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Is There a Need for Speed? : Risky Driving Behaviour and Young Male Drivers : A Review of the Literature

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Is there a need for speed? Risky driving behaviour and young male drivers. A review of the literature.

Catherine A. Ferguson

A report submitted as a partial requirement for the degree of Bachelor of Arts with Honours in Psychology at Edith Cowan University.

SUBMITTED: October 1999.

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**Is there a need for speed? Risky Driving behaviour and young male drivers.
A review of the literature.**

Abstract

Young male drivers have been identified as a high risk for Motor Vehicle Accident. This paper reviews three components for accident risk; the driving environment, society and individual factors associated with accident histories. Possible predictors for identifying young men at risk for accident involvement are driving behaviour, driving attitude and sensation seeking. Protective factors to reduce the incidence of risky driving in youth might include legal restrictions, increased education and training. The paper recommends that future research tests the above predictors for a relationship with accident involvement in young men.

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Keywords: Young male drivers, predictors for MVA, protective factors for risky driving, lifestyle, interventions, education.

IS THERE A NEED FOR SPEED? RISKY DRIVING BEHAVIOUR AND YOUNG MALE DRIVERS. A REVIEW OF THE LITERATURE.

Worldwide, young males are highly represented in deaths and injuries as a result of a Motor Vehicle Accident (MVA) (Elander, West & French, 1993; Vavrik, 1997). A variety of reasons for the poor driving records of young men have been identified, however, despite extensive research, successful interventions to address the problem have not been forthcoming (Gregersen & Bjurulf, 1996; Deery, Kowadlo, Westphal-Wedding & Fildes, 1998).

The intention in this paper is to review recent literature about young drivers (in particular young male drivers), risky driving behaviours, their links to other risky behaviours and the underlying biological and social differences which may have an effect on risky behaviour. The main predictors for involvement of young men in an MVA will be discussed. Whilst age (youth) and gender (male) have been identified as general predictors, some research has suggested that not all young men may be a high risk (Gregersen & Berg, 1994; Deery et al. 1998). Therefore other predictors may be identifiable in a form that will enable use in practical situations. Some of the possible predictors might include Driving Behaviour, Driving Attitude, the personality variable of Sensation Seeking, and a risky lifestyle. Sensation Seeking has been linked to risky driving behaviour in many studies (Jonah, 1997) and underlies risky behaviour in general (Newcomb & McGee, 1991).

Definition of risky driving. Whilst there is no formal definition of risky driving, the term is used to embrace a variety of behaviours which involve the taking of risks whilst driving. Certain behaviours have been identified as risky, driving at high speed, tailgating, overtaking other vehicles in an unsafe manner. Risky driving may be situational, that is, in

some instances the behaviour is not risky but in others it is, for example, a combination of driving at the posted speed limit when weather conditions are poor may constitute risky driving.

Taking risks whilst driving has been associated with increased involvement in MVA (Elander et al. 1993). In addition to the individual factors which contribute to risky driving, at least two other factors increase the opportunities for indulgence in risky driving and therefore increased accident potential. These are the driving environment, and society or culture. Each of these three factors; driving environment, culture and individual differences will be discussed in this paper; however, the emphasis will be on individual differences and the factors which may predict accident involvement.

The Driving Environment

Driving behaviour can be altered by physical changes to the driving environment (Faure & de Neuville, 1992; Herstedt, 1992; Schnull & Lange, 1992). Physical changes mostly involve methods to reduce driving speed and are usually only used in urban areas. Over the years various improvements to the driving environment have been made. Improvements to the driving environment comprise of road design and structure and improvements to vehicle design including increased safety measures. However, Summala, (1988), Gregersen & Bjurulf (1996), and Jonah (1997) have suggested that as improvements are made to the driving environment, drivers increase their risky behaviour to maintain their preferred level of risk. This belief in risk maintenance by the individual has been based on Wilde's Risk Homeostasis Theory (Wilde, 1982) which suggested that the lack of reduction in the number of road accidents despite environmental improvements was the result of a general increased acceptance of risk within the driving population. Therefore, when a road safety initiative or legislation is introduced, drivers adjust other driving behaviours to maintain

their risk level.

