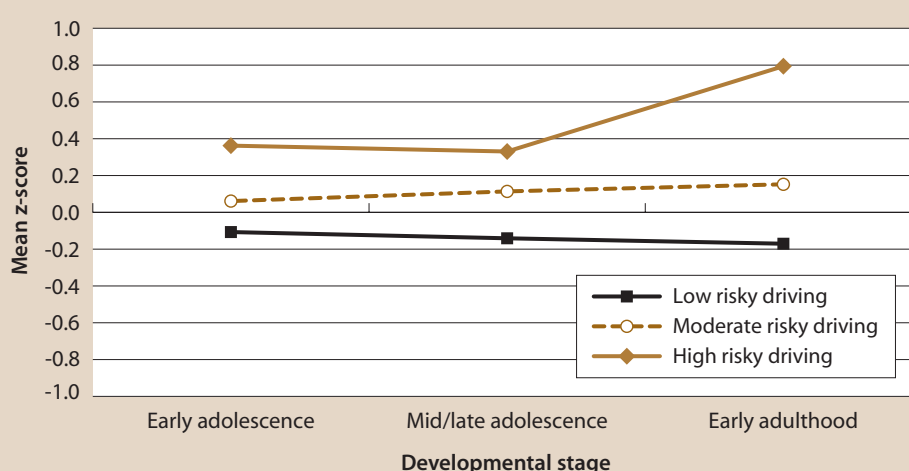


Figure 26. Self-reported differences in association with antisocial peers between the speeding violation groups over time

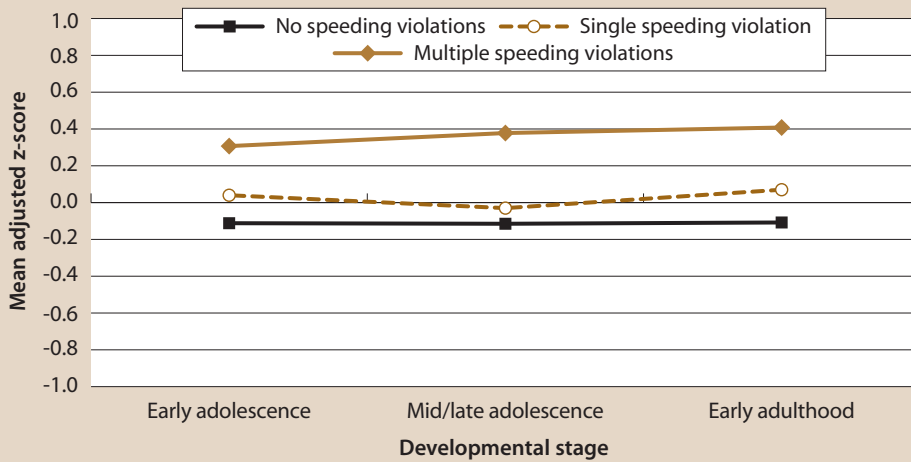
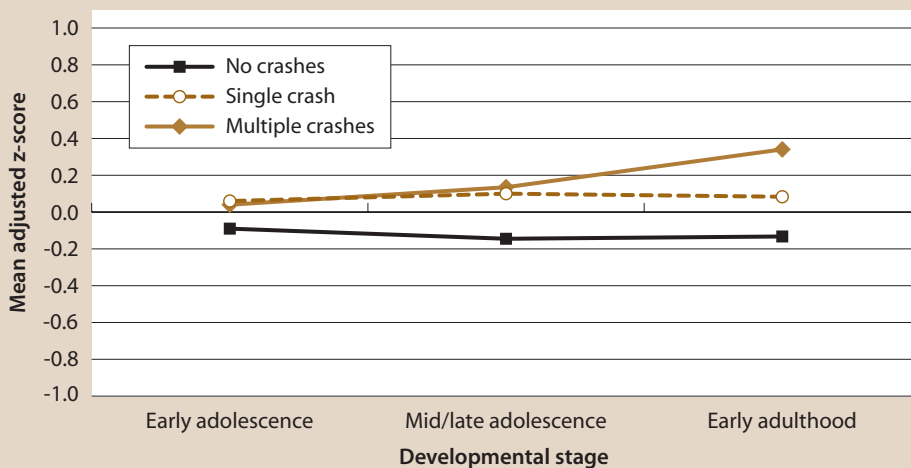


Figure 27. Self-reported differences in association with antisocial peers between the crash involvement groups over time



Parenting practices

Problem drivers did not significantly differ from other drivers in the type of parenting they received during adolescence.

Parental substance use

Levels of parental cigarette and alcohol use did not significantly differentiate problem drivers from other drivers.

Parent-child relationship

Difficulties in relationships between parents and children were characteristic of risky drivers and those who had been involved in multiple crashes. For example, individuals who engaged in high or moderate levels of risky driving reported more difficulties in their relationship with their parents than the low risky driving group during *early adolescence*, while higher levels of conflict between parents and young people were evident among the multiple crash group than the no

crash group during *early adulthood*. All group differences were in the small to medium effect size range.

In addition, the high risky driving group also reported experiencing less warmth in their relationship with their parents (during *mid/late adolescence*), although group differences on this aspect were quite small.

The speeding violation groups did not significantly differ on any characteristics associated with their relationship with their parents at any developmental stage.

Learner driver experiences and current driving behaviour

In terms of learner driver experiences, high levels of stress or conflict when practicing driving (with parents or others) were associated with later crash involvement, but not risky driving behaviour or apprehension for speeding. Group differences on this aspect were within the small effect size range. However, problem drivers did not differ from other drivers in the amount of driving practice they received.

In relation to current driving behaviour, higher driving exposure (more time spent driving) was characteristic of young adults who engaged in high or moderate levels of risky driving, although group differences on this aspect were quite small. As time spent driving was used to control for the effects of exposure on speeding violations and crash involvement, group differences on this variable were not examined as part of the longitudinal analyses. However, it can be reported that the speeding violation groups and crash involvement groups also differed in their amount of driving, with those who had been involved in a crash or been apprehended for speeding reporting that they drove significantly more than other young adults, underscoring the importance of controlling for this variable in analyses.³⁸

Current circumstances

Current family situation

Problem drivers did not significantly differ from other drivers in terms of family socio-economic status (parents' occupational and educational levels); parental unemployment; financial strain; family structure (family size, parental separation/divorce/death, parental marital status); family residential location – urban, regional or rural; family stress; or parental characteristics (parental age and ethnic background).

Current life circumstances

Current employment status and educational status was associated with apprehension for speeding, but not risky driving behaviour or crash involvement. For example, those in the multiple speeding violation group were more likely to be in paid employment than other young adults (59 per cent multiple violation group compared with 33 per cent of single violation group and 27 per cent of no violation group) and were less likely than other young adults to be studying (37 per cent of the multiple speeding violation group compared with 63 per cent of the single violation group and 68 per cent of the no violation group). These group differences were moderate in strength.

³⁸ One-way ANOVAs revealed that those in the multiple and single speeding violation groups drove significantly more each week than those in the no crash group ($F(2, 997) = 17.87$, $p < .001$), while those in the single and multiple crash groups spent more hours driving than the no crash group ($F(2, 1005) = 14.90$, $p < .001$).

However, young adults who engaged in illegal or unsafe driving behaviour did not differ from other drivers in their work histories (constant employment/some unemployment); their current living arrangements (with parents, away from parents), or their current involvement in a romantic relationship.

Summary of social and environmental precursors

Table 27 provides a summary of the precursors of each of the three problem driving outcomes. A tick (✓) indicates that a particular social and environmental characteristic or current life circumstance was found to be associated with a particular driving outcome at a minimum of one timepoint, while a cross (✗) indicates that this characteristic was not associated with a particular outcome at any developmental stage.

As this Table shows, there was considerable variability in the type of environmental characteristics and aspects of young adults' current lives that predicted the different driving outcomes. For example, while aspects relating to school experiences predicted both risky driving and apprehension for speeding, characteristics associated with interpersonal relationships (with parents and peers) were mainly associated with crash involvement and risky driving. Furthermore, there were some characteristics that uniquely predicted the different problem driving outcomes (for example, high stress during driving practice predicted later crash involvement, while a tendency to be in paid employment, and not to be undertaking tertiary study, was associated only with speeding violations).

Aspect	High risky driving	Multiple crashes	Multiple speeding violations
<i>School adjustment and achievement</i>			
More school adjustment problems	✓	✗	✓
Lower level of completed secondary education	✗	✗	✓
<i>Peer relationships</i>			
Higher antisocial peer affiliations	✓	✓	✓
Poorer quality peer relationships	✓	✗	✗
<i>Parent-child relationships</i>			
Poorer quality parent-child relationship	✓	✗	✗
Higher conflict in parent-child relationship	✗	✓	✗
Less warmth in parent-child relationship	✓	✗	✗
<i>Learner driver experiences & current driving behaviour</i>			
Higher stress experienced when practising driving	✗	✓	✗
More time spent driving	✓	NA	NA
<i>Current circumstances</i>			
More likely to be in paid employment	✗	✗	✓
Less likely to be studying	✗	✗	✓
Note: NA = not applicable. As time spent driving was used to control for the effects of exposure on speeding violations and crash involvement, group differences on this variable were not examined.			

Summary

Young adults in the *high risky driving*, *multiple crash*, and/or *multiple speeding violations* groups differed from other drivers on a wide range of domains. For example, in comparison to other drivers they were generally found to:

- be more aggressive and antisocial;
- have a less persistent temperament style;
- use more licit and illicit substances;
- have more friendships with antisocial peers; and
- have higher rates of police contact for driving offences.

In addition, those in the *high risky driving* and *multiple speeding violations* group tended to:

- be more hyperactive;
- be less cooperative; and
- experience more school adjustment difficulties, than other drivers.

Both the *high risky driving* and *multiple crash groups* also tended to:

- use less adaptive, acting out coping strategies; and
- experience more parent–child relationship difficulties than others.

While there was a considerable overlap between the predictors and correlates of risky driving, crash involvement and speeding violations, the strength of these predictors varied between outcomes, as did the timing in which group differences emerged. Group differences tended to be more powerful, more consistent, and emerge earlier among the risky driving groups and the speeding violation groups than the crash involvement groups.

There were also some individual attributes and environmental characteristics that uniquely predicted particular problem driving outcomes. For example, *high risky drivers* also tended to be characterised by poorer quality peer relationships and lower levels of responsibility, empathy, and civic engagement, while those with who had been involved in *multiple crashes* were generally more reactive (moody, volatile) and reported experiencing more stress and conflict when learning to drive than other drivers. Those with *multiple speeding violations*, on the other hand, were generally characterised by higher levels of sociability, lower anxiety and depression, higher rates of contact with the criminal justice system, higher rates of paid employment and lower levels of current and past education.

These implications of these findings will be discussed later in Section 7.

Overlap in membership of the three most problematic driving groups

As there were similarities between the correlates and precursors of the three problem driving outcomes (high risky driving, multiple crash and multiple violation), the degree of overlap in these groups was examined to determine whether an overlap in group composition might have influenced these findings. If the same individuals were found in the high risky driving, multiple violation and multiple crash groups, then the similarity evident between the predictors of these three outcomes would not be surprising.

This examination found that the majority of problem drivers were from one problem driving group only. Thus, 70 per cent of the multiple crash group had not engaged in high levels of risky driving or been apprehended for speeding on multiple occasions; 62 per cent of the speeding violation group reported high levels of this type of unsafe behaviour only; and 54 per cent of the high risky driving group engaged only in high levels of risky driving. However, as Table 28 shows, there was some overlap between high risky driving and other problem driving outcomes. For example, a little under half (46 per cent) of the young drivers in the high risky driving group reported that they had been involved in multiple crashes and/or been apprehended on multiple occasions for speeding. Group overlap was also found for the multiple crash and multiple speeding violation groups, although the clear majority of participants in both groups did not report other unsafe driving behaviours. Only a small number (n=6) belonged to all three problematic driving groups.

