

PSYCHOSOCIAL DEVELOPMENT AND DRIVING BEHAVIOURS: SOME RESULTS FROM THE AUSTRALIAN TEMPERAMENT PROJECT

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ABSTRACT

A set of items concerning road safety and driving behaviour was included in the most recent, thirteenth survey wave of the Australian Temperament Project, a large, longitudinal community study of children's development and wellbeing from infancy to adulthood. Commencing in 1983, information has been collected from parents, teachers and the young people themselves on the children's social and school progress, personal adjustment, temperament style, relationships with others, attitudes, and beliefs, and aspects of the family environment. Responses obtained from 1,140 young people and 1,040 parents during the most recent survey included self and parent reports of young people's experiences as a learner driver, driving exposure, crash and offence experiences, and the frequency of some risky driving behaviours. A series of analyses indicated that it was possible to identify young drivers likely to engage in risky driving from data collected in mid-childhood (using teacher reports) and early adolescence (using parent and self reports). Young drivers with a tendency towards risky driving behaviours differed from others in measures of temperament (especially persistence), behaviour problems (especially aggression and hyperactivity), social competence, school adjustment, and the quality of relationships. This paper describes some key results of the study and discusses their implications.

INTRODUCTION

The overrepresentation of young drivers in crashes is widely recognised, both in Australia (e.g. Australian Bureau of Statistics, 2003) and elsewhere (e.g. Begg and Langley, 2000; Laapotti, Keskinen, Hatakka, & Katila, 2001). There is evidence that young or novice drivers are particularly overrepresented in single-vehicle crashes (Engström et al., 2003), crashes at night (Chen, Baker, Braver, & Li, 2003), crashes on weekends (Engström et al., 2003), crashes where there are passengers in the car (Chen et al., 2003), crashes involving excessive speed (Palamara et al., 2001), crashes involving fatigue (Engström et al., 2003), and crashes in which seatbelts are not used (Begg & Langley, 2000). The overrepresentation of younger drivers in crashes has been explained as a consequence of inexperience-related skill and cognitive deficits (e.g. Engström et al., 2003; Harrison, 1999), developmental factors associated with their age (e.g. Laapotti et al., 2001), exposure patterns (e.g. Cavallo & Triggs, 1996), and risk taking (e.g. Williams & Ferguson, 2002).

There has been some interest in the possibility that there is a sub-group of young

drivers with a relatively high risk of crash involvement. While it is not necessary to assume intentional risk taking amongst this group, there is some evidence that there is a group of “problem” young drivers that could be an appropriate target for interventions. Characteristics associated with this group of drivers include high levels of aggression or hostility (Begg, Langley, & Stephenson, 2003), attentional problems (Barkley, Murphy, Dupaul, & Bush, 2002), alcohol and drug use (Shope, Lang, & Waller, 1997), a sensation-seeking personality style (Jonah, 1997), attitudes favourable to norm-defying behaviours (Ulleberg & Rundmo, 2003), low parental supervision (Hartos, Eitel, Maynie, & Simons-Morton, 2000), limited parental control of driving (Hartos et al., 2000), and involvement with peers who misuse drugs and alcohol (Shope et al., 1997).

There is also evidence that young people who take risks in driving are also likely to engage in a wide range of risky or problem behaviours (Williams & Ferguson, 2002). This has been taken to suggest that high-risk driving behaviour is one part of a broader collection of problem behaviours that reflect an underlying pattern or trait – consistent with the Problem Behaviour Theory of Jessor (1987).

This investigation made use of the Australian Temperament Project (ATP) housed at the Australian Institute of Family Studies (AIFS). The ATP is a longitudinal study following the psychosocial development of a large group of children from infancy to adulthood. It is described briefly in the Method section and in detail in Prior, Sanson, Smart, & Oberklaid (2000). The project’s general aim is to investigate the contribution of personal, familial, and environmental factors to the adjustment and well-being of children and young adults.

