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Discussion of findings and implications



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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.

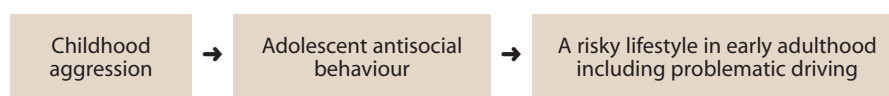
How might these correlates and antecedent factors influence driving behaviour? First, if an individual fails to learn to regulate difficult childhood characteristics

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.