Table 28. Overlap between the problem driving groups

Combinations of outcomes	High risky driving		Multiple crashes		Multiple speeding violations	
	n	%	n	%	n	%
High on this outcome only	37	54.4	94	70.7	69	62.2
High risky driving & multiple speeding violations	14	20.6	--	--	14	12.6
High risky driving & multiple crashes	11	16.2	11	8.3	--	--
Multiple speeding violations & multiple crashes	--	--	22	16.5	22	19.8
High on all	6	8.8	6	4.5	6	5.4

These findings offer a partial explanation for the similarity of the profiles of the high risky driving, multiple crash and multiple speeding violation groups, as they suggest that, to a certain extent, the findings resulted from having some of the same young adults in each of the groups. However, it should be noted that the majority in the high risky driving, multiple crash and multiple speeding violation groups did not exhibit other problem behaviours. Hence it is likely that other factors, in addition to a possible common factor which the problem driving groups shared, are primarily responsible for these findings.

6

Relationship between unsafe driving and other problem behaviours



6 Relationship between unsafe driving and other problem behaviours

An important issue is taken up in this next section – namely, the degree to which unsafe driving is associated with other types of problem behaviours. As outlined earlier, it has been suggested that many problem behaviours (such as antisocial behaviour, substance use, other risk-taking behaviours) are related to each other, and may be caused by a common underlying trait or propensity for problem behaviour. According to this view, certain forms of unsafe driving (such as risky driving) should not be viewed as isolated problems, but rather as manifestations of a broader problem behaviour syndrome (Crettenden and Drummond 1994; Jessor 1987; Newcomb and McGee 1991; Swisher 1988; Williams 1998; Wilson and Jonah 1988).

If this theory is correct, then it would be expected that the pathways to these forms of unsafe driving would be similar to those found for other types of problems, such as antisocial behaviour and substance use. This would have important intervention and prevention implications, as it would mean that appropriately targeted efforts could have a broad impact, reducing a range of problematic behaviours. Nevertheless, without sound research evidence, a broad behaviour syndrome should not be assumed to account for unsafe driving behaviour.

In this section, the relationship between unsafe driving and other problem behaviours is explored by: investigating the similarity between the precursors of unsafe driving and those of other problem behaviours (that is, antisocial behaviour and substance use); examining rates of problem behaviours among unsafe drivers; exploring the connections between problem behaviours in adolescence and later unsafe driving behaviour in early adulthood; and determining whether there are specific risk factors for different combinations of problem behaviours in adulthood.

For the purposes of this examination, levels of risky driving (low, moderate or high) are used to indicate unsafe driving. This variable was selected as it encompasses a wide range of unsafe driving behaviours (speeding, failure to wear a seat-belt or helmet, driving when very tired or when under the influence of alcohol or illicit drugs) and is positively associated with negative driving outcomes (crash involvement and speeding violations).

Substance use (alcohol and marijuana use) and antisocial behaviour are the other problem behaviours examined here. These variables were selected due to their prevalence in this age group, the adverse effects they may have on an individual's life, and their close association with one another, which suggests they may reflect a broader underlying syndrome (Jessor 1987; Newcomb and McGee 1991).

Overlap between the precursors of risky driving and other problem behaviours

In order to examine the relationship between risky driving and other problem behaviours, the similarity between the longitudinal precursors of risky driving, antisocial behaviour and substance use was examined to see if similar personal

and/or environmental characteristics predicted each type of outcome. For the purposes of this comparison the precursors of high risky driving identified earlier in this report were used, while precursors of antisocial behaviour and substance use were drawn from previous Australian Temperament Project (ATP) research.

The precursors of adolescent antisocial behaviour were reported as part of the collaborative project between the Australian Institute of Family Studies and Crime Prevention Victoria (see Vassallo et al. 2002 for further details).

In the first of a series of reports from this collaborative project,³⁹ three distinct patterns of adolescent antisocial behaviour were identified using adolescents' reports of their own antisocial behaviour between the ages of 13 and 18 years. The most problematic of these was a "*Persistent*" pattern of adolescent antisocial behaviour, which was characterised by high levels of antisocial behaviour⁴⁰ at multiple time points over adolescence. Individuals who engaged in *Persistent* adolescent antisocial behaviour could be distinguished from those who consistently engaged in little or no antisocial behaviour over adolescence (a *Low/non antisocial* pattern) from as early as five to six years of age. Group differences typically centred on individual characteristics (such as temperament style, externalising behaviour problems, social skills, coping styles and attraction to risk taking) as well as aspects of peer relationships and school adjustment. However, some family environment characteristics also differentiated the *Persistent* and *Low/non antisocial* groups. Group differences were generally to the disadvantage of the *Persistent* group.

The precursors of adolescent substance use are taken from a report commissioned by the Ross Trust (Williams et al. 2000). As part of a series of in-depth analyses, ATP participants who engaged in multiple licit and/or illicit substance use⁴¹ during mid-adolescence were compared to the remainder of the ATP sample on a wide range of characteristics, at each survey wave, to identify precursors for the adolescent multi-substance use. These analyses revealed that adolescents who became multi-substance users could be differentiated from the rest of the sample from as early as infancy. More specifically, multi-substance users generally had more problematic personal characteristics (such as a more "difficult" temperament style, higher aggression and depression) and experienced poorer quality peer relationships than other young people. They also tended to be more sociable and less fearful.

The risk factors identified for high risky driving, persistent adolescent antisocial behaviour and multi-substance use are summarised in Table 29. As a guide to interpreting this table, a "tick" (✓) indicates that a particular characteristic (activity) was found to be a precursor of a specific outcome (persistent adolescent antisocial behaviour), while a cross (✗) indicates that this characteristic was not associated with the outcome in question. For example, the temperament characteristic of "negative reactivity" was found to be a precursor of persistent adolescent antisocial behaviour but not high risky driving or multi-substance use.

39 The first two reports from this collaborative project can be accessed from AIFS website at www.aifs.gov.au/atp/pubs or by phoning Crime Prevention Victoria on (03) 9651-6933. A third report is to be released in 2005.

40 Three or more different antisocial acts in the past 12 months (or in the past month for illicit substance use).

41 Multi-substance use was defined by the presence of at least four of the following six criteria at 15-16 years of age: (i) smoking tobacco on 3 or more occasions in the past month; (ii) drinking alcohol on three or more occasions in the past month; (iii) drinking to intoxication on one or more occasions in the past month; (iv) any marijuana use in the past month; (v) any substance sniffing; and (vi) any use of illicit drug such as heroin, cocaine, speed or designer drugs.

As Table 29 shows, there was considerable overlap in the precursors of high risky driving, persistent adolescent antisocial behaviour and multi-substance use. For example, approximately one-fifth of the precursors listed in Table 29 predicted all three outcomes. Common predictors were found in the domains of temperament style (task persistence), behaviour problems (aggression, hyperactivity), school

Table 29. Overlap between the precursors of high risky driving behaviour, persistent adolescent antisocial behaviour and adolescent multi-substance use			
Precursors	Risky driving^a	Antisocial behaviour^b	Substance use^c
<i>Temperament/Personality</i>			
■ Task persistence	✓	✓	✓
■ Negative reactivity	✗	✓	✗
■ Activity	✗	✓	✓
■ Approach/withdrawal	✗	✗	✓
<i>Behaviour Problems</i>			
■ Aggression	✓	✓	✓
■ Hyperactivity	✓	✓	✓
■ Anxiety	✗	✓	✗
■ Depression	✗	✓	✓
<i>Social Competence</i>			
■ Assertiveness	✗	✓	✓
■ Cooperation	✓	✓	✗
■ Empathy	✓	✓	✗
■ Responsibility	✓	✓	✗
■ Self-control	✗	✓	✓
<i>Other Individual Attributes</i>			
■ Civic mindedness/engagement	✓	✓	✗
■ Emotional control	✗	✓	✓
■ Sensation-seeking	✗	✓	✓
<i>School Adjustment</i>			
■ School readiness at 5-6 yrs	✓	✗	✗
■ School difficulties in adolescence	✓	✓	✓
<i>Parenting Practices</i>			
■ Supervision / Monitoring	✗	✓	✗
■ Harsh discipline	✗	✓	✓
■ Warmth of relationship	✓	✓	✗
■ Attachment to parents	✓	✓	✓
<i>Parental Substance Use</i>			
■ Father's substance use	✗	✓	✓
■ Mother's Substance use	✗	✓	✓
<i>Peer Relationships</i>			
■ Antisocial peer affiliations	✓	✓	✓
■ Participation in organised activities	✗	✓	✓
■ Attachment to peers	✗	✓	✓
■ Friendship quality	✓	✗	✓
■ Peer involvement	✗	✗	✓
Note: ^a risky driving = high risky driving behaviour at 19-20 years. ^b antisocial behaviour = persistent antisocial behaviour between the ages of 13 and 18 years. ^c substance use = multi-substance use at 15 to 16 years of age.			

adjustment (school adjustment difficulties), peer relationships (friendships with antisocial peers) and parent–child relationships (attachment to parents).

The highest degree of overlap was evident between the precursors of persistent adolescent antisocial behaviour and multi-substance use, which may in part be due to the time period at which these variables were measured. Antisocial behaviour and substance use were both measured during adolescence (13-18 years and 15-16 years, respectively), whereas risky driving was measured later, when participants were aged 19-20 years. More than half (55 per cent) of the predictors listed were common to both of the outcomes. However, there was also substantial overlap between the precursors of high risky driving and persistent adolescent antisocial behaviour (38 per cent of precursors in common), and to a lesser extent, high risky driving and multi-substance use (24 per cent in common). Interestingly, school readiness in early childhood (how well a child adapts to the transition to primary school) was the only characteristic that uniquely predicted high risky driving behaviour.

Fewer risk factors were identified for high risky driving than for persistent adolescent antisocial behaviour or multi-substance use. For example, whereas several temperament factors were identified as predictors of persistent adolescent antisocial behaviour and/or multi-substance use, only one temperament factor (persistence) was identified as a precursor of high risky driving. Similarly, more characteristics associated with interpersonal relationships (peer and parent–child) predicted persistent adolescent antisocial behaviour and/or multi-substance use, than high risky driving. However, as noted above, risky driving was measured at a later age than these other problem outcomes (early adulthood compared with adolescence), and the longer time span between risks and outcome for risky driving, may have contributed to the fewer number of precursors identified.

Taken together, these findings offer partial support for Problem Behaviour Theory (Jessor and Jessor 1977; Jessor 1987), as they suggest that high risky driving, persistent adolescent antisocial behaviour and multi-substance use are somewhat interrelated in terms of their precursors. However, it should be noted that high risky driving did not share as many precursors with multi-substance use or persistent adolescent antisocial behaviour as these problem behaviours did with each other; and the degree of overlap between the outcomes was not absolute.

Thus, these findings suggest that while some common factors may contribute to the development of these three problem behaviours (particularly persistent antisocial behaviour and multi-substance use), it is likely that some unique attributes or factors also play a role in their etiology. Consequently, the precursors and correlates of high risky driving, persistent adolescent antisocial behaviour and multi-substance use should not be assumed to be the same, and hence, need to be examined separately from each other.

SUMMARY

Summary

In summary, there was some overlap in the precursors of high risky driving, persistent adolescent antisocial behaviour and multi-substance use, with aspects of temperament style, behaviour problems, school adjustment, peer relationships and the parent–child relationship, predicting all three outcomes. The highest degree of overlap was between the precursors of persistent adolescent antisocial behaviour

and multi-substance use, although there was considerable overlap between the precursors of high risky driving and persistent adolescent antisocial behaviour, and to a lesser extent, high risky driving and multi-substance use. Only one risk factor uniquely predicted high risky driving (school readiness in mid childhood).

There were fewer risk factors for high risky driving than the other problem outcomes. This was particularly evident in the domains of temperament style and interpersonal relationships. However, as risky driving was measured later than antisocial behaviour and substance use, it is possible that the longer time span between risks and outcomes may have partly accounted for these findings.

While the findings were seen to partially support Problem Behaviour Theory (Jessor and Jessor 1977; Jessor 1987), given the differences between the precursors of these outcomes, the need to also examine separately the etiology of high risky driving, persistent adolescent antisocial behaviour and multi-substance use was highlighted.

The co-occurrence of problem behaviours at 19-20 years

Connections between risky driving and other problem behaviours were next investigated to determine whether individuals who engaged in high levels of risky driving were also more often involved in substance use and antisocial behaviour.⁴²

Substance use

Formation of groups

Problematic substance use was defined in terms of alcohol and marijuana use at 19-20 years of age, as there were insufficient numbers to investigate the use of other illicit substances such as ecstasy, amphetamines or heroin⁴³. Participants completed questions about the number of days during the past month in which they had used alcohol or marijuana, as well as questions about harms associated with such use (for example, trouble at work, injury, violence, dependence). Further details of the measures used may be found in Appendix 2. Both types of information (pattern of daily use and harms associated with use) were used to form low, moderate and high “Alcohol Use” and “Marijuana Use” groups.