The most recent survey wave (the thirteenth) provided an opportunity to collect data concerning road safety issues from participants who at that time were around 20 years of age. The Transport Accident Commission and the Royal Automobile Club of Victoria Ltd jointly provided funding to allow the inclusion of some road safety items in the parent and young-adult surveys, and to allow the AIFS to conduct a series of multivariate statistical analyses to assess the relationship between data collected in earlier surveys and responses to the road safety related items. This paper presents a small subset of the results in the project report (Smart et al., in preparation).

METHOD

The ATP commenced in 1983 with the selection of a representative sample of 2,443 infants and their families living in urban and rural areas of Victoria. Children entering the sample were aged between 4 and 8 months at this stage, and families were recruited through Infant Welfare Centres in selected local government areas in a 2-week period in May 1983. These centres made contact with 94 percent of live births, and the service was widely used. Subsequent analysis indicated that the initial sample was representative against census data.

Thirteen waves of data have been collected over the first 20 years of the children’s lives, using mail surveys. Approximately 65 percent of the sample is still participating in the project, with the attrition being greater for families with a relatively low socioeconomic status and families that included parents born overseas. Despite this, there are no significant differences between the retained and no-longer-participating samples on any characteristics measured in infancy.

Characteristics assessed during the project have included 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 have 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, the children have reported on their own personal adjustment, relationships with others, and attitudes and beliefs.

In the latest data collection wave at 20 years of age, participants and their parents completed additional questions relevant to road safety. These included questions relating to licensing, experiences as a learner, driving exposure, crash and enforcement experiences, and self-reported behaviours in relation to speeding, restraint use, fatigue, and drug and alcohol use.

Data from the surveys were used to investigate the longitudinal precursors and concurrent correlates of differing patterns of driver behaviour. Data from some of the earlier survey waves were consolidated to reflect major developmental stages, with the result that data were analysed in terms of measures concerning infancy (4-8 months), toddlerhood (1-3 years), early childhood (3-4 years), mid-childhood (5-8 years), late childhood (9-12 years), early adolescence (13-14 years), mid-to-late adolescence (15-18 years), and early adulthood (19-20 years). A detailed description of the domains and dimensions investigated in each developmental stage is provided in the project report (Smart et al., in preparation).

The survey data and the specific measures relating to road safety were analysed using descriptive and then multivariate statistical techniques. Each analysis was undertaken to assess the relationship between a measure of road safety outcomes or behaviours and the broad range of measures included in each developmental stage. This involved dividing participants into groups in three road safety domains – low, moderate, and high risky driving behaviour groups based on responses to the self-reported behaviour items.

RESULTS

The sample consisted of 1,140 young adults. Forty-four percent of the participants were males, and eighty-six percent of the sample had obtained their probationary driver licence. The mean period of licensure was 20.8 months.

Figure 1 shows the pattern of driving exposure amongst participants, disaggregated by day of week (weekday or weekend) and time of day (day and night). Night-time driving was less common than driving during daylight hours. There was greater variation in the amount of weekday, daytime driving reported by participants – perhaps reflecting the effect of different patterns of work and study across the sample.

Forty-three percent of participants reported that they had been involved in a crash. Most of these (95 percent) were property-damage-only crashes, and 62 percent occurred when the driver was alone in the car. Thirty-one percent of participants had been detected speeding.