Investigation of this theory has produced varying results (Trankle & Gelau 1992; Jackson & Blackman, 1994) however overall the theory has not been substantiated. The 1998 road statistics for Australia reveals a reduction in road deaths from 3,272 in 1980 to 1,763 in 1998 (Federal Office of Road Safety, 1999). These figures in practical terms do not support Wilde's Risk Homeostasis Theory.

Robertson (1986) and Summala (1988) have suggested that both modifications to the driving environment and reductions in speed limits are required to reduce deaths on the road. As support, Summala cited the experiences of European Countries in the 1970s where road deaths declined significantly after speed limits were reduced. Robertson (1986) indicated a similar situation in the United States. Casey and Lund (1987, 1992) found that as national speed limits are increased drivers increase their actual driving speed on all roads. These results further suggest that speed limits should be reduced.

More recently, some European countries have used road design as an opportunity to reduce speed and these speed reductions have reduced the numbers of MVA, death and injury (Faure & de Neuville, 1992; Herstedt, 1992; Schnull & Lange, 1992). However, road calming devices have been designed for urban settings where the severity of road crashes is less than in country areas. The higher speed limits on country roads, increase the severity of an accident and there is a higher chance of death or serious injury for those involved. The Australian road statistics for 1998 revealed that 44% of MVAs occurred in areas with a speed limit of over 100 km/h (Federal Office of Road Safety, 1999). Kanellaidis, Golias and Zarifopoulos (1995) found that most drivers complied with speed limits in urban areas, however, compliance was less on roads between cities where monitoring of speeding motorists is also difficult.

Robertson (1986) suggested that both a reduction in the number of accidents and a reduction in severity was required to reduce road trauma. Despite the recent successful changes to driving environments in Europe, Summala (1988) has suggested that proposals for reducing speed limits are not popular with drivers or politicians. Robertson (1986) also criticised manufacturers of vehicles for producing vehicles capable of travelling at twice the maximum legal speed limit for purchase by the general public. Robertson (1986) has suggested that this is neither necessary, nor a good safety measure. However, the suggestion that vehicles be modified to reduce their capabilities is unlikely to be acceptable to the public.

Therefore, there are environmental devices which have the potential to reduce the number and severity of accidents. However, the use of these devices has been limited to urban areas and the potential for them to be introduced on country roads is limited. Given that the most severe MVAs occur on country roads on which higher speed limits apply, environmental modifications may play only a small part in the overall reduction in deaths and injuries from MVA.

Society and Culture

Arnett (1996) has suggested that the adolescent and young adult in Western culture lives in a system that encourages and facilitates indulgence in risky driving. The lack of implementation of proposals for speed reduction and modification of vehicles' maximum speed supports this view. Some authorities have imposed lower speed limits on young drivers, however, there are no limitations on the power of the vehicle which young drivers are allowed to drive. Many young men are attracted to powerful vehicles and are inclined to drive them to their limits (Robertson, 1986).

Western cultural acceptance of the values of independence and individuality provide

environments which facilitate indulgence in risky behaviour. These cultures accept the risks for their young people, and in many countries, reliance on the motor vehicle increases the opportunity for the adolescent to indulge in risky driving. Many countries are now investigating methods of reducing the opportunities for risky driving. These methods include curfews on young drivers and graduated licensing procedures which extend the training period for new drivers. Arnett and Taber (1994) and Arnett (1996) provide a review of the cultural effects for young people and risky behaviour.

Individual Factors Involved in Risky Driving

Whilst the driving environment and Western cultures provide opportunities for indulgence in risky driving, it is the individual who uses these mechanisms to fulfil motivational needs. Many variables combine in the individual to form poor driving behaviours including high speed driving which is a major contributor to MVAs (Elander et al. 1993).

As a result of the wide range of the research in the area of risky driving, and significant results found in studies using differing variables, no one aspect of this complex area has been discounted. Therefore, many areas still require further investigation.