The criteria used to select the groups, and the characteristics of the groups, are summarised in Table 30. To investigate whether use of both types of substances conveyed a heightened risk for risky driving, four groups with differing patterns of substance use were formed, using the criteria described in Table 30. These were: no substance use, marijuana use only, alcohol use only, and use of both substances. The criteria used, and the characteristics of the groups, are summarized in Table 31.

⁴² For reader interest, the relationship between unsafe driving and anxiety and depression were also examined. However, no significant relationships were found between risky driving and these types of problems.

⁴³ Only 84 individuals (7.3 per cent) reported the recent use of one or more of such substances.

Table 30. Definition and composition of alcohol and marijuana use groups at 19-20 years

Groups	N	% sample	% male
Alcohol			
■ No/Low - Use on less than 5 days in past month, no/low harms	474	50.6	36.3
■ Moderate - Use on 5-9 days in past month & low or moderate harms	218	23.4	45.6
■ High - Use on 10+ days & low to high harms	239	25.7	57.3
Marijuana			
■ No/Low - Use on less than 5 days in past month, no harms	947	90.7	42.6
■ Moderate - Use on 5+ days in past month and no harms	36	3.4	47.2
■ High - Use on 5+ days in past month and some harms	61	5.8	62.3

Note: Some individuals were excluded from the alcohol use/harms and marijuana use/harms groups as they did not fit the criteria developed (e.g. low use but reported harms; high use but no reported harms).

Table 31. Definition and composition of combined substance use groups at 19-20 years

Groups	N	% sample	% male
No - No / low alcohol and no/low marijuana use	424	49.1	36.1
Marijuana only - Moderate / high marijuana use; no /low alcohol use	19	2.2	36.8
Alcohol only - Moderate / high alcohol use; no / low marijuana use	355	41.4	50.1
Both - Moderate / high use of both substances	65	7.5	60.0

Findings

Individuals who engaged in high risky driving behaviour had significantly higher rates of *alcohol*⁴⁴ and *marijuana*⁴⁵ use than individuals whose driving pattern was less risky. Approximately 60 per cent of individuals in the moderate and high risky driving groups were moderate or high alcohol users, compared with 44 per cent of those in the low risky driving group (see Figure 28). In addition, while the great majority of individuals in all three risky driving groups were no / low marijuana users (ranging from 77 to 94 per cent), there were higher rates of moderate and high marijuana use among individuals in the moderate and high risky driving groups (Figure 29).

Odds ratios can be used to assess the likelihood of a particular outcome (for example, high levels of substance use) occurring if a certain factor (in this case, high risky driving) is present. The odds ratio is thus an estimate of the degree to which an individual who displays the risk factor under study is likely to display the other outcome, as compared to someone who does not display the risk factor⁴⁶. With regards to high alcohol use, the odds ratios indicated that high risky drivers were twice as likely as low risky drivers to be high alcohol users, while moderate risky drivers were 1.8 times more likely to be high alcohol users than low risky drivers⁴⁷. With regard to

44 $\chi^2 (4) = 23.05$; $p < .001$.

45 $\chi^2 (4) = 28.19$; $p < .001$.

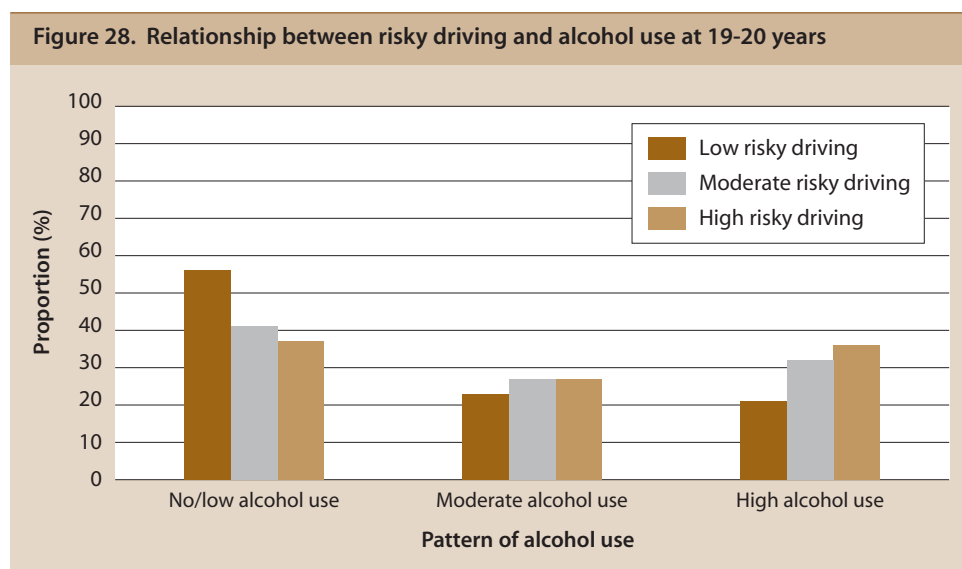
46 The odds ratio obtained for a variable denotes the change in the odds of being in the outcome group (for example, marijuana use) for each change in the level of that variable (for example, risky driving). An odds ratio of 1 represents no change in risk (odds are the same at any level of the variable). Odds ratios significantly greater than 1 indicate an increased risk at increased levels of the variable, whilst odds ratios smaller than 1 indicate a decreased risk at higher levels of the variable. For example, with regard to marijuana use, the odds ratios suggest that as propensity to engage in risky driving increases, marijuana use increases.

47 Odds ratio for the comparison of high and low risky driving groups on high alcohol use OR = 2.12, CI (1.18 - 3.79); and for the comparison of moderate and low risky driving groups OR = 1.81, CI (1.30 - 2.52).

marijuana use, high risky drivers were four times more likely than low risky drivers to engage in high levels of marijuana use, while moderate risky drivers were 2.6 times more likely to be high marijuana users than low risky drivers⁴⁸.

Turning now to young adults' use of both alcohol and marijuana⁴⁹ (shown in Figure 30), more than half of the low risky driving group (56 per cent) were no/low users of both substances, while in contrast around two-thirds of moderate (62 per cent) and high (69 per cent) risky drivers reported moderate or high use of alcohol, marijuana, or both substances. For example, approximately half the moderate and high risky drivers were alcohol users only, while almost 20 per cent of high risky drivers used both alcohol and marijuana, double the rate among moderate risky drivers (10 per cent) and four times the rate of low risky drivers (5 per cent).

The odds ratios revealed that high and moderate risky drivers were almost twice as likely as low risky drivers to be moderate/high alcohol users only⁵⁰ (that is, not moderate/high marijuana users as well). With regard to moderate/high use of both alcohol and marijuana, high risky drivers were more than six times more likely than low risky drivers to have engaged in both types of substance use, while moderate risky drivers were 2.8 times more likely to have engaged in moderate/high use of both substances⁵¹. This finding suggests that use of both types of substances was indeed more characteristic of the high risky driving group than the moderate and low risky driving groups. Due to the low numbers of individuals who were high marijuana users only (N = 19 across all three driving groups), odds ratios for this type of substance use could not be reliably completed.



48 Odds ratio for the comparison of high and low risky driving groups on high marijuana use: OR=4.17, CI (1.77- 9.82); and for the comparison of moderate and low risky driving groups: OR = 2.60, CI (1.43-4.73).

49 χ^2 (6) = 40.63; p <.001.

50 Odds ratio for the comparison of high and low risky driving groups on moderate/high alcohol use but not moderate/high marijuana use OR = 2.12, CI (1.08 - 4.19); and for the comparison of moderate and low risky driving groups on this outcome OR = 1.89, CI (1.36 - 2.62).

51 Odds ratio for the comparison of high and low risky driving groups on moderate/high alcohol use and moderate/high marijuana use OR = 6.71, CI (2.68 - 16.83); and for the comparison of moderate and low risky driving groups OR = 2.77, CI (1.49 - 5.12).

Figure 29. Relationship between risky driving and marijuana use at 19-20 years

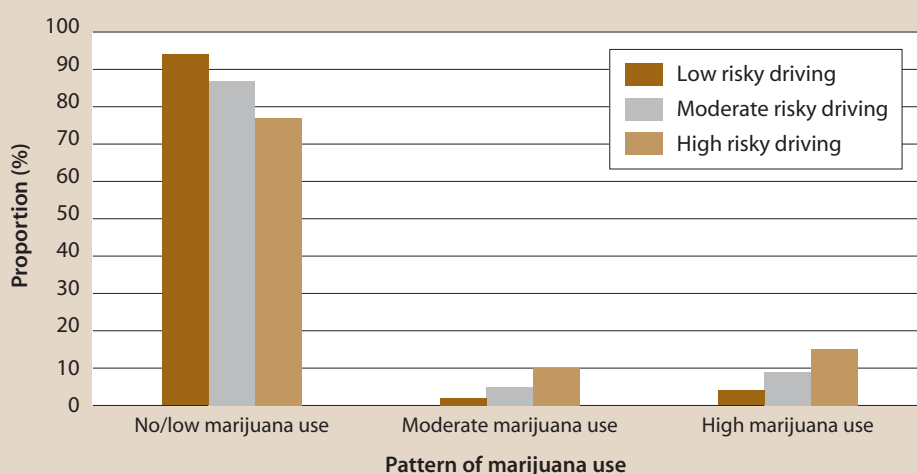
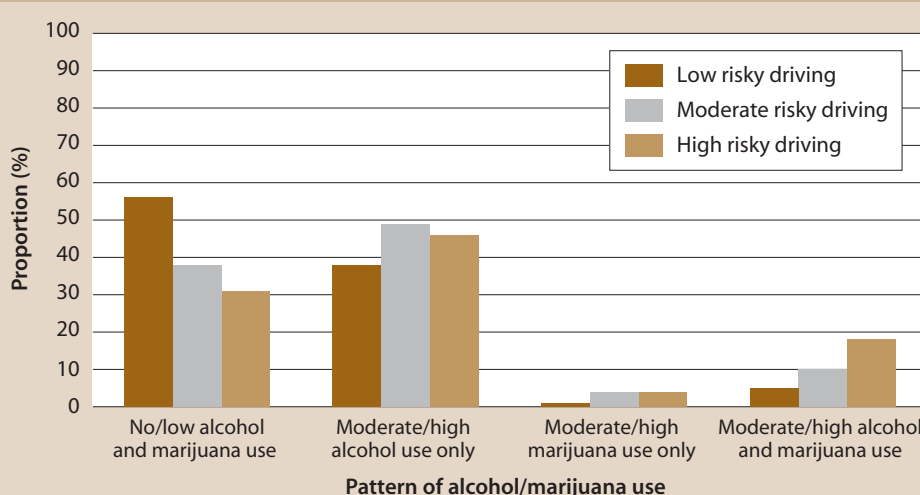


Figure 30. Relationship between risky driving and combined alcohol and marijuana use at 19-20 years



Antisocial behaviour

Formation of groups

Questions concerning involvement in *violence* (for example, fighting, assault), *property offences* (for example, vandalism, stealing), and *authority transgressions* (for example, obtaining benefits to which one was not entitled, passing fake cheques) were used to measure antisocial behaviour at 19-20 years⁵². The items used were drawn from the Self Report of Delinquency Scale (Moffitt and Silva 1988), with additional items added to assess newly emerging types of antisocial acts (for example, illegally accessing a computer system or network). Details of the questions used can be found in Appendix 3. Individuals were classified as showing high levels of antisocial behaviour if they reported engaging in three or more different types of antisocial acts during the previous 12

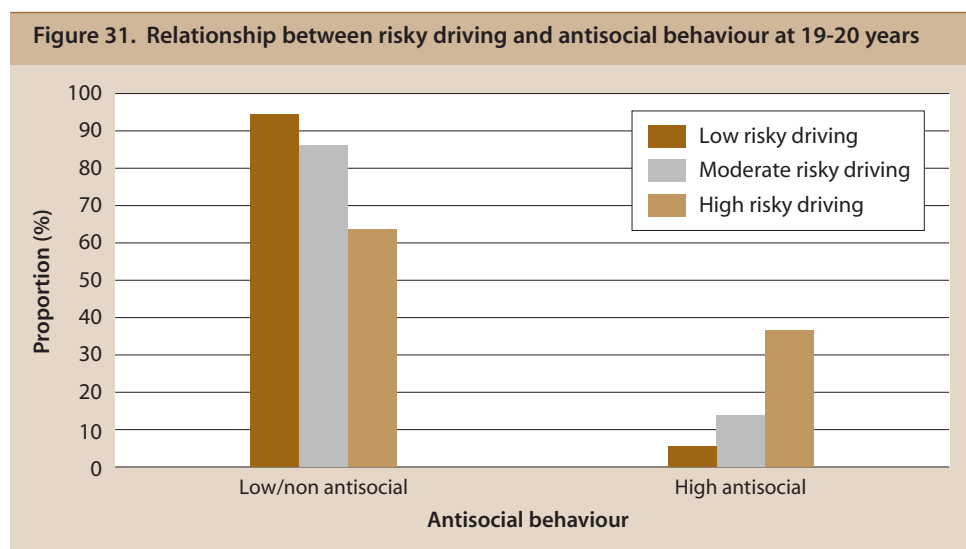
⁵² In these analyses, illicit substance use was not included as an indicator of antisocial behaviour, in contrast to much other research into antisocial behaviour.

months,⁵³ while those who reported fewer than three different antisocial acts within this time span were classified as showing low levels of antisocial behaviour. Using this criterion, two groups were formed, as described in Table 32.