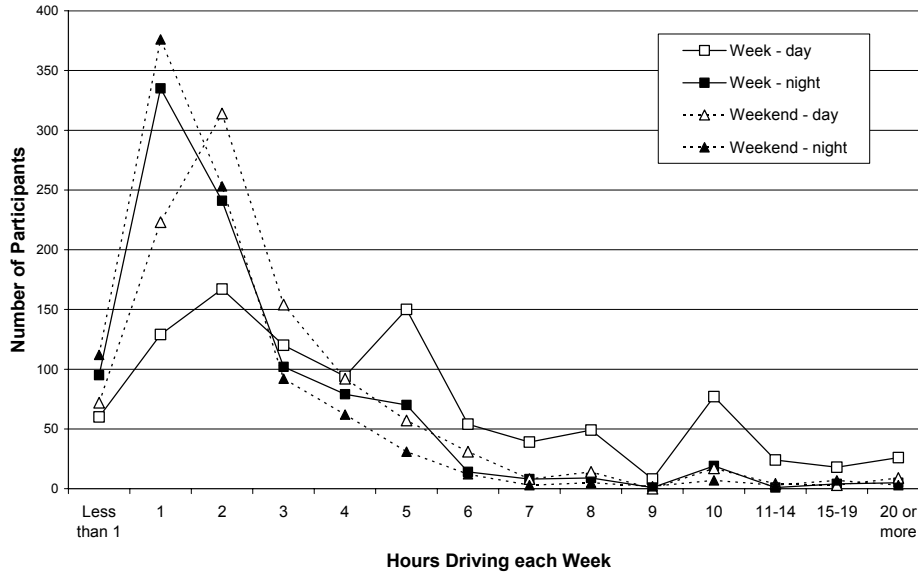


Figure 1: Driving exposure pattern reported by young adults

The pattern of self-reported unsafe behaviours is shown in Figure 2. Participants reported low levels of speeding (up to 10 km/h over the limit) on just over 40 percent of their ten most recent driving trips, and higher levels of speeding on over 20 percent of their recent trips. Fatigued driving was common, with 15 percent of the most recent driving trips occurring when drivers felt very tired.

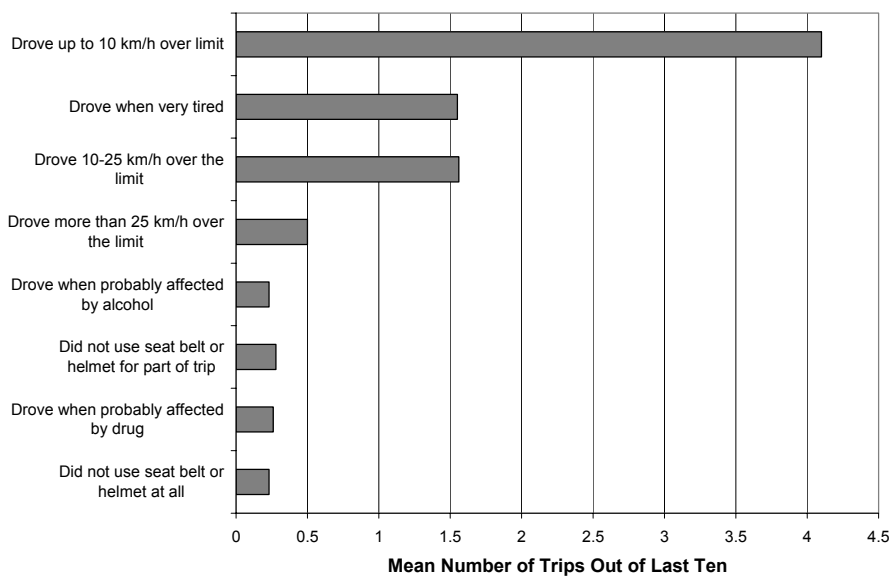


Figure 2: Self-reported unsafe behaviours in last ten trips – averaged across whole sample

It is not possible to describe the results of all the analyses undertaken for this project in the current paper. The results discussed here relate specifically to the division of participants into three groups based on their responses to the eight self-reported behavioural items in Figure 2. Division into three groups involved the use of a cluster analysis technique including the eight self-report items. A two-step method was used, based on Ward's method and squared Euclidian distances to determine the most appropriate number of clusters, followed by a K-means clustering technique.

A three-cluster solution was selected, giving a “low risky driving” group with 675 members (64 percent of the sample), a “moderate risky driving” group with 306 members (29 percent of the sample), and a “high risky driving” group with 74 members (seven percent of the sample). The profile of the three groups on the eight self-reported behaviours is shown in Figure 3. The high risky driving group was less safe on all self-reported measures, and the low risky driving group was consistently safer. The high level of speeding behaviour in the high risky driving group stands out.