Risky driving behaviour as a predictor for involvement in MVA. Risky driving behaviour is prevalent in adolescence and in particular in young males (Evans & Wasielewski, 1983; Jonah, 1986; Jonah, 1990; Moore & Rosenthal, 1993, Gregersen & Berg, 1994; Massie, Campbell & Williams, 1995; Blockley & Hartley, 1995; Gabany, Plummer & Grigg, 1997; Meadows, Stradling & Lawson, 1998). Risky behaviour appears to lead to increased involvement in MVA. Massie et al. found that drivers in the age group 16 – 19 had a threefold increase in risk of being in a fatal crash compared with all drivers. This is similar to the results of Preusser, Ferguson and Williams (1998) who found that

overall drivers aged 16 had a risk of 3.28 times the risk of drivers aged 30 – 59 of involvement in a fatal accident. One solution to this problem may be to increase the age at which a driving license may be obtained. This solution is however unlikely to be popular in Western cultures, and the question is then asked ‘At what age should the individual be allowed a driving license?’ It must be noted that not all young drivers are a high risk. Deery et al. (1998) found that three clusters out of five contained young people who did not appear to be a high risk for MVA. However, these clusters were predominately comprised of female subjects. The two clusters considered to be at greater risk due to their personality and driving attitude measures contained a higher proportion of males.

Much of the research on risky behaviour concentrates on participants in mid adolescence (16 – 18 years of age). Arnett (1996) split his research participants into two groups, high school students aged 17 – 18 years and college students aged 18 – 21 years. This research found that the college-aged students scores on Arnett’s Inventory of Sensation Seeking were more highly correlated with reckless behaviour than the scores for the school aged students. However, the differences between the high school students and college aged students was small and, across twelve categories of reckless behaviour only six results indicated the trend of increased risk taking in the older group. This research however needs further replication to investigate risky behaviour in older adolescents and young adults. Overall, in excess of 80 % of the participants studied by Arnett (1996) indulged in high speed driving.

Jonah (1986) suggested that risk taking is the major cause of MVA involving youth. Jonah also discussed the importance of whether or not the young drivers were aware or unaware of the risk when they committed violations. Jonah referred to these differences as ‘risk perception’ and ‘risk acceptance or utility’. Risk perception describes the young

driver's lack of understanding of the result of their action, whereas risk utility describes the young driver's acceptance of risk as it fulfils some motivational need. It would appear that some drivers are aware of the risks but choose to ignore them (Jonah, 1997). Young drivers do not perceive driving risks as effectively as older drivers (Finn & Bragg, 1986; Gregersen, 1996).

Finn and Bragg (1986) compared young male drivers aged 18 – 24 years with an older group of male drivers aged 38 –50. Three measures were used: a questionnaire, a series of still photographs and a series of videotaped recordings. The still photographs and the videotapes consisted of various driving situations. In general the younger drivers viewed their personal risk as less than that of their peers, however, they viewed their age group overall as being at greater risk of accident involvement than older drivers. The questionnaire revealed that younger drivers underestimated their own chances of accident involvement compared to peers by 15.6% whereas older drivers underestimated their risk compared to peers by 1.8%. The results of the still photographs indicated that young drivers viewed themselves as being at less risk than peers in two out of ten situations: driving on wet roads and driving after consuming six beers within one hour. In all other measures there was no difference between their personal risk view and the peer risk. However, they also viewed themselves as at less risk than older drivers. The results of the videotaped sequences again found differences between the groups. Older drivers considered a tailgating scene to be risky, however, young drivers rated a pedestrian stepping out as risky. Therefore all three parts of this research revealed that young male drivers perceive less risk in driving situations than older drivers. Finn and Bragg (1986) suggested that this difference in risk perception may be part of the reason why young men are so highly represented in MVAs.

Gregersen and Bjurulf (1996) developed a model for young drivers' accident involvement. This model considered individual factors, social factors and learning factors as primary determinants of accident involvement. Gregersen and Bjurulf expressed concern at the short time within which drivers are able to obtain their driving license. The overestimation of ability and hazard perception deficits in young drivers have been recognised as contributing to the young adult's accident risk. If a situation is not perceived as hazardous drivers will not amend their driving behaviour. Dejoy (1992) also found that young men did not perceive the risks of dangerous driving behaviours and young males overestimated their own driving skills when compared to young women. Using a thirteen point scale of - 6 to +6 with a midpoint of zero, Dejoy found that the mean rating for young men comparing themselves with others of their age on driving skill was 3.53 (SD 2.09) and for young women 2.31 (SD 1.95). Effect size was 0.60 SD, indicating medium sized differences. When comparing self with the average driver, young men again revealed greater belief in their skill. The mean rating for young men was 3.60 (SD 2.15) and for young women, 1.96 (SD 2.24), effect size 0.75 SD. Effect sizes represent the differences of the group means, expressed as a proportion of the standard deviation for the whole population. The higher the effect size, the greater the difference between the groups.

