

Different Factors Predict Different Risky Driving Behaviours: A Challenge to the Assumed Generalizability of Prediction and Countermeasure

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Biography

Ralston Fernandes is currently enrolled as a full-time postgraduate research student with the University of Sydney, studying towards a PhD in Psychology. He holds a Bachelor of Science in Honours in Psychology, and is currently employed as a Tutor in the School of Psychology, University of Sydney. Current research is in the area of Health Psychology, specifically driver attitudes, risk perceptions, prevention and countermeasure for driver risk taking. He also completed his Honours Thesis in road safety research.

Abstract

It has been shown repeatedly that adolescents are over-represented in crashes among all classes of road user, compared with other age groups. Causation of this over-representation is complex, with many different factors implicated from both basic and applied research perspectives. Ultimately, applications of theories of human behaviour must guide road safety studies of road user behaviour, and are critical to practical outcomes in addressing the problem of road trauma. While there is a gamut of applied research on road safety, it is typically focused on single problems (e.g. drink-driving or speeding). The present study begins the process of comparing factors involved in various problem behaviours in relation to attitudes across various risky driving behaviours. Study 1 (N=109) examined a range of possible predictors of risky driving, and investigated the nature of attitudes to risk taking for young drivers. The aim of Study 1 was to investigate whether predictive factors for various risky driving behaviours differed from behaviour to behaviour (e.g. drink-driving vs. speeding vs. non-use of seat belts). Results illustrated that different risky driving behaviours were predicted by different factors (e.g. speeding was predicted by authority rebellion, while drink driving was predicted by sensation seeking and optimism bias). These results are inconsistent with the cherished assumption in the field that the predictive factors of one risky driving behaviour can be generalized to another. Study 2 (N=115) examined the generalizability of the results from a student sample to the general driving population. Again, the common practical assumption of generalization from university students to the general population was not supported in several cases. Overall, the results clearly illustrate that *different* factors predict *different* risky driving behaviours, and future research must now focus on a multi-factor framework for each specific risky driving behaviour, rather than assuming generalizability from one risky behaviour to another.

It is consistently shown that adolescent drivers are over-represented in road crash statistics, both in Australia and worldwide (Jonah, 1986; Job, 1996; 1999). Causation of this over-representation is complex (Cameron, 1985). Exposure is seen as a major contributor, with young people driving more often than older drivers, and at more dangerous times (Lee, Prabhakar & Job, 1993). The lack of driving experience in

adolescents is another contributing factor, with an important consequence believed to be a lack of driving skill. However, recent literature suggests that motivation, rather than skill, is a major determinant of road safety (Naatanen & Summala, 1976; Job, 1999; Job & Hatfield, 1996). Consequently, risk taking has been proposed as a substantial contributor to the over-involvement of young drivers in road crashes (Cameron, 1985; Jonah, 1986; Job, 1996). It is believed that young people with limited experience engage in behaviours with the anticipation of reward or gain, and without fully understanding the consequences of their actions (Job, 1999). As a result, many young people continue to take risks while driving despite the possibility of injury or death. Compared with older drivers, young drivers are more likely to drive fast, tailgate, allow too little time to merge, and fail to give way to pedestrians (Jonah, 1986; Job, 1990; 1999).

Given the extensive research on risk taking and its apparent role in road trauma causation, thorough investigation into young peoples' attitudes toward driving is essential. However, the lack of valid and reliable instruments to measure risk taking attitudes makes it difficult to measure any effects of attitude change, and many self-reports of driving behaviour have not been psychometrically examined. Furthermore, most past research has focused on single driving behaviours (e.g. Harre, Brandt & Dawe, 2000). Consequently, there is a pervasive assumption that factors such as optimism bias and sensation seeking contribute to risky driving behaviours in the same way, regardless of the behaviour. Thus, it is thought that we must use the same approach in advertising to speeding, drink-driving, and not wearing seat belts. For instance, successes in drink-driving are being used to generate principles to apply to many other risky driving behaviours. This assumption, however, has never been tested. Consequently, before it can be assumed that attitude change will lead to improving road safety, it is essential to establish the nature of any relationship between attitudes and on-road behaviour, across a variety of risky driving behaviours.