Table 32. Definition and composition of antisocial behaviour groups at 19-20 years			
Groups	N	% sample	% male
Low/non antisocial	1022	89.8	41.0
High antisocial	116	10.2	71.6

Findings

Antisocial behaviour was clearly associated with risky driving, as shown in Figure 31. Considerably more high risky drivers (36 per cent) had engaged in high levels of antisocial behaviour, than moderate (14 per cent) and low (6 per cent) risky drivers. The association between high risky driving and high levels of antisocial behaviour appeared to be very powerful, with high risky drivers being found to be approximately nine times more likely than low risky drivers to engage in high levels of antisocial behaviour, according to the odds ratio analyses, and moderate risky drivers also at heightened likelihood of antisocial behaviour (odds ratio of 2.7)⁵⁴.



SUMMARY

Summary

In summary, these findings suggest that individuals who engage in high levels of risky driving behaviour also tend to exhibit higher levels of other problem behaviours during early adulthood than young people who engage in little or no risky driving behaviour. For example, about 70 per cent of high risky drivers reported moderate

53 The cutoff of three or more antisocial acts in the past year is consistent with the criteria for Conduct Disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association 1994).

54 Odds ratio for the comparison of high and low risky driving groups on antisocial behaviour OR = 9.63, CI (5.42-17.12); and for the comparison of moderate and low risky driving groups OR=2.68, CI (1.69-4.25).

or high use of alcohol, marijuana, or both substances (compared with 44 per cent of low risky drivers). More than one-third engaged in high levels of antisocial behaviour (compared with 14 per cent of moderate risky drivers only 6 per cent of low risky drivers).

While the majority of high risky drivers did not engage in marijuana use or antisocial behaviour (although many engaged in moderate or high alcohol use) rates of substance use and particularly antisocial behaviour were generally substantially higher among the high risky driving group, as indicated by odds ratios.

Connections between problem behaviours in adolescence and driving behaviour at 19-20 years

Connections between problem behaviours in adolescence and risky driving patterns in early adulthood were next investigated, to determine whether adolescent problem behaviours were predictive of risky driving behaviours at 19-20 years.

Substance use

Formation of groups

To investigate this question, groups of adolescents with differing across-time patterns of alcohol and marijuana use were identified⁵⁵. First, patterns of alcohol and marijuana use at each time point (13-14, 15-16 and 17-18 years) were examined and adolescents were classified as engaging in no/low⁵⁶ or moderate/high⁵⁷ substance use each time point. With regard to alcohol consumption, 6.8 per cent were classified as moderate/high alcohol users at 13-14 years, 22.6 per cent at 15-16 years and 38.1 per cent at 17-18 years. A total of 6.4 per cent were classified as marijuana users at 13-14 years, 14.0 per cent at 15-16 years and 19.9 per cent at 17-18 years.

Second, patterns of use across the three time points were inspected to identify groups with differing across-time trajectories of use. Based on adolescents' reported levels of alcohol and marijuana use at each time point, three groups were identified for each substance type (alcohol, marijuana). These were: *stable low* – these individuals had engaged in low/no use of the substance at all time points; *experimental* – these individuals engaged in moderate or high use of the substance during early to mid adolescence and then ceased this level of use; and *stable high* – these individuals engaged in moderate or high levels of use of the substance at two or more time points, including 17-18 years. Some individuals did not fit these across-time patterns and were therefore excluded. Further details relating to the formation of these groups are available in Appendix 4. Table 33 summarises the characteristics of these groups.

55 Slightly different criteria were used to assess levels of substance use across the three adolescent survey waves (13-14 years, 15-16 years, and 17-18 years). The criteria were designed to take into account the normative increase in substance use that occurs across adolescence.

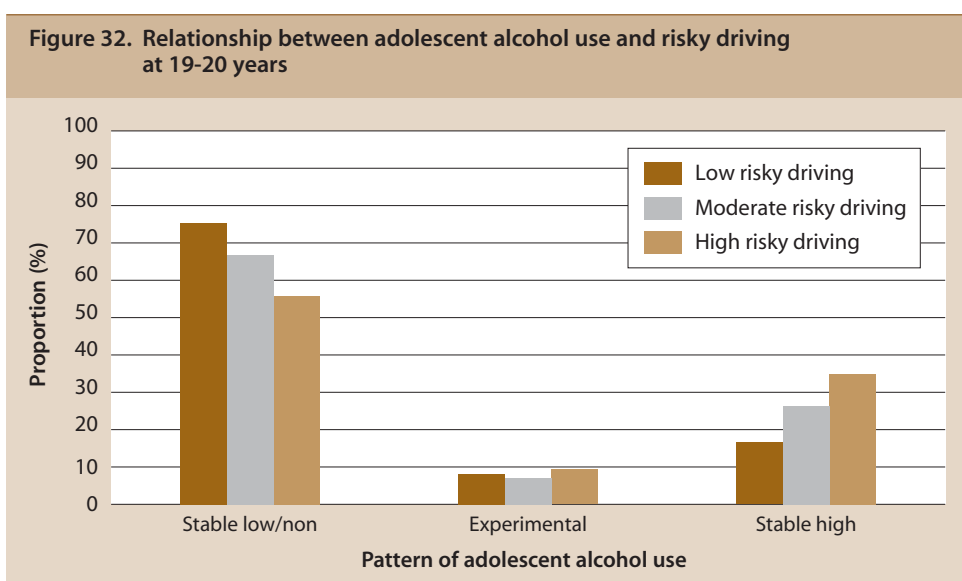
56 For alcohol, low/no use was defined as consumption of alcohol on 0-3 days in the past month at the 13-14 and 15-16 year survey waves, and as consumption of alcohol on 0-4 days in the past month at 17-18 years. For marijuana, low/no use was defined as no lifetime use at the 13-14 year survey wave; and as no use in the past month at the 15-16 and 17-18 year waves.

57 For alcohol, moderate/high use was defined as consumption of alcohol on 4 or more days in the past month at 13-14 and 15-16 years, and as consumption of alcohol on 5 or more days in the past month at 17-18 years. For marijuana, moderate/high use was defined as any lifetime use at 13-14 years; and as any use in the past month at the 15-16 and 17-18 years survey waves.

Table 33. Characteristics of adolescent substance use groups			
Groups	N	% sample	% male
Alcohol			
Stable low/non	664	56.9	41.3
Experimental	69	5.9	40.6
Stable high	186	15.9	51.5
Marijuana			
Stable low/non	831	71.2	44.3
Experimental	77	6.6	37.7
Stable high	83	7.1	49.4

Findings

Adolescent *alcohol* use was significantly related to later risky driving behaviour⁵⁸. Young people who reported high levels of risky driving behaviour were more likely to have engaged in “stable high” levels of alcohol use during adolescence (35 per cent) than those whose driving pattern was less risky (26 per cent of moderate risky drivers and 17 per cent of low risk drivers), as can be seen in Figure 32. Additionally, fewer high risky drivers engaged in “stable low” levels of alcohol use during adolescence. Nevertheless, the majority of risky drivers (about two-thirds) had not been moderate/high users of alcohol over adolescence. The odds ratios indicated that high risky drivers were almost three times more likely to have engaged in stable high alcohol use over adolescence than low risky drivers, while moderate risky drivers were almost twice as likely to have done so⁵⁹.



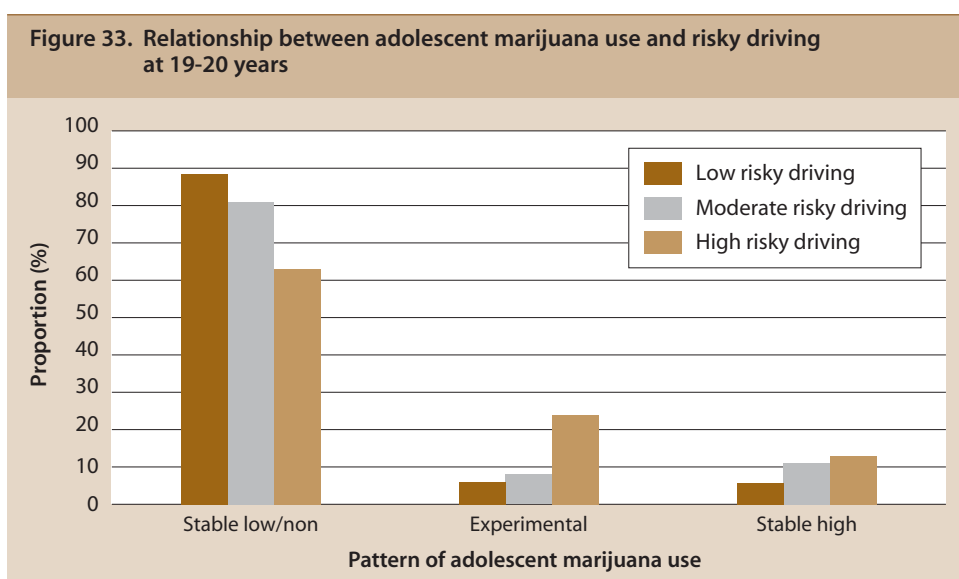
Connections between adolescent marijuana use and young adult risky driving behaviour were similar⁶⁰, although less powerful and clear-cut (see Figure 33), perhaps because few adolescents were experimental or high marijuana users (as

58 $\chi^2 (4) = 14.78$; $p < .05$.

59 Odds ratio for the comparison of high and low risky driving groups on stable high alcohol use over adolescence: OR= 2.70, CI (1.38-5.29, and for the comparison of moderate and low risky driving groups OR = 1.80, CI (1.21-2.68.

60 $\chi^2 (4) = 29.49$; $p < .001$.

shown in Table 33). Only about one-third of high risky drivers had used marijuana during adolescence. While high risky drivers were more likely to report some marijuana use during adolescence this use tended to be “experimental” (to have ceased by late adolescence) rather than stable. The low risky driving group had the lowest rates of adolescent marijuana use, with only 12 per cent of this group engaging in experimental or stable high marijuana use, compared with 19 per cent of moderate risky drivers and 37 per cent of high risky drivers. The odds ratios indicated that both high and moderate risky drivers were about twice as likely as low risky drivers to have engaged in stable high marijuana use over adolescence than low risky drivers⁶¹.



Antisocial behaviour

Formation of groups

Groups of adolescents with differing across-time patterns of antisocial behaviour have previously been identified in ATP research (see Vassallo et al. 2002). Using a criterion of engagement in three or more different types of antisocial behaviour (such as property offences, violence, authority transgressions, or the sale or use of illegal drugs) within the previous 12 months to indicate high levels of antisocial behaviour, individuals were classified as highly antisocial or low/non antisocial, at three separate time points – early adolescence (13-14 years), mid adolescence (15-16 years) and late adolescence (17-18 years). Twelve per cent of adolescents were classified as highly antisocial at 13-14 years, 20 per cent at 15-16 years, and 20 per cent at 17-18 years.