Yagil (1998) considered the effects of the instrumental and normative perspectives on young drivers' behaviour. The instrumental perspective relates to deterrents which can apply for misbehaviour; whereas normative perspectives are internalized and comprise part of the person's belief system. In relation to driving this implies that drivers are motivated to comply with the laws on the basis of avoiding fines or, alternatively, they are motivated to obey the laws simply because obedience with laws is part of their personal beliefs.

Yagil (1998) found that young drivers believed that committing violations was less

important than did older drivers. Older drivers revealed strong normative beliefs in safe driving, however their compliance with road rules was based on instrumental motives. Therefore, older drivers believe in safe driving, however they obey the road rules to avoid penalties. Younger drivers lack of compliance with driving laws was internalised and young drivers were less motivated to drive safely to avoid fines. Therefore, it is unlikely that steps to increase penalties for road violations will have any effect on young drivers' motivation to drive more safely unless the penalties are increased substantially. What has to be changed is the belief system of the adolescent, something which requires a direct strategy and is not easy to achieve.

Parker, Manstead, Stradling, Reason and Baxter (1992) used four different scenarios covering issues of drinking and driving; speeding; close following (tailgating) and dangerous overtaking. The scenarios were presented verbally to participants by a trained interviewer. The participant was also given a written version of the scenario and line drawings to study. This research found that younger drivers were more likely to indulge in committing violations when compared with older drivers and that young drivers were more motivated to comply with the perceived wishes of their peers. The results in this research also showed that participants had negative attitudes to all four behaviours, however, speeding was viewed as less negative than the others. Age (youth) was a significant predictor of the participants' intention to speed. Parker, Manstead, Stradling, and Reason (1992) suggest that media campaigns aimed at young drivers may have an effect if they include peer disapproval for committing violations. A general finding of this research was that younger drivers are less concerned about the negative outcomes of risky driving for both themselves and others.

Speeding and tailgating in particular are two forms of risky driving in which younger

drivers have been identified as assessing less risk than older drivers (Elander et al. 1993). Speed has been accepted as a definite component for risk in accidents (Kanellaidis et al. 1995; Lajunen, Karola & Summala, 1997). Kanellaidas et al. found that speed limit compliance varied between urban and nonurban roads. Using self report, 92.5% of drivers reported compliance with speed limits on urban roads. This is compared to 73.8% reporting consistent behaviour between both urban and nonurban driving. At least 50% of drivers who reported seldom or never obeying non urban speed limits reported obeying urban limits. Only a small percentage, somewhere between 3% and 12% of drivers comply with nonurban speed limits but do not comply with urban speed limits. Additionally, up to 58% of drivers who seldom or never complied with speed limits indicated that they believed that reducing speed limits would reduce accidents. Drivers' reasons for not obeying speed limits were given as: being in a hurry; absence of police enforcement; underestimation of risk of speeding; unreliability of speed limits; and overestimation of their driving abilities. It should be noted however, that the participants in this study ranged in age from 18 to 68 years and included both male and female respondents. In this research 40.5% of the variance in the reasons given for speeding related to the egocentric behaviour of the driver, suggesting that personality plays a considerable part in speeding behaviour.

Lajunen et al. (1997) recruited 195 young men, with an average age of 19.8 years, from the Finnish armed forces and had them drive an instrumented vehicle round a test track. The results of this research showed that those drivers who had admitted to several accidents used higher maximum speeds and higher speeds at the specific sites on the track where a safe driver would have been expected to slow down, such as a crest with short visibility and a sharp curve. Therefore, driving speed appears to be affected by the driving environment, that is posted speed limits and the behaviour of the individual. Speed appears to be a good

predictor of accident involvement.

Gabany et al. (1997) devised a Speeding Perception Inventory which has five factors: ego gratification, thrill, excitement and risk-taking; time pressures; disdain of driving; and inattention. The inventory was produced through discussions with driver education teachers and members of a National Safety Council committee. The inventory has face validity, however, the age range of the groups upon which the inventory was tested was narrow (university students) and further research is required to establish its usefulness and applicability for wider populations. Whilst not statistically significant, there were gender differences in responses with males reporting more ego gratification and females reporting more time pressures, disdain of driving and inattention. Additionally, younger participants indicated greater risk taking than older ones. This inventory requires further development to substantiate its use in the identification of reasons why a particular person speeds. Further development may result in interventions which encourage drivers to slow down. Age and gender of the driver appear to be important factors in the identification of the appropriate intervention.