STUDY 1: INVESTIGATING THE RISK-TAKING ATTITUDES OF YOUNG DRIVERS

Study 1 examined demographic, personality, and attitudinal factors in relation to predicting a range of risky driving behaviours, and investigated whether different factors predict different risky driving behaviours. One important theory for risky driving is Jessor & Jessor's (1977) Problem-Behavior Theory, which has since been extended specifically to risky driving. Problem-Behavior Theory proposes an interaction of factors that arise from three major systems – the personality system, the perceived environment system, and the behavior system – and predicts a regular general tendency for deviance across a large range of behaviours, with similar predictors present for each behaviour. The vast research on driver risk taking illustrates that many different factors have been implicated as determinants of risky driving, and it is difficult to acknowledge a single factor as significant. Based upon this and Problem-Behaviour Theory, a range of possible predictors of risky driving was examined in Study 1. The greater value of the multiple testing of many factors is that it negates the problem of possibly confounded predictors that have not been directly compared. The factors tested in Study 1 are listed below:

- (A) Age – Research has found that there exist significant differences in risky driving behaviour between specific driver age groups (Jonah, 1990; Begg & Langley, 2001).
- (B) Gender – Gender effects have been prominent for optimism bias (Job, 1990b; 1996).
- (C) Sensation seeking – Zuckerman (1994) suggests that sensation seeking is presently the most common purpose of risky driving for young men.
- (D) Competitiveness – The inclusion of this factor was based on logical possibility.

- (E) Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism – Arthur & Doverspike (2001) have found that crashes significantly correlated with the five-factor model of personality, and, in particular, with conscientiousness.
- (F) Aggression – Recent research suggests that aggression is a significantly high-risk personality sub-group of young drivers (Ulleberg, 2001).
- (G) Psychopathy – several studies have illustrated the relevance of antisocial personality to deviant behaviour (e.g. Kuriychuk, 1992).
- (H) Authority Defiance – The inclusion of this factor was based on logical possibility.
- (I) Time saving – Research shows that people engaging in risky driving are more likely to view being on time for appointments as desirable (Adams-Guppy & Guppy, 1995).
- (J) General and Specific Attitudes – It is often believed that people treat different driving behaviours as the same. That is, they hold a general attitude about driving, which groups all driving behaviours together. On the other hand, people may hold specific attitudes for performing each behaviour. Consequently, all attitude questions were designed to cover general attitudes and specific attitudes.
- (K) Optimism Bias Attitudes – The influence of optimism bias on road trauma has been reviewed previously in this paper (c.f. General Introduction).
- (L) Avoidance Attitudes – The inclusion of this factor was based on logical possibility.

It was also necessary to investigate a range of driver behaviours, with the following ten selected: speeding, drink-driving, driving while fatigued, red light running, aggressive driving, reckless driving, competitive driving, not wearing seat belts, not using indicators, and tailgating. (Ethics approval was granted, for both studies, by the University of Sydney Ethics Committee).

1.1 Method

Participants were required to complete a questionnaire, estimated to take 50 minutes to complete. Participants were 109 first-year psychology students from the University of Sydney (who participated for course credit), and were required to be twenty-two years of age or less, and to have held a current NSW drivers license for at least one year. The questionnaire used for Study 1 included seven sections: (1) *Optimism bias*, (2) *Attitudes to driving*, (3) *Avoidance attitudes to driving*, (4) *Driving behaviour intentions*, (5) *Personality scales*, (6) *Infringements and accidents*, and (7) *Demographics*. Upon completion, subjects were debriefed, given their course credit, and thanked for their participation. Behavioural intentions were used as a measure of actual driving behaviour (DV). A range of driving situations were presented for each behaviour, and participants were asked to rate the extent to which they would engage in that behaviour *given the circumstance in each question* (as a percentage).

For the present analyses, Cronbach's Alpha was set as 0.05, and all tests were 2-tailed. The primary analytic model used was multiple linear regression (MLR). An Increment Test is one such MLR operation. The use of an Increment Test (using "Enter" in SPSS Regression) allows the researcher to test certain predictors that are hypothesised to predict each risky driving behaviour *prior* to any other predictor. Additionally, the researcher is able to test other predictors, which are added to the original regression model for each behaviour, in order to investigate whether they also predict *additionally to the original predictors*. The advantage of this model is that the multiple correlation coefficient, R , is widely understood, and the square of this coefficient provides the proportion of variance that is accounted for by the combined set

of predictors. Thus, in addition to statistical significance, the use of multiple linear regression enables the researcher to evaluate the amount of variation explained by a particular model.

The aims for Study 1 were tested by comparing regression models for a variety of risky driving behaviours, each containing a range of possible factors. A gradation of factors was proposed, arranged in order of *how stable each set of factors were as an intrinsic characteristic of the person*. Accordingly, three regression models were considered for each behaviour:

(1) Demographics only Model - Age and Gender were considered to be the *most* stable characteristics of a person. Thus, it was reasoned that they have a greater capacity to predict the performance of certain behaviours than other factors.

(2) Demographics plus personality factors Model - Personality factors were considered the next most stable set of factors, as they are generally believed to be a property of the individual. As such, their predictive value is considered after any effects of demographics on risky driving.

