



Risky attitudes towards road use in pre-drivers[☆]

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Abstract

Motor vehicle accidents are one of the principal causes of adolescent disability or mortality and male drivers are more likely to be involved in road accidents than female drivers. In part such associations between driver age and sex have been linked to differences in risky behaviour (e.g. speed, violations) and individual characteristics (e.g. sensation seeking, deviant behaviour). The aim of this research is to determine whether associations between risky road user behaviour and individual characteristics are a function of driver behaviour or whether they are intrinsic and measurable in individuals too young to drive.

Five hundred and sixty-seven pre-driver students aged 11–16 from three secondary schools completed questionnaires measuring enthusiasm for speed, sensation seeking, deviant behaviour and attitudes towards driver violations. Boys reported more risky attitudes than girls for all measures. Associations between sensation seeking, deviant behaviour and attitudes towards risky road use were present from early adolescence and were strongest around age 14, before individuals learn to drive.

Risky attitudes towards road use are associated with individual characteristics and are observed in adolescents long before they learn to drive. Safe attitudes towards road use and driver behaviour should be promoted from childhood in order to be effective.

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Keywords: Pre-drivers; Risky behaviour; Sex differences; Sensation seeking; Driver violations

1. Introduction

It is well known that young people have an increased risk of both intentional and unintentional injuries and that, globally, motor vehicle accidents are one of the principal causes of adolescent disability or mortality (Morrison and Stone, 2000). In the United States, 16-year-olds are 18 times more likely to be killed in a car crash than those aged 30–34 years (Jelalian et al., 2000) and in New Zealand, Harré reports that road crash injuries are a leading cause of death and hospitalisation for adolescents (Harré et al., 2000). In the European Union, motor vehicle fatalities accounted for 84% of unintentional deaths to young people aged 15–24 (Morrison and Stone, 2000) and in the UK, young drivers are 2.5 times more likely to be involved in an accident than those who are older (Clarke et al., 2005). There are also sex differences in accident involvement: with respect to motor vehicle accidents, male drivers are more likely to be involved in road

accidents than female drivers (McKenna et al., 1998; Norris et al., 2000; Wasielewski, 1984) even after differences in exposure have been accounted for (Evans, 1991; Maycock et al., 1991).

One of the reasons put forward to explain such disproportionate accident involvement is the propensity for young people generally, and males specifically, to involve themselves in potentially risky behaviours such as driving at inappropriate speeds and driving at night, perhaps while under the influence of alcohol (Evans, 1991; Gullone et al., 2000; Lawton et al., 1997; McKenna et al., 1998; Parker et al., 1995; Wasielewski, 1984; West and Hall, 1997). In an attempt to conceptualise these individual age and sex differences in risk behaviours and to inform programmes aimed at intervention and prevention, scholars have looked to psychological concepts such as sensation seeking and deviant behaviour (Arnett, 1992; Newcomb and McGee, 1991; West et al., 1993). Males report more general sensation seeking and socially deviant behaviour than females (Arnett, 1992; Arnett, 1994; Byrnes et al., 1999; Jessor, 1998; Roth et al., 2005; Steinberg and Avenevoli, 1998) and younger people report more sensation seeking and socially deviant behaviour than those who are older (Gullone et al., 2000; Miller and Byrnes, 1997; Zuckerman, 1979). This trend fits what we know of risky driver

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behaviour and accident involvement: drivers are most likely to be accident involved in the early part of their driving career (usually during late adolescence/early adulthood) and if they are male.

Both biosocial and psychosocial models have been developed to try and explain these differences in risk behaviour. By about 3 years of age, boys involve themselves in more risk-taking behaviours than girls (Maccoby, 1998) and by adolescence, boys and older adolescents report lower perceptions of risk than girls and those who are younger (Gullone et al., 2000). Levels of brain neurotransmitters such as monoamine oxide (MAO) have been associated with risky behaviour (Jonah, 1996) and there is also evidence that the heritability of risk-taking behaviours is relatively high (Zuckerman and Kuhlman, 2000). Yet other work has postulated that, in adolescence, executive processes are still developing so that impulse control, foresight and other self-regulatory capacities are immature and therefore unable to modify thrill or reward-seeking behaviours (Steinberg, 2004; Gardner, 2005). However, socialisation models may also explain sex differences in risk-taking behaviours: mothers tolerate, and indeed encourage, risky behaviour to a greater extent in their sons than their daughters in playground situations both when they are teaching the child a new skill and also in free play sessions (Morrongiello and Dawber, 1999, 2000). Although this differential encouragement may be a response to inherited or biological traits in boys and girls, the values, attitudes and behaviours of those who encourage risk behaviour in boys but not girls may be internalised by children so shaping their future behaviour (Bussey and Bandura, 1999).