Across-time patterns of antisocial behaviour were then mapped, leading to the formation of the following three groups:⁶² *low/non antisocial* – these individuals displayed low/no antisocial behaviour at all time points; *experimental* – these individuals exhibited high antisocial behaviour during early to mid adolescence

61 Odds ratio for the comparison of high and low risky driving groups on stable high marijuana use over adolescence: OR=2.47, (CI 0.96-6.32), and for the comparison of moderate and low risky driving groups OR=2.01, CI (1.15-3.53).

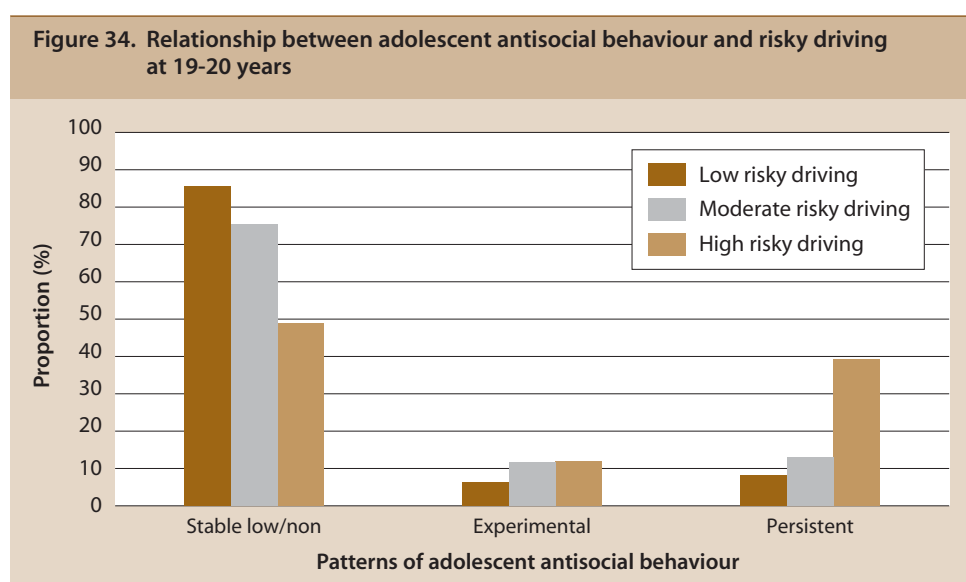
62 Some individuals did not fit these across-time criteria, and were therefore excluded.

and then desisted; and *persistent* – these individuals engaged in high levels of anti-social behaviour at two or more time points, including 17-18 years. The three groups thus identified, and their characteristics, are shown in Table 34.

Groups	N	% sample	% male
Stable low/non	844	72.6	40.9
Experimental	88	7.6	43.2
Persistent	131	11.3	64.9

Findings

Adolescent antisocial behaviour was significantly related to young adult risky driving behaviour.⁶³ Approximately 40 per cent of high risky drivers had been persistently antisocial adolescents, compared with only 13 per cent of moderate risky drivers and 8 per cent of low risky drivers (see Figure 34). Furthermore, odds ratios indicated that high risky drivers were eight times more likely than low risky drivers to have been persistently antisocial during adolescence, while moderate risky drivers were 1.8 times more likely to have been persistently antisocial during adolescence⁶⁴.



SUMMARY

Summary

In summary, high risky drivers had displayed higher rates of all types of problem behaviours during adolescence. These trends were most apparent for antisocial behaviour, with 40 per cent of high risky drivers having engaged in persistent adolescent antisocial behaviour, and odds ratios showing that high risky drivers were eight times more

⁶³ $\chi^2 (2) = 75.78; p < .001$.

⁶⁴ Odds ratio for the comparison of high and low risky driving groups on persistent antisocial behaviour during adolescence: OR = 8.44, CI (4.34-16.39); and for the comparison of moderate and low risky driving groups OR=1.82, CR (1.11-2.97).

likely to have been persistently antisocial adolescents than low risky drivers. High risky drivers had also more frequently consumed alcohol at moderate or high levels throughout adolescence, with one-third of high risky drivers having been consistently moderate/high alcohol users compared with 26 per cent of moderate risky drivers and 17 per cent of low risky drivers. High risky drivers were also significantly more likely to have used marijuana during adolescence, but this trend was less powerful, perhaps because few adolescents overall were involved in marijuana use. High risky drivers tended to engage in experimental rather than consistently high marijuana use.

These findings suggest that adolescent problem behaviours were powerful risks for later risky driving behaviour. Nevertheless, it should also be noted that many risky drivers had not engaged in problem behaviours during adolescence.

Profile of risks of single-problem and multiple-problem groups

The final issue addressed was whether distinct risk factors could be identified for groups with differing patterns of problem behaviours. To investigate this issue, single and multi-problem groups were identified, based upon participants' self reports at 19-20 years.

Three types of analyses were conducted in order to identify the correlates of different combinations of problem behaviours. Single and multi-problem groups were compared on aspects of personal functioning, relationships with parents and peers, current life circumstances, and attitudes and values, all measured at 19-20 years.

The first set of analyses compared three groups: a high risky driving group who were not high users of alcohol, a high alcohol use group who were not high risky drivers, and a dual problem group who were both high risky drivers and high alcohol users. The second set of analyses also involved three groups: a high risky driving group who were not high marijuana users, a high marijuana use group who were not risky drivers, and a dual problem group who were high risky drivers and high marijuana users. Similarly, three groups were used for the third set of analyses: a high risky driving group who were not highly antisocial, a high antisocial group who were not high risky drivers, and a dual problem group who were both high risky drivers and highly antisocial. Thus, three different *high risky driving only* and *dual problem* groups were used in these analyses.

As the number of individuals who met the criteria for some groups was quite small, these findings should be viewed as exploratory only, and interpreted with caution.

Correlates of risky driving and alcohol use

"High risky driving only" (n=36), "high alcohol use only" (n=199), and "dual problem" (high risky driving and high alcohol use) groups (n=20) were compared to identify correlates of these patterns on problem behaviours at 19-20 years. Table 35 summarises the significant findings from this analysis.

A consistent trend emerging from these analyses was the higher rate of emotional problems (depression, stress, shy (unsociable) temperament, low assertiveness) among the high risky driving only group, particularly in comparison with the

Table 35. Significant differences between the high risky driving only (n=36), high alcohol use only (n=199), and dual problem (high risky driving and high alcohol use) (n=20) groups at 19-20 years		
Domain	F	Group differences
Temperament style ■ Sociability	7.57***	Risky driving only group less sociable than Alcohol only group
Behavioural and emotional problems ■ Depression	8.53***	Risky driving only group more depressed than Alcohol only group
■ Stress	7.05***	Risky driving only group more stressed than Alcohol only group
Social skills ■ Assertiveness	4.18*	Risky driving only group less assertive than Alcohol only group
Other individual characteristics ■ Civic engagement	4.19*	Alcohol only group more civic engagement than Risky driving only group
■ Confidence in the police	4.60*	Alcohol only group less confidence in the police than Risky driving only group
■ Life satisfaction	4.04*	No two groups significantly differed
Parent-young adult relationship ■ Conflict in the relationship	3.18*	Dual Problem group more conflictual relationship than Alcohol only group
■ Parents' emotional support	3.25*	No two groups significantly differed
*** p <.001 * p<.05		

high alcohol use only group. These findings do not necessarily mean that the high risky driving only group was highly problematic on these aspects (that is, that they were clinically depressed), just that they scored higher on these emotional problems than the groups to which they were compared.

The high alcohol use only group, on the other hand, tended to report less confidence in the police than the high risky driving only group. They also tended to participate in civic activities more than the high risky driving only group, although rates of civic engagement among all three groups were low.

Interestingly, only one significant difference was found between the dual problem group and the single problem groups: individuals who exhibited high levels of both risky driving and alcohol use tended to have more disagreements with parents than the high alcohol use only group. Hence, the dual problem group did not significantly differ from the single problem groups on any aspects of their personal functioning, their peer relationships, their life circumstances or their attitudes and values, during early adulthood.

While the comparisons of the high risky driving only group with the dual problem group did not reach significance (perhaps partly due to the lower power associated with the small size of these groups), the gap between these groups was often almost as large as found when comparing the high risky driving only group and the high alcohol use only group. In other words, the dual problem group was similar to the high alcohol use only group on many characteristics.

Correlates of risky driving and marijuana use

Few significant differences were found when comparing the “high risky driving only” (n=53), “high marijuana use only” (n=46), and the high risky driving and

Table 36. Significant differences between the high risky driving only, (n=53) high marijuana use only (n=46), and dual problem (high risky driving and high marijuana use) (n=8) groups at 19-20 years		
Domain	F	Group differences
Temperament style		
■ Distractibility	3.23*	No two groups significantly differed Risky driving only group more persistent than Marijuana only group
■ Persistence	4.08*	
Social skills		
■ Responsibility	3.80*	Risky driving only group more responsible than Dual Problem group
Other individual characteristics		
■ Emotional control	3.34*	Risky driving only group more control of emotions than Marijuana only group
■ Emotional management	4.41*	No two groups significantly differed
* p<.05		

high marijuana use “dual problem” (n=8) groups (see Table 36). However, it should be noted that the groups compared were very small (particularly the dual problem group), hence, the power of these analyses to detect statistically significant group differences would have been greatly limited.

Table 37. Significant differences between the high risky driving only (n=47), high antisocial only (n=80), and dual problem (high risky driving and high antisocial) (n=27) groups at 19-20 years		
Domain	F	Group differences
Temperament style		
■ Activity	4.99**	Risky driving only group less active than Antisocial only and Dual problem groups Risky driving only group more flexible than Antisocial only and Dual problem groups Dual problem group more reactive than Risky driving only and Antisocial only groups
■ Flexibility	3.71*	
■ Negative reactivity	8.78***	
Behavioural and emotional problems		
■ Anxiety	3.13*	No two groups significantly differed Dual problem group more illicit drug use (excluding marijuana) than Risky driving only group Dual problem group more stressed than Antisocial only group
■ Illicit drug use (excluding marijuana)	3.77*	
■ Stress	3.47*	
Social skills		
■ Responsibility	3.17*	No two groups significantly different Risky driving only group more self controlled than Dual problem and Antisocial only groups
■ Self Control	4.89**	
Other individual characteristics		
■ Emotional management	5.20**	Dual problem group poorer management of emotions than Risky driving only group Antisocial use only group more civic engagement than Dual problem group
■ Civic engagement	5.29**	
Peer relationships		
■ Friends' negative appraisal	3.43*	No two groups significantly differed
Parent-young adult relationship		
■ Conflict in the relationship	5.37**	Dual problem group more conflictual relationship than Risky driving only group
*** p<.001 ** p<.01 * p<.05		

Those differences that were found pointed to greater difficulties on emotional control and persistence among the high marijuana use only group than the high risky driving only group. The dual problem group (high risky driving and high marijuana use), on the other hand, tended to be less responsible than the high risky driving only group.

Correlates of risky driving and antisocial behaviour

A number of significant group differences were found when comparing the “high risky driving only” (n=47), the “high antisocial only” (n=80), and the “dual problem” high risky driving and high antisocial (n=27) groups. These are shown in Table 37.

Group comparisons consistently indicated greater difficulties among the dual problem (high risky driving and high antisocial) group than the single problem groups, especially the high risky driving only group. More specifically, the dual problem group displayed a more difficult temperament style, tended to have lower social skills, had considerably higher rates of illicit drug use, had more disagreements with parents, and were less involved in civic activities than individuals who only engaged in high levels of risky driving or antisocial behaviour. Hence, young adults who displayed a pattern of high antisocial behaviour and high risky driving appeared to experience substantially more difficulties than those who engaged in high risky driving behaviour alone.

SUMMARY

Summary

These exploratory analyses revealed several significant differences between dual problem groups and single problem groups. For example, young people who engaged in *high risky driving and alcohol use* tended to have more disagreements with parents than those who only reported a single problem behaviour, while those who engaged in *high risky driving and marijuana use* were less responsible than those who only engaged in *high risky driving*.

However, the most extensive differences were between young people who engaged in both *high risky driving and high antisocial behaviour* and their counterparts who reported only one of these behaviours. Thus, the *high risky driving and high antisocial behaviour* group tended to display a more difficult temperament style, possess lower social skills, experience more conflict with parents, and participate less in civic endeavours than those who reported a single problem behaviour (particularly those who only engaged in high levels of risky driving). Interestingly, the *high risky driving but no alcohol use* group tended to report more emotional problems than the *high alcohol use only and high risky driving and alcohol use* groups. These findings suggest that there is substantial variability among individuals who engage in high risky driving. However, perhaps not surprisingly, high risky drivers who also engage in high levels of antisocial behaviour, high alcohol use or high marijuana use tend to experience more difficulties overall than those who engage in only one of these behaviours.