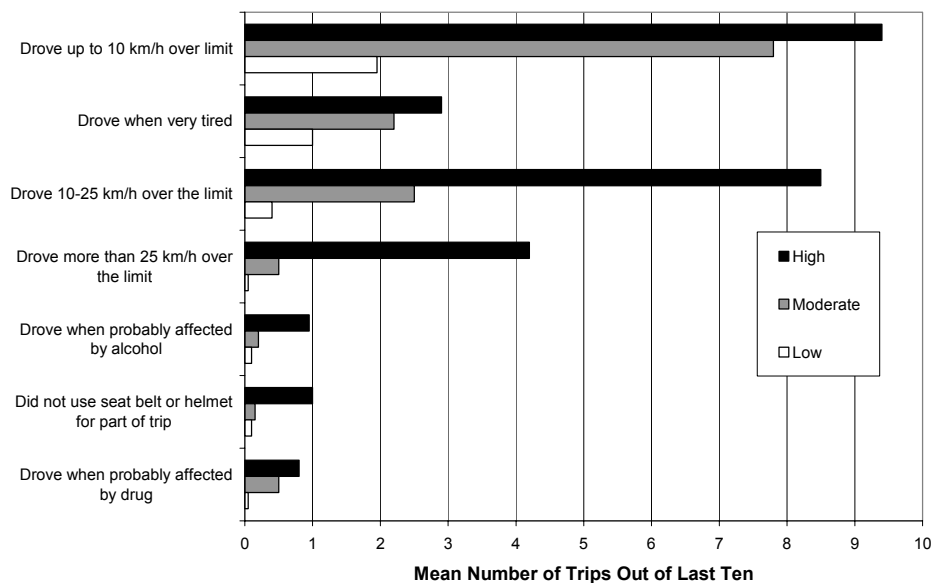


Figure 3: Self-reported unsafe behaviours disaggregated by group membership

Seventy-seven percent of the high risky driving group members were males. There was a significant difference in crash involvement between the three groups ($F_{(2, 1032)} = 5.61, p < .01$) – the average number of crashes reported by members of the high risky driving group was 0.83, compared to 0.67 and 0.54 in the moderate and low risky driving groups respectively. The high risky driving group reported an average of 1.41 speeding violations, compared to 0.65 and 0.37 in the moderate and low risky driving groups ($F_{(2, 1024)} = 32.04, p < .001$).

Multivariate analyses of variance using conservative corrections for possible inflation of the Type I error rate in post-hoc group comparisons were undertaken to assess the relationship between group membership and potential precursor measures collected in the prior (and current) survey waves. Only the statistically-significant differences between groups are reported here.

Significant differences between the three groups first emerged in mid-childhood (5-8 years). There were no detectable differences in any measures from the infancy, toddlerhood, or early childhood survey waves. During mid-childhood, teacher reports indicated that children later classified in the high risky driving group were significantly more aggressive and hyperactive than the other children, less task oriented, and had greater difficulty adjusting to the routines and demands of school life.

During late childhood (9-12 years), teachers rated the high risky driving group as less task oriented than the moderate and low risky driving groups, and also noted that the high risky driving group was less cooperative than the other groups.

The differences between the high risky driving group and the other groups were increasingly clear in early adolescence (13-14 years). Group comparisons indicated that members of the high risky group were less persistent, more antisocial, less cooperative, less responsible, and less empathic than the other two groups. Members of the high risky driving group experienced more school-adjustment difficulties and poorer-quality friendships than the other groups. The high and moderate risky driving groups had a poorer relationship with their parents than the low risky driving group at this age, and were more aggressive and less self-controlled. The high risky driving group also associated more with antisocial peers than the low risky driving group at this time.

There were fewer significant differences in mid-late adolescence (15-18 years), with only the self-reported differences reaching significance. There were significant differences in aggression, antisocial behaviour, hyperactivity, association with anti-social peers, and warmth in the parent-child relationship. There were also significant differences in the use of externalising coping strategies such as complaining to others and drug use. The differences were all in the expected direction, with the addition that during this developmental stage there was increasing differentiation between the moderate and low risky driving groups.