While age and sex differences can be seen in general risky behaviour, it is less clear whether they also apply within a road user environment: can the specific age and sex differences observed in drivers be explained by pre-existing differences in individual characteristics such as sensation seeking and deviant behaviour? Alternatively, are they more likely to be due to factors such as a lack of experience in handling a motor vehicle in a road environment and the subsequent mismatch between driver expectations and abilities? Research carried out with novice drivers and also pre-drivers in New Zealand (Harré et al., 2000) has examined the effects of age, sex and experience on attitudes towards risky driving behaviour. There was no evidence for an experience effect between learner and novice drivers (Harré et al., 2000). In those with no experience of driving, there was some evidence of age and sex effects with younger pre-drivers (mean age 14.2 years) and females displaying less risky attitudes towards driving than males or novice drivers who were 2 years older (mean age 16.4 years: in New Zealand, students can learn to drive aged 15 years). This negative association between age and risk judgements is supported by more recent work in the United States (Millstein and Halpern-Felsher, 2002) where older adolescents reported fewer feelings of vulnerability towards alcohol and risky sexual behaviour than those who were younger.

The aim of the current study is to examine sex and age differences regarding attitudes towards driving behaviour in adolescents before they are old enough to drive. If risky driver behaviour is associated with pre-existing individual characteristics such as sensation seeking and deviant behaviour, then it should be possible to find sex and age differences in variables

associated with risky driver behaviour *before* driving begins i.e. before experience has an effect. Alternatively, if age and sex differences in driver accidents are a function of differential experience and skill in the task of driving, one would not expect to find differences in variables associated with risky driver behaviour in people who have no experience of driving. We report research which was carried out with school pupils aged between 11 and 16 i.e. young males and females who have not yet learnt to drive.

2. Method

2.1. Participants

Five hundred and sixty-seven school pupils aged between 11 and 16 (who were all too young to learn to drive) were recruited from secondary schools. Head teachers were approached by letter initially and were told about the proposed research and its aim to investigate sex differences in risky road use and accident involvement. They were also given a copy of the questionnaire and asked to contact the experimenter if they had any queries. About 1 week later, a follow-up telephone call was made asking whether the head teachers were willing for their students to take part in this study. Of nine schools approached in this way, three agreed to take part. One school administered the questionnaire to all pupils, another to its Year 7 and Year 11 pupils and the final school to its Year 11 pupils only. No fee was paid to the students or the schools. Cell sizes by age and sex are given in Table 1.

2.2. Procedure

Questionnaires were photocopied and delivered to the schools in question. They were administered by tutors within 50-min tutorial sessions. The questionnaire asked for basic demographic information (sex and age) and included self-report questions about attitudes towards road use and individual characteristics previously associated with risky driver behaviour and accident involvement. All requirements of the University's ethical review board were met.

2.3. Measures

2.3.1. Speed choice

Enthusiasm for speed was assessed by averaging the response from two questions: "do you like being a passenger when the car is being driven fast?" and "do you think that driving fast is

Table 1
Cell sizes by age and sex for pre-drivers

	Male	Female
11 years	54	56
12 years	47	45
13 years	45	64
14 years	50	36
15 years	57	44
16 years	36	33

exciting?” Each item was scored on a scale from 1 to 7 with high scores indicating more enthusiasm for fast speeds.

2.3.2. Attitudes towards driving violations

Five questions about driving violations were also asked (modified from the Violations Questionnaire from the DBQ (Reason et al., 1990): ‘is it ok for drivers to “drive especially close to the car in front as a signal to its driver to go faster or get out of the way?” “cross a junction knowing that the traffic lights have already turned red?” “chase another driver (who has made him/her angry) with the intention of giving him/her a piece of his/her mind?” “ignore the speed limits late at night or very early in the morning?” “get involved in “unofficial” races with other drivers?”’ Responses were scored on a Likert Scale ranging from 1: never to 6: all the time.