Nevertheless, while a number of group differences were found, there were many aspects on which the single and dual problem groups did not significantly differ. Thus, it seemed that there were considerable similarities between the single and multiple problem groups as well, and that they shared many risk factors. However, these findings should be viewed cautiously and as exploratory only, because the small group sizes employed limited the study's power to detect group differences.

7

Discussion of findings and implications



7

Discussion of findings and implications

This report, a product of the collaboration between the Australian institute of Family Studies, the Royal Automobile Club of Victoria and the Transport Accident Commission of Victoria, has examined patterns and precursors of different types of driving behaviour among a large sample of Victorian young adults (aged 19-20 years) participating in the longitudinal Australian Temperament Project (ATP). More specifically, it has examined young people's learner driver experiences and current driving behaviour, as well as identifying individual attributes and environmental characteristics in their past or present lives that may have contributed to current driving outcomes (that is, level of risky driving behaviour, crash involvement, and number of speeding violations).

While acknowledging the important role of situational factors (such as traffic conditions, time-of-day), structural factors (such as road design, road conditions) and community factors (such as norms/laws regarding driving behaviour, enforcement of road laws) on driving behaviour, this report focused primarily on individual and social factors.

A summary of the findings emerging from this research is provided below to provide a framework for discussion later in this section.

Experiences when learning to drive and subsequent driving behaviour

In the latest ATP data collection wave in 2002, 19-20 year old young adults and their parents completed questions relevant to road safety. These included questions about licensing, experiences as a learner, driving exposure, crash and enforcement experiences, and self-reported behaviours in relation to speeding, seat-belt use, fatigue, and drug and alcohol use.

Most young people (86 per cent) had obtained a car licence by 19-20 years of age. The majority of these individuals appeared to have obtained frequent practice when learning to drive, with four out of five reporting that they practised driving on at least a weekly basis. Parents predominantly provided this practice. While practising with parents involved some stress and conflict for most young adults, driving practice with others was generally stress-free. There was considerable diversity in the number of professional driving lessons undertaken by young adults; however, most commonly it was between one and five.

Regarding young adults' current pattern of driving, most driving was reported to take place during the week in daylight hours. Over 40 per cent had been involved in a crash while driving a car or motorcycle. Two-thirds of these crashes occurred when young people were driving alone, and most resulted in property damage. Approximately 30 per cent had been apprehended for speeding. Additionally, speeding was one of the most common unsafe driving behaviours reported by

participants, with over 80 per cent having driven up to 10 km/h above the limit at least once during their past ten trips. Driving while very tired was also relatively common.

The learner driver experiences of young men and women differed. On average, young women reported taking more professional driving lessons, practising driving more frequently with people other than their parents, and experiencing more stress when practising with their parents than did young men. Similarly, there were differences between young men and women in their current driving behaviours, with young men reporting higher rates of unsafe driving behaviours (particularly speeding, driving when affected by alcohol, and failure to wear a seatbelt or helmet) than young women.

The type of locality in which young people lived (metropolitan, regional or rural) had little impact on driving experiences. The only significant differences emerged on aspects of: learner driver experiences (young adults in metropolitan areas tended to undertake more professional driving lessons, while those in regional areas practised driving less frequently); crash involvement (young adults in metropolitan localities were more likely to have been involved in a crash); and unsafe driving behaviour (young adults in regional centres were more likely to drive when affected by alcohol, while those in rural areas were less likely to wear a seatbelt or helmet).

Precursors and correlates of risky driving behaviour, crash involvement and speeding violations

An important goal of the research was to identify characteristics which differentiated safe from risky drivers. To do this, young adults were divided into separate groups on the basis of three types of driving-related behaviours or outcomes: level of self-reported risky driving behaviour (low, moderate or high risky driving); the number of crashes they had been involved in (no, single, or multiple crashes); and the number of times they had been apprehended for speeding by police (no, single or multiple speeding violations). The correlates and precursors of each of these problematic driving outcomes were then examined.

The analyses showed a number of differences between groups. In general, problematic drivers (that is, those who engaged in high levels of risky driving, had been involved in multiple crashes or been caught speeding on multiple occasions) tended to have a less persistent temperament style, displayed higher levels of aggression and hyperactivity, more frequently engaged in antisocial activities, and used more licit and illicit substances. Unsurprisingly, problematic drivers tended to report more police contact for driving-related offences. They also tended to have experienced more school adjustment difficulties earlier in life and had more frequently formed friendships with antisocial peers than less problematic drivers.

The three types of driving-related behaviours examined here (risky driving, crash involvement, and speeding violations) overlapped considerably in terms of predictors and precursors, but the strength of predictors varied across the outcomes, as did the timing at which group differences emerged. Group differences tended to be more powerful, more consistent, and to emerge earlier (mid- to late-childhood compared with mid/late adolescence) among the risky driving and speeding violation groups than the crash involvement groups. There were also some

individual attributes and environmental characteristics that were uniquely associated with each driving outcome.

Of course, risky driving, crash involvement, and detection for speeding are unlikely to be independent. In fact, an examination of the degree of overlap between the three group types revealed that close to half (46 per cent) of the young adults in the high risky driving group had also been involved in multiple crashes or been apprehended for speeding on multiple occasions. Overlap was also evident among members of the multiple crash and multiple speeding violation groups. Some of the similarity in the profiles of these groups may have resulted from some overlap in their membership. Nevertheless, it is important to note that the majority of young adults in these groups displayed only one of these types of problem driving behaviour. Hence it is likely that other factors also contributed substantially to the group profiles.

Relationship between unsafe driving behaviour and other problem behaviours

Another important question was whether risky driving occurred in conjunction with other problematic behaviour. The relationship between unsafe driving (as measured by risky driving), substance use, and antisocial behaviour was therefore examined to determine whether these problem behaviours were interrelated.

First, the similarity between the risk factors for risky driving, antisocial behaviour and multi-substance use was examined, to see if similar personal and/or environmental characteristics predicted each of these outcomes. These comparisons revealed some overlap in the risk factors, with temperament style, behaviour problems, school adjustment, and characteristics of peer and parent-child relationships predicting all three outcomes. The highest degree of overlap was evident between the precursors of persistent adolescent antisocial behaviour and multi-substance use (with 55 per cent of precursors in common). However, there was also substantial overlap between the precursors of high risky driving and persistent adolescent antisocial behaviour (38 per cent in common), and to a lesser extent, high risky driving and multi-substance use (24 per cent in common). Only one characteristic – school readiness (how well a child adapts to the transition to primary school) – uniquely predicted high risky driving behaviour.

Fewer risk factors were identified for high risky driving than for adolescent antisocial behaviour or multi-substance use. This was particularly evident in the domains of temperament style and interpersonal relationships (peer and parent-child). However, risky driving was measured at a later age than these other problem outcomes. Thus, the longer time span between risks and outcomes may have diminished these associations.

Second, the co-occurrence of these problem behaviours was examined. Young adults who engaged in high levels of risky driving behaviours in early adulthood also tended to exhibit higher levels of antisocial behaviour and substance use (alcohol, marijuana, or use of both substances) during early adulthood, than less risky drivers. Furthermore, looking back in time, high risky drivers had displayed higher levels of all these problem behaviours during adolescence. These trends were particularly marked for antisocial behaviour (40 per cent had engaged in persistent antisocial behaviour during adolescence) and for alcohol use (one-third of high risky drivers had been consistently high alcohol users). Nevertheless, it

should be noted that there was a sizeable number of high risky drivers who did not engage in substance use or antisocial behaviour during adolescence and/or early adulthood.

A further issue addressed was whether common or distinct risk factors could be identified for young people who engaged in only one type of problem behaviour by comparison with those who engaged in more than one of the problem behaviours, although small group sizes limited the power of these comparisons. Several significant differences were found between those who engaged in high risky driving only, and those who also engaged in other problem behaviours. There were also numerous similarities between the single and multiple problem groups, with many of the same risk factors in common. Given the small group sizes, these findings should be seen as exploratory only, and viewed cautiously.

Conclusions and implications

Taken together, these findings provide valuable insights into the development of “normal” and “problematic” driving behaviours, which in turn have important implications for prevention and intervention strategies aimed at reducing unsafe driving behaviour.

The learner driver experience

Although there was considerable diversity in the number of professional driving lessons undertaken by young people, most (about 80 per cent) reported practising driving on a regular basis (that is, weekly or more often), and usually with parents. This suggests that both parents and young adults are heeding the message communicated by road safety authorities, which recommends novice drivers gain extensive driving experience before attaining their licence. As mentioned previously, research suggests that young drivers who gain high levels of supervised experience prior to attaining their licence are at lower risk of being involved in a crash than less experienced drivers (Engström et al. 2003).

Nevertheless, while levels of driving practice were high overall, there was a tendency for young adults living in regional areas to report less frequent driving practice than those living in other areas. Furthermore, rural and regional participants reported undertaking fewer driving lessons with a professional instructor than those living in metropolitan areas. While it is beyond the capacity of this study to explain this pattern of findings, it is likely that lower access to professional driving instruction in rural and regional areas and fewer suitable practice opportunities may have contributed to these findings (see Harrison and Seymour 2003). If this is true, further efforts may be needed to ensure that learner drivers living in regional or rural areas are provided with sufficient opportunities to acquire and practise driving skills. Further research examining the learner experiences of young people living in rural, regional and metropolitan areas may be needed to better understand these differences.

It should also be noted that while young people generally rated driving practice with persons other than their parents as a stress-free experience, most young adults (especially women) and their parents reported experiencing some stress or conflict during their practice sessions together. While we do not know whether the level of stress experienced was sufficient to have had a negative effect on young adults or parents, or to have lessened the effectiveness of the practice sessions, strategies aimed at reducing the stressful nature of this experience (for

example, providing parents with information or training on how to assist learner drivers) may be beneficial. Road safety authorities have a range of materials and programs available that could assist parents with this process.⁶⁵ Nevertheless, there may be some circumstances in which practising driving with parents may not be ideal (for example, if there is a high degree of conflict in the parent–young adult relationship, or if parents find practice sessions provoke anxiety). In these circumstances, it may be preferable to involve other licensed drivers (such as trusted friends or relatives) in this role.

Many exhibit some degree of unsafe driving behaviour

Consistent with previous research (see, for example, Cavallo and Triggs 1996; Clarke et al. 2002; Engström et al. 2003; Williams 1998), the findings of the ATP Young Drivers Study suggest that some level of unsafe driving behaviour is relatively common, particularly for young males. The most common forms of unsafe driving reported were speeding and driving when very tired. Driving up to 10km/h above the speed limit was particularly common (with 84 per cent of the sample reporting that they had done so at least once in their past ten trips). Of particular concern was the finding that approximately two-thirds of the sample reported driving when fatigued.

Speeding, driving when fatigued and driving when affected by alcohol are all strong risk factors for crash involvement (Clarke et al. 2002; Engström et al. 2003), while failure to wear a seat-belt increases the chance that an individual will be seriously injured or killed in the event of a collision (Data Analysis Australia 2000). Hence, the findings of the ATP Young Drivers Study strongly reinforce the objectives of current road safety initiatives, as they suggest that these behaviours (particularly speeding and driving when fatigued) are still prevalent among young drivers, especially young men. These findings also suggest that the current range of initiatives may not be reaching some people. Further research among this age group may be needed to understand more clearly why these communications are not effectively connecting with these young people, and how this age group may be better targeted. It is possible that a single approach to these unsafe driving behaviours may not be the most effective approach, and that a range of new strategies which specifically target different groups of young people, and particularly young men, are needed. Given the higher rates of driving when affected by alcohol among regional participants, and the lower use of seat-belts (or helmets) among rural participants, approaches that specifically target these behaviours among young adults in regional and rural areas may also be of benefit.