During early adulthood (19-20 years, the current survey wave) the differences between groups were detected in a wide range of parent- and participant-reported domains. The high risky driving group displayed more externalising behaviour problems such as aggression and antisocial behaviour, lower social skills such as empathy and responsibility, more problematic peer relationships, and less involvement in community activities. The high risky driving group also tended to have had more police contact for driving-related offences. As noted for mid-to-late adolescence, the moderate risky driving group continued to be more-differentiated from the low risky driving group than was noticed at earlier ages. At this developmental stage, the groups did not differ in terms of family characteristics (e.g. parental marital, employment, or educational status; level of financial strain), learner experiences (e.g. frequency of driving practice, stress experienced during driving practice), or current life circumstances (e.g. employment and educational status, living arrangements).

DISCUSSION

The analyses reported here suggested that it is possible to divide participants in the ATP into three groups based on their self-reported unsafe driving behaviour in the most recent survey wave. Importantly, these groups have different levels of crash involvement. The high risky driving group – differentiated most strongly from the other groups in terms of self-reported speeding behaviour – had a significantly higher level of crash involvement based on an average of less than two years of post-licence driving experience. The relationship between group membership and crash involvement suggests that any differences between the three groups on precursor measures collected during earlier survey waves may have safety-related consequences.

The most consistent and widespread differences between the three driving-riskiness groups relate to individual attributes rather than environmental or familial characteristics. This is important because it implies that interventions targeting parenting or similar influences are likely to have less effect on subsequent safety than interventions that target individual factors, although this should not be taken as an argument that there is no role for parents or schools in the implementation of interventions targeting the problem attributes. If evidence-based programs can be targeted at the individual attributes identified here, it is likely that their delivery would depend strongly on the support and active involvement of teachers and parents.

The individual attributes that are related to subsequent safety-related driving behaviours appear to relate most strongly to externalising behavioural problems rather than internalising problems such as depression or anxiety. Young people who had antisocial patterns of behaviour, high levels of aggression, antisocial peers, and problems adjusting to the school environment in earlier ATP survey waves were more likely to exhibit unsafe driving behaviours once licensed, and were in turn more likely to have crashed within the first two years of solo driving. The links between these attributes and unsafe driving behaviours were present for parent-, self-, and teacher-reported patterns of behaviour in the earlier surveys.

Young people who showed signs of hyperactivity and low persistence were also more likely to be included in the high risky driving group. This is consistent with research findings suggesting that children (and adults) identified as affected by attention deficit disorder have a higher risk of crash involvement than unaffected children and adults (e.g. Barkley et al., 2002). This may reflect the poor attentional control and weak inhibitory cognitive processes present in attention deficit disorder, although it needs to be emphasised that children exhibiting these attributes in this study had not necessarily been diagnosed with attention deficit disorder.

Interpretation of these results and their implications – where it appears that two clusters of childhood attributes (anti-social behaviours and attentional problems) are associated with unsafe driving behaviours – were areas of some debate amongst the project team. The views expressed here reflect those of the first author primarily, and are presented to promote discussion. A more-complete discussion of alternative views is presented in the project report (Smart et al., in preparation).

The significant relationships between childhood and adolescent attributes and subsequent safety-related measures raise two important issues that need to be addressed. The first is whether it is possible to view the links between childhood characteristics and subsequent behavioural patterns as causal. The ATP data are not conclusive on this issue as they are correlational in nature, highlighting a statistical association between some childhood characteristics and subsequent safety-related behaviours and crash risk. This statistical association may not be a causal relationship. Nevertheless, it is useful to consider the consequences of a causal link because without one it would be difficult from a road safety point of view to argue for the implementation of programs targeting these factors.

There may be a case for considering a causal relationship between attentional problems and subsequent driving behaviours based on other research. The current understanding that attention deficit disorder has its cause in cognitive mechanisms that normally serve to control the allocation of attentional resources (Barkley, 1997)

suggests that drivers who have this disorder are less likely to possess or develop the cognitive skills necessary to attend to relevant information in the driving environment. The suggestion in the current analysis, therefore, that childhood hyperactivity and attentional problems are correlated with subsequent driving behaviour and crash involvement may suggest in turn that the effect of the cognitive patterns that underlie childhood attentional problems continue to have an effect in young adulthood (see Barkley et al., 2002). The current data suggest that attentional problems even at non-diagnosed or subclinical levels may impact on driving behaviours.