2.3.3. Sensation seeking

The questionnaire included eight items from the novelty seeking sub-scale of Arnett’s Inventory of Sensation Seeking (AISS): (Arnett, 1994) e.g. “when I listen to music I like it to be loud” “I stay away from movies which are said to be frightening”. Students were asked to rate how well each statement described him or her using responses scored on a Likert Scale from 1: not like me at all to 4: very like me.

2.3.4. Deviant behaviour

Six items from the Social Deviance Scale (West et al., 1993) were used and students were asked: “How likely is it that you would do these things if you were completely certain that you would not get caught: e.g. “leave a shop with goods you have not paid for” “ride on public transport (a bus or train) without paying a fare”. Again, items were scored on a Likert Scale from 0: not at all to 2: very likely.

Completion of the questionnaires was anonymous. When the questionnaires had been completed, the experimenter was contacted to collect them from the schools.

2.4. Statistical analysis

Although it is possible to debate the nature of the empirical structure which underlies the data described above, discussion has taken place across the social sciences literature indicating that there is little disadvantage in the use of parametric methods for analysis of such data (Binder, 1984; Kim, 1975; Zumbo and Zimmerman, 1993). Therefore we report the results of parametric analyses as we believe this facilitate a more informative interpretation of the results. In part our decision was based upon the relatively large size of our sample. As Lumley et al. (2002) have noted, parametric tests such as the *t*-test and linear regression only require a normal distribution for small sample sizes (<100); such parametric analyses may be used in samples larger than 500 in data without a normal distribution. Notwithstanding the above arguments, in order to be confident in our approach, equivalent non-parametric analyses were undertaken. As expected there were no differences in the level of significance as a result of the analyses used.

Most analyses were carried out using 2 × 6 (sex × age) ANOVAs. Unless stated otherwise, post-hoc tests, if used, report Student–Newman–Keuls statistics. Linear regressions were carried out to determine the extent to which sensation seeking and deviant behaviour could predict enthusiasm for speed and attitudes towards violations in this pre-driver sample. Both means and medians have been provided to describe the data.

3. Results

3.1. Risky behaviours

3.1.1. Speed choice

When enthusiasm for speed was analysed by age and sex, it was found that there was a main effect of sex ($F(1,545) = 82.45, p < .001$) and also a main effect of age ($F(5,545) = 4.48, p = .001$) for pre-drivers.

The interaction between age and sex is not significant ($F(5,545) = 1.39, p = .227$). Boys have a greater enthusiasm for speed than girls (mean = 4.90 (S.D. 1.74, 95% CI 4.69–5.12; median = 5.0) and 3.72 (S.D. 1.70, 95% CI 3.51–3.94; median = 4.0), respectively, Cohen’s $d = .69$). Post-hoc tests indicate that students aged 11 and 16 are significantly less excited by fast speeds than those at any other age but this seems, specifically, to be a function of the female responses. As can be seen in Fig. 1, boys’ enthusiasm for speed appears not to change after the age of 12 years. Univariate ANOVAs carried out for boys and girls separately indicate that 14-year-old boys have a greater enthusiasm for speed than same sex peers of any other age ($F(5,277) = 2.30, p = .046$) and the same is true for girls aged 13 ($F(5,268) = 2.77, p = .002$). Post-hoc tests showed that girls aged 11 and 16 are significantly less enamoured by fast speeds than girls of any other age.

3.1.2. Violations

When asked whether it was ok for drivers to commit violations, boys felt that this was significantly more acceptable than girls did ($F(1,512) = 11.22, p < .001$). Mean responses for the hypothetical violations questions were 1.61 (S.D. = .84, 95% CI 1.52–1.72; median = 1.4) and 1.39 (S.D. = .56, 95% CI 1.32–1.46; median = 1.31) for boys and girls, respectively,

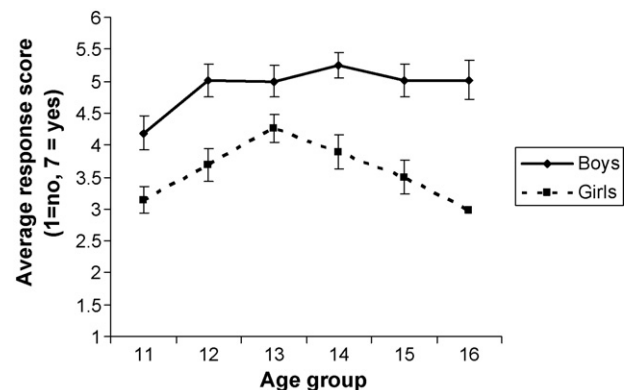


Fig. 1. Pre-driver’s affinity for speed by sex and age.