Nevertheless, it should be noted that most young people only occasionally engaged in risky driving. Only a small number (approximately 7 per cent) exhibited a consistent pattern of highly unsafe driving. In comparison with other drivers, this group of high risky drivers tended to display a range of less adaptive

65 VicRoads runs free training sessions for learner drivers and their parents (“Keys please: The first step into the driver’s seat”). Contact VicRoads on 1300 360 745 to find out location and dates of these training sessions. VicRoads also provides a wide range of other resources for learner drivers and their parents. For example, the booklet “Getting there from Ls to Ps: A step-by-step guide for learners and supervising drivers on learning to drive” is available from all VicRoads Registration and Licensing offices in Victoria or can be ordered via VicRoads website: www.vicroads.vic.gov.au. Information for parents may also be accessed from the following websites: <http://www.tacsafety.com.au/jsp/content/NavigationController.do?areaID=3> (click on the link to “parents”) or <http://www.drivertrainers.com.au/parents.html>.

personal characteristics, had experienced more school adjustment difficulties while growing up, had more difficulties in their relationships with parents, had more frequently formed friendships with antisocial peers, were less involved in community activities, and had higher rates of police contact for driving-related offences. While these findings reflect overall group differences (that is, not all high risky drivers exhibited these characteristics) they point to the broader difficulties that can sometimes underlie highly risky driving behaviour.

This small group of high risky drivers would appear to represent a major road safety concern, and hence, interventions aimed specifically at this group would seem particularly worthwhile. A key question that could be asked is: Why do such individuals not heed current road safety messages? Do they underestimate the risks, disregard them, or do their personal tendencies (for example, low frustration tolerance, inattention, impulsiveness) over-ride their adherence to safer patterns of driving? While the ATP Young Drivers Study cannot provide answers to these questions, these are important issues for future research to take up, which can inform intervention strategies targeted at this group of young drivers.

It is not the purpose of this research to spell out the details of intervention strategies. However, these findings highlight a dilemma for those planning intervention efforts, and that is to decide upon the group of young drivers whom it may be most beneficial to target. Should the large group of young adults who occasionally engage in risky driving behaviour be the focus, or alternatively, the small group who frequently engage in high levels of unsafe driving behaviours?

It is important to consider which group will be more amenable to change and the likely reduction in road trauma that would be achieved by changing the driving behaviour of each group. Clearly further research is needed to compare the efficacy of intervention strategies aimed at these two very different groups of young drivers. However, a combination of both approaches – targeted approaches aimed at the small group of frequent risky drivers and broad-based interventions aimed at the larger group of occasional risky drivers – may be most effective.

Risk factors for problematic driving practices could be identified from mid childhood

Due to its longitudinal nature, the unique contribution of this study was its ability to examine links between driving behaviour and earlier characteristics. Clear and consistent group differences were observed between high risky drivers and other drivers from mid childhood on, while individuals who subsequently committed multiple speeding violations could be distinguished from other drivers from late childhood. These findings suggest that antecedents of some types of unsafe and unlawful driving behaviour are noticeable as early as mid- to late-childhood, many years before a person first drives a car or motorcycle. If this is the case, then interventions targeting childhood and adolescent precursors may have a positive, flow-on effect on later driving behaviour.

There is a growing recognition among researchers, policymakers, and practitioners that many problem behaviours that become apparent in adolescence and early adulthood (for example, antisocial behaviour, risky substance use) have their origins in childhood, and that early intervention and prevention can inhibit their development. The findings of the ATP Young Drivers Study suggest that this process may also apply to unsafe driving.

How might these correlates and antecedent factors influence driving behaviour? First, if an individual fails to learn to regulate difficult childhood characteristics

these may directly influence his/her later driving behaviour. For example, underlying aggressive or impulsive tendencies, which are likely to be influenced by the individual's physiological make-up, may cause an individual to respond in an aggressive or impulsive manner when driving. Second, an individual's characteristics may impact indirectly, by influencing other factors that affect driving behaviour. For example, childhood factors such as a reactive or impersistent temperament style, or aggressive or hyperactive behaviour problems, might influence driving behaviour by contributing to the development of cognitive, emotional or behavioural response styles that are associated with problematic driving outcomes.

With regard to childhood aggression, a considerable body of research (for example, Dodge 1986) suggests that this characteristic often underlies the development of an inaccurate 'social information processing' style, in which an individual may form a distorted view of events and of the actions of others. Thus, aggressive individuals tend to attribute hostile intent to others even when the event was accidental (Dodge 1986), and to react negatively and intensely when irritated or stressed (Rutter et al. 1998). These less adaptive response styles could lead an individual to respond inappropriately or hazardously in a driving situation. Social information processing deficiencies may lead drivers who are prone to aggression to misinterpret the actions of other drivers (for example, perceiving malicious intent when accidentally "cut off" by another driver) while emotional reactions to these perceived slights may lead them to respond in an overly aggressive manner (for example, yelling at other drivers, or engaging in unsafe driving practices such as "tailgating"). Further research examining whether risky driving often involves such attributions and emotions could provide valuable guidance for intervention efforts.

Similarly, childhood hyperactivity and a more inattentive, less persistent temperament style may be indicative of cognitive deficits such as a diminished capacity to maintain and control one's attention and to inhibit undesirable responses. These deficits may limit a young driver's ability to attend to relevant information in the driving environment, increasing the chances that he or she will be involved in a crash. Thus, cognitive capacities that underlie childhood attention difficulties may continue to have an effect in young adulthood, and young people who tend to be overly active and have difficulty maintaining attention may be less likely to possess or develop the cognitive skills necessary to divide and switch attention between competing driving tasks. Once again, research examining the role of such individual differences on driving behaviour appears warranted and could help inform intervention approaches.

Third, the presence of childhood risk factors could be seen as signalling the onset of a problematic developmental pathway which may lead on to a range of later difficulties, including problematic driving. This explanation emphasises the broader role of risk factors as indicators that a child's development is not progressing well. It also highlights the links between childhood and adolescent risk factors and more proximal factors associated with unsafe or unlawful driving. These proximal factors, which are often more powerfully related to problematic driving outcomes than distal factors, may be influenced by earlier factors and developmental processes. Hence, earlier risk factors may be important stepping stones in a developmental sequence or chain, for example:



These are some of the ways in which childhood and adolescent risk factors might influence and contribute to unsafe driving behaviour in early adulthood. Given the connections revealed between childhood and adolescent factors and subsequent driving outcomes in the ATP Young Drivers study, early intervention programs targeted at these stages of development may prove a useful addition to current road safety initiatives. From a broad public health perspective, early intervention is considered preferable to intervening later on, once problem behaviours have become established (Greenberg et al. 2001; Homel et al. 1999). Early intervention strategies are generally more efficient and cost-effective than remedial programs (Greenwood et al. 1998; Homel et al. 1999).

Furthermore, given that research suggests that many problem behaviours share the same risk factors (Jessor and Jessor 1977; Jessor 1987), these strategies may have additional benefits in averting the development of a range of behavioural difficulties (Greenberg et al. 2001; Homel et al. 1999). However, these types of interventions should be seen as an adjunct, not an alternative, to current road safety initiatives which primarily target young drivers during the early years of their driving career or in the years just prior to them gaining a Learner Permit (see Roads Corporation 2003 for examples of some existing road safety initiatives in Victoria).

When might early intervention efforts be most useful? The present findings showed that risk factors for risky driving and speeding first became evident during the primary school years, suggesting that this period is the time when pathways to such behaviours commence. Hence, interventions implemented at this time may be valuable in diverting children from problematic pathways at an age when they are most amenable to change. Given that many unsafe drivers reported a lack of connectedness to school during the secondary school years, and those with multiple speeding violations were less likely to have completed formal education, interventions aimed at primary school aged students may have an added benefit of reaching a large proportion of at-risk children, who may not be as accessible or open to intervention at older ages. Given the breadth of the risk factors identified, such interventions might ideally involve a collaborative approach in which families, schools and other stakeholders with an interest in positive child and/or adolescent development (community organisations, government agencies) work in a coordinated manner with one another to implement suitable intervention or prevention strategies.

There is empirical support for the effectiveness of interventions targeted at primary school aged children in preventing or reducing a range of problematic outcomes, such as childhood behaviour problems, adolescent antisocial behaviour, and substance misuse (Farrington 2002; Greenwood et al. 1998; Homel et al. 1999). The most successful programs have generally adopted a multi-faceted approach, involving parent and teacher training in behaviour management (for example, monitoring child behaviour, use of effective discipline) and interventions aimed at enhancing children's social, cognitive and problem solving skills (see Homel et al. 1999 and Greenberg et al. 2001 for more detailed descriptions of such programs).

These findings support current efforts to assist children to make the best possible start in life. They suggest that early intervention programs aimed at primary school aged children may help curtail later problematic driving behaviour, among a range of other problematic behaviours, complementing current road safety initiatives aimed specifically at reducing unsafe driving behaviour among young drivers.

Predicting crash involvement was less easy

The findings of this research suggest that it is more difficult to predict crash involvement than other problematic driving outcomes. For example, while it was possible to differentiate individuals in the high risky driving and multiple speeding violations groups from other drivers as early as mid- to late-childhood, individuals who were later involved in one or more crashes did not significantly differ from their counterparts on any individual attributes or environmental characteristics until mid/late adolescence. Furthermore, group differences were generally smaller and less consistent among the crash involvement groups than the risky driving and speeding violation groups.

A number of reasons may underlie the smaller number of differences found. First, in this study, crash involvement was assessed on the basis of the number of crashes young people reported having been involved in when they were driving. Information was not obtained about the cause of the crash, and thus, the single and multiple crash groups included individuals involved in crashes in which they were “at-fault”, and crashes in which they were not culpable. Given this heterogeneity, it is less surprising that a clear profile of risk factors did not emerge for crash involvement.

Second, the vast majority (95 per cent) in the single and multiple crash groups reported being involved in a relatively minor collision which resulted in property damage only. Very few (n=23) had been involved in a serious crash in which someone was injured or killed. Much of the previous research that has been conducted on crash involvement has focused on serious crashes, as it is these collisions that are of particular concern. Hence, it is possible that if the focus here had been on more severe crashes, a clearer pattern of group differences may have emerged. The small number of participants who reported having being involved in a crash resulting in injury or death precluded such a focus. However, it may be possible to undertake this investigation in future data collection waves, as it can be anticipated (unfortunately) that over time a larger number of participants will be involved in a serious crash.

Finally, crashes are singular events, in which situational circumstances (such as errors of judgement, road conditions, the psychological state of the driver) and to a certain extent, luck, may play important roles. Hence, it is not surprising that crashes are generally harder to predict than more habitual behaviours such as speeding.

Nevertheless, the ATP Young Drivers Study found some individual and environmental characteristics that appeared to heighten the risk that a young adult would become involved in a crash when driving. For example, those who had been involved in a crash tended to have more difficulties remaining focused on tasks, react more negatively and intensely when frustrated or upset, and exhibit more behaviour problems (aggression, antisocial behaviour and multi-substance use) than those who had not been involved in a crash when driving. They also tended to have poorer coping skills, experience more conflict in their relationship with parents, and to have had more police contact for driving-related offences than other drivers. Many of these characteristics are similar to those identified as precursors of risky driving and/or speeding behaviour. Hence, while it may be difficult to predict crash involvement in isolation, it may be possible to identify individuals at risk of problematic driving behaviour in general.

Similarities between problem drivers and those who display other problem behaviours

The findings of this research offer partial support for Problem Behaviour Theory (Jessor and Jessor 1977; Jessor 1987), which posits that problem behaviours are closely related to each other and are caused by a common underlying propensity. Substantial overlap was found between the precursors of risky driving and the other problem behaviours examined (antisocial behaviour and substance use). In addition, rates of alcohol use, marijuana use, combined alcohol and marijuana use, and antisocial behaviour were higher among high risky drivers than those who engaged in low or moderate levels of risky driving behaviour. Furthermore, adolescent antisocial behaviour and substance use were potent risk factors for a risky driving pattern in early adulthood. Taken together, these findings suggest that problem driving, substance use and antisocial behaviour are interrelated.

These findings have important implications for prevention and intervention as they suggest that preventative interventions targeted at substance use and/or antisocial behaviour may also be effective in preventing or reducing problem driving behaviour. Hence, while there is clearly a need for intervention programs specifically targeting problem driving behaviour, more broadly-based early intervention and/or prevention programs aimed at reducing or inhibiting problem behaviours in general are likely to have pay-offs in decreasing problem driving. Such an approach, which has the capacity to target multiple problems simultaneously, is likely to be more cost effective than narrower approaches directed at a single problem outcome.