(3) Demographics plus personality factors plus attitudes Model - Attitudes were hypothesised to be the least stable factors of an individual (in determining risky behaviour). These factors were to be considered after the effects of demographic and personality factors.

1.2 Results

Reliability levels for all scales constructed were acceptable, ranging from 0.53 to 0.96. The summary of results for Study 1 regression analyses performed for each risky driving behaviour is shown in Table 1. Some behaviours (such as drink-driving) were initially predicted by gender, but were then superseded by a more dominant attitudinal predictor. Other behaviours (such as competitive driving) were predicted by both personality and attitudinal factors. One clear result was that age was not a significant predictor of any behaviour. The proportion of variance accounted for by each model ranged from 15.3% to 59.7%.

Table 1: Study 1 regression analyses summary, illustrating the factors significantly predicting each risky driving behaviour within each of the three behaviour models (with the proportion of variance accounted for by each model in brackets).

BEHAVIOUR	DEMOGRAPHIC ONLY MODEL	DEMOGRAPHICS PLUS PERSONALITY FACTORS MODEL	DEMOGRAPHICS PLUS PERSONALITY FACTORS PLUS ATTITUDES MODEL
<i>COMPETITIVE DRIVING</i>	Gender *** (15.7%)	Gender *** (14.9%)	Hyper-competitiveness * Time urgency * Specific attitude *** (59.7%)
<i>TAILGATING</i>	- (1.5%)	Aggression* (5.5%)	- (15.3%)
<i>RED LIGHT RUNNING</i>	- (0.5%)	- (-2.7%)	Specific attitude *** (31.0%)
<i>NOT WEARING SEAT BELTS</i>	- (-0.7%)	Extraversion * (12.3%)	Specific attitude * (36.4%)
<i>NOT USING INDICATORS</i>	- (1.5%)	- (0.4%)	Specific optimism bias * Specific attitude *** (30.7%)
<i>AGGRESSIVE DRIVING</i>	- (-1.5%)	Extraversion *** (12.1%)	Openness * Specific attitude *** (30.0%)
<i>RECKLESS DRIVING</i>	Gender *** (14.0%)	Gender *** (13.1%)	Gender * Time urgency * Specific attitude * (21.9%)
<i>DRINK-DRIVING</i>	Gender * (2.8%)	Sensation seeking * (17.1%)	Sensation seeking * Crash avoidance * General optimism bias * Specific attitude *** (51.8%)
<i>SPEEDING</i>	- (1.4%)	- (1.3%)	Authority rebellion * Specific attitude *** (31.2%)
<i>DRIVING WHILE FATIGUED</i>	- (-0.1%)	Sensation seeking * (6.4%)	Attitude to peer approval * Specific avoidance * Optimism bias to driving *** (30.1%)

* = $p < 0.05$ *** = $p < 0.01$

STUDY 2: INVESTIGATING THE GENERALIZABILITY OF STUDY 1 RESULTS

Study 2 examined whether Study 1 results could be generalized beyond the student population, and whether any differences between student and general populations were due to age. In Study 1, participants were required to be 22 years or younger. Thus, this low variance may have controlled for the effects of age as a predictor of risky driving

behaviour. Alternatively, there are no such limitations on age in the general population, resulting in greater age variance. Study 2 investigated the predictive power of age, with the more extended age range of the general driving population. Also examined were the results for a sub-group of the general population *of the same age as the student population* to determine if results were similar when matched for age. This allows for a better understanding of the mechanisms underlying any differences between the student and general populations.

2.1 Method

Study 2 was conducted outside a variety of RTA Motor Registries across the Sydney metropolitan area. Four registries were used, and were selected to allow representation of a range of socioeconomic areas. Participants were 115 people of varying age, sex, and ethnicity, and were required to have held a current NSW drivers license for at least one year. Participants were approached at the entrance of each registry, and were asked for their voluntary participation. The questionnaire employed for Study 2 was a condensed version of the original questionnaire, with only two risky driving behaviours examined (speeding and not wearing seat belts). This was to ensure participant completion of the questionnaire in approximately 10 minutes, due to concerns regarding sample loss. Upon completion, Participants were asked to return their questionnaire, and were then debriefed and thanked for their participation. Multiple linear regression was employed for the present study, as set out in Study 1. In order to test the aims for Study 2, three analyses were planned: (1) Full regressions including age as a predictor, (2) Regressions excluding age as a predictor, and (3) Regressions in an age-restricted sample.