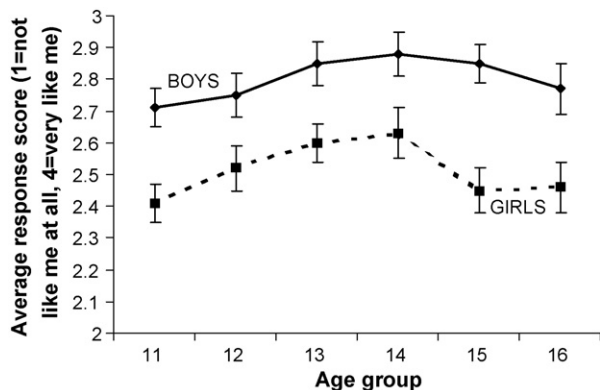


Fig. 2. Sensation seeking by sex and age.

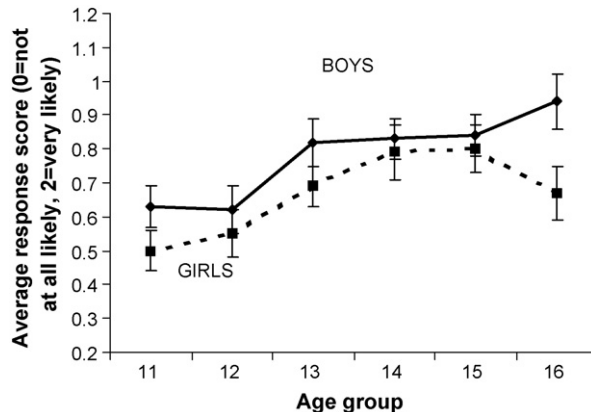


Fig. 3. Social deviance by sex and age.

Cohen's $d = .30$). However, it should be noted that both boys and girls respond with scores of less than two on a scale which ranges from 0 to 6: overall, neither boys nor girls condone driving violations. There was no effect of age ($F(5,524) = 1.93, p = .088$).

3.2. Individual characteristics

In adult drivers, speed choice and violations are associated with sensation seeking and socially deviant behaviour.

3.2.1. Sensation seeking

There is a significant effect of sex such that boys score higher in sensation seeking than girls ($F(1,523) = 56.30, p < .001, d = 0.60$; means = 2.80 (S.D. 0.46, 95% CI 2.75–2.86; median = 2.75) and 2.51 (S.D. 0.42, 95% CI 2.46–2.57; median = 2.5), respectively (Fig. 2).

There is also a significant effect of age ($F(5,523) = 2.43, p = .034$). There is some evidence that sensation seeking behaviour peaks in mid-adolescence for both boys and girls before flattening out for boys and falling for girls.

3.2.2. Social deviance

In this group of pre-drivers, there was a significant sex difference such that males were more prone to deviant behaviour than

females (means = .78 (S.D. 0.44, 95% CI .71–.82; median = .67) and .67 (S.D. .45, 95% CI .61–.72; median = .50), respectively; $F(1,507) = 8.78, p = .003, d = 0.25$) (Fig. 3).

There was also a significant age effect ($F(5,507) = 6.64, p < .001$); post-hoc tests indicate that 11- and 12-year-olds report being less deviant than the rest of the sample.

3.3. Associations between speed choice, violations and individual characteristics

There was a significant correlation between enthusiasm for speed and sensation seeking for both males ($r = .42, p < .001$) and females ($r = .34, p < .001$). Those who expressed a greater enthusiasm for speed (i.e. reported that they liked travelling fast in cars) were also more likely to score highly on the sensation seeking scale. The association between violations and sensation seeking was also significant for both boys and girls ($r = .21, p < .01$ and $r = .20, p < .01$, respectively): those who felt that violational behaviour was relatively acceptable were also more likely to score highly for sensation seeking. Similar relationships were found for social deviance and speed ($r = .21, p < .01$ for males and $r = .14, p < .05$ for females) and also for social deviance and violations ($r = .24, p < .001$ for males and $r = .19, p < .01$ for females). Increased enthusiasm for speed and

Table 2
Standard multiple regression of individual characteristics on speed choice and violations