Elander et al. (1993) indicated that tailgating (travelling too close to the vehicle in front) had been identified as one of the risky driving behaviours indulged in by adolescents and young adults. Evans and Wasielewski (1983) and Wasielewski (1984) conducted extensive observational studies and found that young male drivers, who were alone in the vehicle and who were driving a newer vehicle, tailgated more often than older drivers. Presumably drivers of newer vehicles felt that these vehicles were more reliable and more easily controlled than older vehicles. Female drivers were less likely to tailgate, as were drivers who had passengers. Once again the research has identified young men as the risk takers on the roads.

Baxter, Manstead, Stradling, Campbell, Reason and Parker (1990) considered the effects of social facilitation on drivers' behaviour. Researchers covertly observed drivers' behaviour over a period of 3 – 5 minutes by following a particular vehicle. Details of the gender and age of the driver (less than or over 30 years) and of any passengers (gender and age) were noted. A total of 244 observations were made over a four month period. Observers worked in pairs taking turns to drive. Observations were not discussed during the observation period in an effort to reduce inter observer bias. Drivers' behaviour was noted for violations and errors in several categories. The results revealed that younger drivers committed more violations than older drivers by speeding and tailgating and that the carrying of an older passenger appeared to produce better driving behaviour. This suggested that drivers' behaviour depended upon the age and gender of their passenger. Passengers provide the 'norms' for good driving. If the passenger is the mother of the adolescent then one driving style will be adopted, however, if the passenger is a young male another driving style will be used. These passengers represent two distinct groups in driving research. Younger males and older females are respectively the least and most law abiding drivers (Reason et al. 1990). Baxter et al. (1990) suggested that road safety campaigns could use the acceptable social norm for driving behaviour to promote safe driving. An alternative would be to run campaigns on the basis of undermining the social norms for poor driving, making such behaviour the subject of ridicule. As young men are more highly represented in MVA and research has found that it is young men who participate more often in risky driving, the conclusion may be drawn that indulgence in risky driving is a predictor for MVA.

Driving skill and driving style (attitude). Elander et al. (1993) found that the major components of crash risks are - driving skill/driving style; ability for attention switching

and visual acuity; and type A behaviour and/or anti social attitudes. Elander et al. found several interactions in the above variables which caused individuals to have a higher risk for MVAs. The next section of this paper will take each of the above variables and discuss their implications and effects on the driving of young men in particular.

Elander et al. (1993) and Gregersen (1996) suggested that driving style is more important than driving skill when considering risk of accident. However, a minimum level of skill is required to be able to obtain a driving license and to conduct oneself properly on the road. Gaps in a drivers knowledge and skill leads to an increased risk for accident (Gregersen, 1996). Elander et al. (1993) dichotomise driving behaviour into the effects of skill and the effects of style (attitude). Whilst attitude and behaviour are different constructs, behaviour can result from the holding of a particular attitude (Parker, Manstead, Stradling, Reason & Baxter, 1998). Driving style (attitude) is defined as:

“the way individuals choose to drive or driving habits that have become established over a period or years. It includes choice of driving speed, threshold for overtaking, headway, and propensity to commit traffic violations. It is expected to be influenced by attitudes and beliefs relating to driving as well as more general needs and values.”

(Elander et al. 1993, p. 279).

Whilst driving attitude has been found to be important in the equation for accident risk. Overestimation of driving skills may also lead to increased accident risk through the process of risk assessment. Both Dejoy (1992) and Gregersen (1996) found that overestimation of driving skills was particularly evident in young males. Gregersen (1996) had participants, aged 18 - 24 years, take part in either a skill training situation (handling driving on ice) or a driving sessions during which they were shown how their skills (at