However, it should be noted that a sizeable proportion of young adults who engaged in high risky driving did not engage in high levels of substance use or antisocial behaviour in adolescence and/or young adulthood, and there were some precursors that uniquely predicted the three problem behaviour outcomes (risky driving, substance use and antisocial behaviour) and their combinations. Hence, while a “common solutions approach” (as described above) may help reduce problem driving behaviour, it is likely that specific programs targeting problem driving will always be needed if intervention initiatives are to be fully effective.

The importance, and intervention implications, of individual attributes

As noted earlier, for all types of problematic driving, the most problematic drivers could be distinguished from other drivers on a range of individual attributes and behaviours. Common risk factors for all types of problem driving were a less persistent temperament style, higher aggression, and higher levels of antisocial behaviour and multi-substance use. There were also some individual characteristics that uniquely predicted particular driving behaviours. For example, low responsibility was associated with risky driving behaviour only, while high reactivity (volatility, moodiness) was only associated with crash involvement. Individual attributes appeared to be particularly important in discriminating the speeding violation groups.

Thus, broad-based, multi-faceted early interventions, which include a focus on these individual attributes, may have long-term benefits in preventing or reducing problem driving behaviour (particularly speeding behaviour). Intervention programs targeted at modifying individual attributes would need to be tailored to different developmental stages. Interventions targeted at primary school aged children might involve training parents and teachers to better manage difficult

child behaviour (for example, monitoring child behaviour, using effective discipline, rewarding positive behaviour), and assisting children to regulate their behavioural responses through cognitive and problem skills training. Examples of these types of programs are the Seattle Social Development Project and the Fast Track program, both of which have shown success in reducing problematic child and adolescent behaviour (see Greenberg et al. 2001 for more details). As these types of programs aim to inhibit emerging problem behaviours and move children onto more positive developmental pathways, they may in turn reduce the likelihood of later problematic driving behaviour.

In older age groups, interventions targeting individual attributes may involve helping young people to gain a better understanding of their own temperamental proclivities, how these may impact on their everyday behaviour (including their driving behaviour) and how they can manage these tendencies. For example, if a young adult has a highly negative reactive temperament style, he or she may be more likely to become upset or irritated by the actions of other drivers, and/or become impatient when caught in traffic, than would a person with a less reactive temperament style. Similarly, a person with a less persistent temperament style may find it harder to remain focused when driving, becoming more easily distracted than would other drivers by the presence of passengers in the car, or music from the radio, for example.

Once individuals have gained awareness of their own inherent tendencies they can then be assisted to develop techniques or strategies to manage these proclivities more successfully. During the early adolescent years, young people become increasingly capable of complex cognitive processes, such as abstract thinking capacities and developing control of their emotional responses. This increasing capacity for self-regulation may enable individuals to manage their temperamental characteristics more effectively. For example, highly reactive individuals may be taught techniques to assist them to regulate their emotional responses to frustrating events, while individuals with attentional difficulties may learn to minimise distractions or be assisted to better develop attentional capacities.

A broad understanding of how individual differences impact on driving behaviour may also be of assistance in the driver education process. For example, rather than focusing solely on teaching young drivers vehicle handling skills, it would also seem useful to educate them about the influence of these psychological attributes on driver safety. This educational component need not be specific to the individual, but rather provide a broad overview of the impact of individual characteristics on driving behaviour and suggestions on how these characteristics may be managed in the driving situation. This information may be communicated via group workshops, road-safety/learning-to-drive websites and/or written materials such as fact sheets and information kits. Written information could be distributed to novice drivers on attaining their Learner Permits or alternatively, via driving instructors, educational institutions (schools, universities, TAFEs) and/or community health centres.

Many of the individual characteristics found to be associated with problem driving behaviour reflect long-term patterns of behaviour that may not be under the conscious control of drivers. Furthermore, research suggests that some of these characteristics (for example, aggression, hyperactivity, attention problems) may have underlying physiological bases (see Brennan and Raine 1997; Hill 2002; Spencer et al. 2002; Tremblay et al. 2005 for reviews). One likely consequence is that road safety programs that focus on conscious decision making may not be

particularly effective for all individuals. As an example, public education programs that attempt to increase conscious or cognitive executive control of driving behaviours would not be expected to have a significant effect on the unsafe driving behaviours of young adults with attentional problems. As suggested earlier, more effective approaches might include assisting such individuals to gain a deeper understanding of their typical style of responding and the type of situations that pose particular risks for them, and providing strategies to decrease or manage risky or dangerous response styles.

The role and implication of social factors

Factors related to the interpersonal relationships and school adjustment were important predictors of all problem driving outcomes. For example, during adolescence (and earlier among risky drivers), the most problematic drivers were consistently reported to experience more school adjustment difficulties than other drivers and to associate more often with peers who engaged in antisocial behaviour and/or substance use. There was a tendency for individuals who engaged in high levels of risky driving and/or had been involved in multiple crashes to experience more difficulties in their relationships with their parents than other young adults.

These findings suggest that young people who do not feel connected to their school environment and experience problematic interpersonal relationships may be more likely to progress along problematic developmental pathways than those who experience a high degree of school bonding and are involved in more positive and adaptive interpersonal relationships. Such individuals, in turn, may be more likely to engage in a range of problem behaviours, including unsafe or unlawful driving behaviours.

These findings highlight the importance of keeping students connected to school. Interestingly, recent Australian research (Hemphill et al. 2004) suggests that many adolescents do not show high levels of school engagement, with Year 7 and 9 students reporting, on average, that they look forward to going to school only about once a month. Further efforts may therefore be needed to engage and nurture students, providing them with support and encouragement in addition to education and structure.

The findings of this study also draw attention to the importance of assisting young people to form and maintain adaptive interpersonal relationships. Given the higher level of parent–child relationship difficulties among the high risky driving and multiple crash groups, attempts to improve relationships between parents and children would appear beneficial. Such attempts may have an added benefit of assisting parents to have more influence on their child’s activities and friendship groups (Kupersmidt et al. 2004), decreasing the chances they will become involved with antisocial peers. Affiliation with antisocial peers is a powerful and ubiquitous risk factor for many problem outcomes including substance use and antisocial behaviour (see Vassallo et al. 2002; Williams 2000), and, as found here, for unsafe and unlawful driving.

Interestingly, there were generally few differences between the different problematic driving groups and other drivers on other family environment factors. For example, no significant group differences were found on family socio-economic status (parents’ occupational and educational levels, unemployment, financial strain); family structure (family size, parental separation/divorce/death, parental

marital status); family residential location; family stress; parental characteristics (parental age, ethnic background, cigarette and alcohol use); or parenting style (use of harsh disciplinary practices, use of inductive reasoning, amount of supervision) for any of the outcome groups. Hence, it would appear that the degree to which individuals are attached to school, the type of peers they associate with, and the quality of their relationships with their parents are salient precursors of driving behaviour, but not the other aspects of the family environment studied in the ATP Young Drivers Study.

Risky drivers are a heterogeneous group

The findings of the ATP Young Drivers Study clearly demonstrate that young adults who engage in high levels of risky driving behaviour are not all the same. For example, exploratory analyses revealed that the group who engaged only in high levels of risky driving behaviour significantly differed from those groups of high risky drivers who also reported high levels of alcohol use, marijuana use or antisocial behaviour, with the dual problem groups generally reporting more problems than the single problem groups during early adulthood. Young adults who engaged in both high risky driving and high antisocial behaviour tended to be particularly problematic, generally displaying a more difficult temperament style, lower social skills, experiencing more conflict in their relationship with their parents, and participating less in civic endeavours than those who engaged in high levels of risky driving only.

These findings suggest that there is considerable variability among individuals who engage in high levels of risky driving behaviour, and that it is important to distinguish between single and multi-problem groups. The current findings also serve as a reminder of the potential dangers of stereotyping, and over-simplistic conclusions. However, as the groups compared in these analyses were rather small, future research, employing larger sample sizes, is needed to understand the nature of these differences, and their implications for prevention and intervention.

Strengths and limitations of the research

The ATP Young Drivers Study has a number of significant strengths. Most notably, the research draws upon a large pool of data collected over a 20-year period on many aspects of young peoples' lives. The young people and their families involved in the study are drawn from the general population, and come from diverse backgrounds. A further strength of this study is the use of multiple time-points and informants to gain a comprehensive and reliable picture of young people's development and wellbeing.

However, the research also has several limitations. First, some of the groups used in comparisons were quite small. For example, the high risky driving (n=74), multiple crash (n=136), and multiple speeding violation groups (n=113) were markedly smaller than their comparison groups, while the multi-problem groups (risky driving along with high alcohol use, high marijuana use, and/or high antisocial behaviour) ranged in size from only eight to 27 individuals. These small group sizes restricted the statistical power available to detect group differences. Hence, replication of these findings with larger samples is clearly desirable.

Second, the single and multiple crash groups included young adults who were involved in a wide range of different crash types (including crashes in which they were at fault and those for which they were not responsible; minor collisions

resulting in property damage; and serious crashes resulting in injury and death). As previously discussed, it is likely that the heterogeneity of these groups contributed to the limited differences found between the crash involvement groups. Consequently, if more stringent criteria were used to define these groups (for example, if only young adults who were involved in serious crashes were included in the single and multiple crash groups) it may be that a clearer profile of risk factors would have been identified for this outcome. However, such an analysis was not possible with the ATP data set due to the fact that the young adults had only been driving for a few years, so the number of serious crashes in which they had been involved was still relatively low.

Third, there was some overlap in the membership of the three most problematic outcome groups, and particularly, the high risky driving and high speeding violations group which may have contributed to some of the similarity observed in the profiles of these groups. However, as the majority of young adults displayed only one of the types of problem driving behaviour, clearly other factors also contributed to these findings.

Fourth, while the study identified distinct profiles of child and adolescent characteristics associated with later unsafe or illegal driving behaviour, given the apparent dearth of longitudinal research in this area, replication of these findings using other large-scale, representative samples would be desirable.

Finally, the ATP Young Drivers Study is based on a single cohort of young adults born in 1982. Hence, it is a study of problematic driving among the current generation of young adults. As the prevailing socio-economic, social, cultural and technological conditions of an era impact on child development, new studies, such as *Growing Up in Australia* (otherwise known as the Longitudinal Study of Australian Children: Sanson et al. 2002) may also provide valuable information to guide intervention and prevention strategies for future generations of young drivers.

Conclusion

This report of the ATP Young Drivers Study resulted from the research collaboration between the Australian Institute of Family Studies, the Royal Automobile Club of Victoria and the Transport Accident Commission of Victoria. The study drew on extensive longitudinal data gathered by the Australian Temperament Project to provide a comprehensive description of the learner driver experiences and current driving behaviours of a large sample of Victorian young adults, as well as examining the correlates and precursors of risky driving, crash involvement and speeding violations. A number of important conclusions can be drawn from the Study findings.

First, it is clear that some antecedents of problematic driving behaviours emerge at early developmental stages, many years prior to driving age. Consequently, support should be given to early intervention and prevention initiatives that can be targeted at likely high-risk groups. Ideally, these initiatives should be implemented in mid to late childhood.

Second, it is also evident that some overlap exists between young drivers who engage in problematic driving behaviours and those who engage in other high-risk activities. As a result, broader initiatives that address common risk factors (for example, behaviour problems or social skills) should be implemented in addition to more targeted initiatives that focus on a specific outcome (for example, road safety or substance use).

Third, some of the factors that consistently emerged as risk factors for problematic driving (for example, aggression, hyperactivity, attention problems) reflect long-standing patterns of development that are likely to be physiologically-based. Hence, underlying physiological propensities may be of greater concern than previously acknowledged in road safety. Further research examining this issue is needed to determine its relevance to the road safety field and its intervention implications.

Finally, while this research has helped identify some characteristics associated with high-risk driving among young adults, it is important that future efforts are also channelled to trialling and evaluating various preventative interventions. Re-examination of road safety issues in the next ATP survey (planned to take place when participants are aged 24 years) would also be beneficial, to help determine whether any changes in these behaviours have occurred with increasing age and experience.

Taken together, the findings of this research are a reminder that the attributes and capacities that young people bring to the task of driving influence their skills and effectiveness as drivers, together with situational, structural and legal factors associated with the driving environment. While a number of issues remain unresolved, and there is a clear need for continuing research into the development and persistence of problem driving, it is hoped that the findings contained in this report have contributed to an understanding of the development of “normal” and “problematic” driving patterns, and provided valuable guidance for policy making and interventions aimed at preventing unsafe driving among young novice drivers in Australia.

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