The possibility that there is a causal link between aggressive and antisocial behaviours in childhood and adolescence and subsequent unsafe driving behaviours is less certain. It might be argued that the psychological or cognitive factors that underlie externalising behaviours could continue to influence the driver in adulthood, leading to driving behaviours that might be characterised as aggressive or antisocial – such as speeding. There is evidence that aggressive individuals have a strong history of high reactivity (that is, volatility, emotionality, negative mood, intensity) as well as poorer capacities to regulate or control their emotions. Aggressive individuals are more likely to attribute hostile intent to others in ambiguous situations compared to their non-aggressive peers (Dodge, 1986). Such findings have been interpreted in terms of social information processing deficiencies.

Considerable research suggests that many of these same psychological and cognitive factors that underlie aggression also underlie antisocial behaviour. For example, temperament characteristics indicative of poorer self-regulation capacities (ie. high reactivity and high impulsivity) are frequently associated with later antisocial behaviour as are biases in social cognitive information processes such as those described above (although these are particularly associated with violent antisocial behaviour). The link between these and unsafe driving behaviours such as speeding and restraint non-use is less certain, however, than the link between attentional control problems and unsafe behaviours.

The second issue raised by the results reported here is that concerning the potential value of interventions directed towards children and adolescents. While this issue is also not addressed directly by the ATP data, if there is a causal link between predisposing factors that can be detected in childhood or adolescence and subsequent safety outcomes, it may be possible to improve safety outcomes with an intervention that targets the childhood or adolescent attributes. Any response to this issue must be based on sound evidence concerning treatment outcomes, rather than any theoretical bias about the potential benefits of specific interventions.

It is possible to influence the longer term outcomes of childhood and adolescent attention deficit disorder (Barkley, 1998), although there is consistent evidence that nonpharmacological treatments for this disorder are less effective than treatments including the use of stimulant medication (Hinshaw et al., 1998). Based on an important outcome study, Edwards (2002) concluded that an effective treatment regime for attention deficit disorder needed to incorporate parent training, school interventions, and medication. Contingency-management programs that might be taught to teachers and parents appear to have an effect on current behaviour, but not on longer-term outcomes. The broad range of problems associated with this disorder means that it is often identified and treated for educational and behavioural reasons.

This, and the evidence favouring the inclusion of medication as part of a treatment regime, limits the likely value of any additional road-safety funding in this area.

While the attributes identified in the ATP are symptomatic of attention deficit disorder, however, the children with these attributes in the ATP were not necessarily diagnosed with it. If there were evidence that programs targeting children with these attributes had longer-term benefits on attentional and related cognitive processes, it might be reasonable to expect some safety outcomes amongst novice drivers. There is little such evidence, however, although many programs focusing on issues such as persistence and self-control are known to have shorter-term effects.

The potential for interventions directed towards aggressive and antisocial behaviour patterns may be worth considering. While there is some evidence that temperament style can be moderated by the milieu (family, school, and peers) in which children grow up, and that changes in temperament can occur, there is still only limited empirical evidence that it is possible to overcome the poor long-term prognosis of children with externalising disorders (e.g. Kazdin, 2002). The strong focus on intensive, clinically-oriented programs (e.g. Borduin et al., 1995; Durlak et al., 1991) makes it difficult to generalise most evaluation research in this area to less-intensive programs that might operate in a school setting.

From a road safety perspective, one consequence of the results reported here is that some unsafe driving behaviours may reflect long-term patterns of behaviour that are associated with psychological or cognitive mechanisms that are not under the conscious control of drivers. Failures in attentional control or inhibitory processes and aggressive or antisocial behaviours that are related to temperament and personality would not be expected to respond to road safety programs that focus on conscious decision making. Public education programs that attempt to increase conscious or cognitive executive control of driving behaviours would not, for example, be expected to have a significant effect on the unsafe driving behaviours of young adults with attentional problems relating to attention deficit disorder. This suggests that a stronger focus on behaviour modification techniques (such as enforcement) may have a stronger effect on this subgroup of drivers than information-oriented programs.

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