	β		t		p	
	Male	Female	Male	Female	Male	Female
Speed choice						
Social deviance	.118	.059	2.01	.95	.045*	.341
Sensation seeking	.383	.319	6.54	5.15	<.001**	<.001**
				r^2	0.19	0.12
Violations						
Social deviance	.204	.152	3.28	2.37	.001***	.019*
Sensation seeking	.151	.154	2.43	2.41	.016*	.017*
				r^2	0.081	0.059

* $p < .05$.
** $p < .01$.
*** $p < .001$.

greater acceptance of violations were both associated with more deviant behaviour. Each of these relationships is stronger for males than for females. In this sample of pre-drivers, the relationships shown to exist between risky attitudes/behaviour and individual characteristics in qualified drivers are replicated.

Regression analyses were carried out to indicate the extent to which sensation seeking and social deviance could be used (in this group of pre-drivers) to predict enthusiasm for speed and violations (behaviours which predict accident involvement in drivers). Results are shown in Table 2. Linear regressions (with enthusiasm for speed as the dependent variable and both social deviance and sensation seeking entered at the same time) predict 19% of the variance for enthusiasm for speed for boys and 12% of the variance for girls.

Social deviance is not a significant predictor of enthusiasm for speed for females but it does predict the same in males ($p < .05$). However, sensation seeking predicts enthusiasm for speed in both sexes and is an equally strong predictor for both males and females. When the violations score is entered as the dependent variable and social deviance and sensation seeking are entered together as the predictor variables, it is possible to explain 8% and 6% of the variance, respectively for boys and girls.

4. Discussion

Previous research has shown that both general and domain specific risky behaviours have been associated with age and sex differences in individual characteristics such as sensation seeking and social deviance. What was unclear from the literature was whether risky attitudes towards road use could also be associated with sensation seeking and deviant behaviour if an individual was too young to drive. Results from the current study show that, in this group of pre-drivers (who have no driving experience), there are sex and age differences in sensation seeking and deviant behaviour and also in specific attitudes towards risky road use (enthusiasm for speed, acceptance of violations). This indicates that risky driver behaviour is not simply a function of the opportunities provided when behind the wheel of a car; it is also a function of individual characteristics which are present long before driving is an option. The sex differences reflect those seen in qualified drivers (males exhibit more risky attitudes than females) whereas the age differences indicate that risky attitudes seem to increase for a period throughout adolescence, remaining high in young, novice drivers before beginning to decline in older individuals. The reported age and sex differences are consistent with trends observed in previous research with regard to biological correlates of risky behaviour. However, it should be noted that, in the current study, sensation seeking scores peaked at 14 years of age for both boys and girls but that this peak is not mirrored in either enthusiasm for speed or violations scores. Previous research (Gullone et al., 2000; Harré et al., 2000; Miller and Byrnes, 1997) suggests that risky behaviour continues to increase until late adolescence: it seems, therefore, that sensation seeking on its own is not enough to account for this trend.

Regression analyses showed that the same characteristics which predict accident involvement and unintentional injury

in drivers predict risky attitudes towards road user behaviour behaviours in people who are too young to drive and who have no real driving experience. Although these regressions predict a relatively small amount of variance in risky behaviours for both sexes when r^2 is considered – between 0.059 and 0.19 – this translates to an ability to predict between 24% and 43% of risky behaviours when the correlation coefficient (r) is considered in the light of the binomial effect size display (Rosenthal, 1990). As described by Rosenthal in his paper, effect sizes much smaller than this have resulted in the halting of clinical trials because it would have been unethical not to do so. In addition, it should be remembered that this study is measuring *pre-driver attitudes* about hypothetical behaviours and so many other influences are likely to play a role.