2.2 Results

Reliability levels for all scales were satisfactory, ranging from 0.62 to 0.99. The summary of results for Study 2 regression analyses is shown in Table 2. Overall, for both speeding and not wearing seat belts, the predictors found in the first-year psychology populations were different to those found in the general population. For full regression analyses, age significantly predicted speeding through all three models, but failed to predict not wearing seat belts at all (specific attitude and specific optimism bias predicted not wearing seat belts). With age omitted as a predictor, speeding was significantly predicted by specific attitude to speeding, while the predictors of not wearing seat belts were the same as those found for full regression analyses. For the age-restricted sample, age still predicted speeding within the first two models, but upon the addition of attitudes, no factor significantly predicted the behaviour at all. The proportion of variance accounted for by each model (across both behaviours for each condition) ranged from 14.8% to 69.9%.

Table 2: Study 2 regression analyses summary, illustrating the factors significantly predicting speeding and not wearing seat belts within each of the three behaviour models (with the proportion of variance accounted for by each model in brackets).

BEHAVIOUR	DEMOGRAPHIC ONLY MODEL	DEMOGRAPHICS PLUS PERSONALITY FACTORS MODEL	DEMOGRAPHICS PLUS PERSONALITY FACTORS PLUS ATTITUDE MODEL
Regression analyses 1: Full regressions including age as a predictor			
<i>SPEEDING</i>	Age*** (19.2%)	Age*** (18.4%)	Age* (22.5%)
<i>NOT WEARING SEAT BELTS</i>	Gender* (4.0%)	Gender* (3.1%)	Specific attitude* Specific optimism bias*** (27.1%)
Regression analyses 2: Regressions excluding age as a predictor			
<i>SPEEDING</i>	- (-0.6%)	- (-1.5%)	Specific attitude* (19.4%)
<i>NOT WEARING SEAT BELTS</i>	Gender* (4.7%)	Gender* (3.8%)	Specific attitude* Specific optimism bias*** (21.3)
Regression analyses 3: Regressions in age-restricted sample			
<i>SPEEDING</i>	Age*** (20.4%)	Age*** (23.2%)	- (14.8%)
<i>NOT WEARING SEAT BELTS</i>	Gender* (11.0%)	- (10.6%)	Authority rebellion* Specific avoidance* Specific optimism bias*** (69.9%)

* = $p < 0.05$ *** = $p < 0.01$

3. GENERAL DISCUSSION

The present study tested the cherished assumption in the field that attitudinal and personality factors contribute to risky driving behaviours in the same way, regardless of the behaviour. Overall, the results clearly illustrate the varying patterns of predictors between individual risky driving behaviours. A major finding is that, with the exception of tailgating and driving while fatigued, specific attitudes predicted all other behaviour models in Study 1. It was specified at the beginning of the study that a gradation of factors was proposed, such that attitudes were believed to be *less* likely predictors of risky driving. Thus, it is somewhat surprising to find that attitudes appear to be the strongest predictors of risky driving, even when they are considered *only after* age, sex, and personality factors.

While the present results indicate that a range of factors predict deviant behaviour, it does not support Jessor & Jessor's (1977) Problem-Behavior Theory, which predicts a regular general tendency toward deviance across a range of behaviours, with similar

predictors for each behaviour. The existence of *different* predictors for different risky driving behaviours suggests that Problem-Behavior Theory is too simplistic, and may not fully explain the complex, and possibly interactive, nature of risk taking in driving. With so many factors believed to be contributing to risky driving, it may be likely that interaction effects are taking place. However, MLR only allows experimenters to examine linear relationships between factors, and this limitation must be analysed in future research.

Study 2 illustrated that Study 1 results cannot be generalized beyond the student population. Regression analyses showed that, once age was controlled for, the results from Study 1 were not replicated for either speeding or not wearing seat belts. This indicates that first-year psychology participants may be unrepresentative of the general driving population. Consequently, when conducting road safety research of this nature, student samples appear to be a poor guide to the general driving population, and applications of road safety research to the general population (particularly self-report data involving attitudes) cannot be extrapolated from the student population.

Despite this data suggesting that student population results cannot be generalized, it does show that there are two distinct sets of results for the speeding and not wearing seat belts behaviour models. That is, even though results between populations are not the same, what *is* the same (between the two studies) is the finding that *different behaviours* appear to have *different predictors*, which adds further weight in support of the Study 1 findings.

The present data is based on quite a small sample, and clearly future research must examine a greater range of individuals, with a greater overall sample size. Nevertheless, the finding that different factors predict different behaviours indicates the importance of considering separate underlying mechanisms for individual risky driving behaviour. The present results indicate that we cannot extrapolate from one risky driving behaviour to another. Consequently, individual road safety campaigns must be designed for each risky driving behaviour, and practical attempts to curb one particular behaviour cannot be assumed from the apparent success of another.

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Keywords

risk-taking, driving, attitudes, road safety, prediction