The importance of the current study is that it shows that the sex differences in risky attitudes associated with driving behaviour and driver accidents can be seen in children long before they reach the legal driving age — risky road use is more than just a function of getting behind the wheel of a car. The implications of this are that it may be too late to try and educate individuals about safe road use when they are actually learning to drive: they are likely to have existing perceptions about how to drive and existing expectations about the driving experience. Such pre-conceptions are likely to have come, in part, from parents and previous work has reported the inter-generational transmission of driving behaviour from parent to child (Ferguson et al., 2001; Shope et al., 2001; Taubman-Ben-Ari et al., 2005). Therefore policy makers need to consider interventions on two levels: those aimed at young people long before they are old enough to learn to drive and also interventions aimed at parents. Children and adolescents need to be taught that road environments are not appropriate settings for sensation seeking and deviant behaviours—an examination of road accident statistics in the United Kingdom in 2002 shows that almost twice as many boys as girls aged 15 or under were killed or seriously injured in road accidents (*Road Casualties in Great Britain in 2003: Annual Report*, 2003). In part this may be due to differences in education about risk-taking behaviour (Morrongiello and Dawber, 1999) or supervision provided by parents (Maccoby, 1998; Waylen and McKenna, in press). We acknowledge that the evidence for the effectiveness of education as a means of reducing risk-taking in adolescence is speculative and that interventions aimed at reducing risky behaviour per se are unlikely to reduce adolescent vulnerability (Steinberg, 2004). However, we do not believe that this means one should stop trying: rather than aiming for a direct effect of adolescent-targeted interventions, it may be that indirect effects via parental interventions will be more effective in changing the perceived legitimacy of legislation and enforcement with regard to novice drivers and that legislation and enforcement will reduce vulnerability (McKenna, 2007). Parental interventions are already being examined at the novice driver level (Simons-Morton et al., 2003; Simons-Morton et al., 2005) and evaluations have reported that they affect parental behaviours (by increasing the driving restrictions placed on novices) as well as novice driver behaviours (reductions in novice self-reports of risky driving and violations) (Simons-Morton et al., 2006). Additional interven-

tions might focus on informing the parents of young children about differences in the socialisation and supervision of their sons and daughters from a very early age and the potentially important sex differences in attitudes towards road use which are present by early adolescence.

The current study extends the work carried out in New Zealand by Harré et al.: the presence of pre-existing attitudes towards speed and violations reported here goes some way towards explaining the failure of the New Zealand study to find sex differences between learner and novice drivers. The fact that there are such associations between risky attitudes and individual characteristics early in adolescence means that it should be relatively easy to identify those individuals who might be at most risk of being involved in an accident as a result of risky behaviour and so focus appropriate training accordingly.

4.1. Study limitations

There are limitations to this study which should be used to inform future research. The cross-sectional nature of this work means that it is only feasible for us to report associations between individual characteristics and risky behaviour. While the associations may be arbitrary or due to a further (unidentified) variable associated with sensation seeking, deviant behaviour and risky attitudes towards road use, previous research in other domains has suggested that the relationship is causal, at least in part (Roberti, 2004; Rosenblitt et al., 2001). Future research in longitudinal cohorts could test this in specific potentially high risk domains. While it is certainly the case that the sex and age trends for risky attitudes presented here are consistent with an examination of the previous literature, the age effects hint at a biological association between age or stage and attitudes/behaviour which it was not possible to investigate. There may be hormonal associations with risky behaviour as have been suggested between testosterone/cortisol and sensation seeking (see Rosenblitt et al., 2001 for a review). The current study was never intended to record pubertal development but, given the results, information about pubertal status may well have added to the interest. Future research into age and sex differences in adolescent sensation seeking should aim to take account of pubertal status.

We were also unable to determine the extent of social influences in this work. As suggested above (Ferguson et al., 2001; Shope et al., 2001) (Taubman-Ben-Ari et al., 2005) novice drivers appear to be influenced by their parents: those who have an accident early in their driving career are more likely to have parents who have received penalties for unsafe driving. It may be that, as suggested by Morrongiello et al. and Bussey et al., individuals are encouraged and supported in having different attitudes to risk dependent upon their sex and the availability of (in)appropriate role models. Again, future research is needed to determine whether, and if so, to what extent, risky attitudes and behaviours are transmitted within families.

5. Conclusions

Sex differences in road user attitudes and behaviours seem not to be simply a function of actual driving: risky behaviours and

predictors of such behaviours (e.g. enthusiasm for speed, sensation seeking, anti-social behaviour, acceptance of violations) can be measured in children as young as 11. Sex differences in these behaviours (which exist in adults) can also be measured from an early age.

Driver education needs to be initiated at an age much younger than the legal driving age if safe attitudes and behaviours are to be instilled in young people. This study shows that, as individuals approach the age at which they can learn to drive, they already have an abundance of beliefs and ideas about what driving will be like—learner drivers are not “*tabula rasa*” and driver education of children and their parents should be modified to take this fact into account.

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