driving on ice) were deficient (insight training). Results indicated that the drivers who underwent the skill training overestimated their capabilities more than the drivers who participated in the insight training. Therefore, skill training may lead drivers to believe that they have increased skill but in reality they do not. Lund and Williams (1985) reviewed previous research on the effectiveness of Defensive Driving Courses on accident and violation reduction. In reviewing fourteen reports they discounted the results of two thirds of the studies due to methodological flaws which made the findings unreliable. However, in the remainder of the studies reviewed, it was found that attendance at a Defensive Driving Course did not reduce accident involvement, however, the frequency of violations reduced by about 10% during the year following participation in the course. Therefore, the expected improvements to driver accident risk and general driving behaviour is not achieved in many cases (Lund & Williams, 1985; Struckman-Johnson, Lund, Williams & Osborne, 1989; Mayhew, Simpson, Williams & Ferguson, 1998). Gregersen (1996) suggests that drivers attending skill courses should also be taught that their skills are limited and that they should be encouraged to acknowledge their limitations. In this way, better drivers will be produced as they will be better able to assess their actual ability and this should lead to reduced accident involvement.

The importance of the difference between driving skill and driving style was researched further in Deery and Love (1996). Deery and Love devised the Driver Expectancy Questionnaire which includes questions differentiating driving skill and driving style. The driving style questions were used as part of the questionnaire in Deery et al. (1998). The results of Deery et al. indicated five clusters of different types of young driver. Two of these clusters were identified as comprising of drivers who are considered high risk for accident. The scores for driving style questions in these groups were high indicating poor

driving and clusters with high scores for Driving Style also reported higher accident rates. The scale for the Driving Style questionnaire ranged from 1 – 5 (lowest score of 1; highest score of 5). Mean scores on Driving Style for the clusters in this research ranged from 1.6 (SD 0.4) to 3.0 (SD 0.7) revealing large differences between the best and the worst clusters with an effect size of at least 2. The group SD is not quoted to enable an accurate calculation of the effect size.

Whilst a certain level of skill is required avoid MVA, driving style may be more predictive in determining the individual's risk of accident. Elander et al. (1993) suggest however, that there may be a trade off between skill and style. Increased skill may be offset by a poorer driving style and poorer skill may be compensated for by better style. Antisocial motivation and type A behaviour patterns have also shown positive correlations with an individual's risk for MVAs (Elander et al. 1993). Arnett (1994) suggested that the adolescent's desire for 'intensity and novelty of experience' is one reason for anti-social behaviour. Antisocial behaviour is defined as behaviour which is not the norm for adult society and was one of the traits found in two groups of adolescents who displayed poorer driving styles (Deery et al. 1998). Males were highly represented in these groups.

During adolescence attempts are made to set one's own standards and reject those of society at large (Yagil, 1998). This means that adolescents may not be susceptible to changes in attitude as sought by adults due to their developmental stage. Some young drivers may use risky driving as a statement of their non-acceptance of the rules of society and of their parents. Assum (1997) found that accident risk was partially related to attitudes. However, in Assum's research, when age and annual mileage were introduced they appeared to be more important than attitudes for predicting accident risk. However, Assum's findings also showed that accident risk decreased with age and that females had

better attitudes than males. This is a general finding throughout research which uses the variables of age and gender (Jonah, 1990; Blockley & Hartley, 1995) again suggesting that young men are a greater risk on the road.

Personality and sensation seeking as predictors of MVA involvement. Arthur and Graziano (1996) suggested that personality plays a part in the individual's potential for accident involvement and they studied the Neuroticism, Extraversion and Openness – Personality Inventory (NEO - PI -Costa and McCrae, (1988) factors of Conscientiousness and Agreeableness. Each of the five factors on the NEO - PI has six facets. For Agreeableness the following facets have been identified - trust, straightforwardness, altruism, compliance, modesty and tender-mindedness. Conscientiousness is comprised of - competence, order, dutifulness, achievement striving, self- discipline and deliberation (Costa, McCrae and Dye, 1991). Arthur and Graziano found that participants high in Conscientiousness reported having fewer accidents and less moving traffic offences. Agreeableness was also linked to better driving outcomes. When measured, Conscientiousness and Agreeableness are lower in adolescents and young adults than in older populations (McCrae & Costa 1990, p10). Therefore some personality measures may be useful predictors for MVA involvement.

Personality theorists discuss the position of 'states' and 'traits' and are concerned with the stability of an individual's behaviour over time and across situations. Stability, or lack of it, differentiates between the concept of a 'trait' and a 'state'. Sensation Seeking demonstrates the qualities of a long-term 'state' for some individuals as it manifests itself in risky behaviour during their adolescent years. For others, these risky behaviours continue into and throughout their adult years suggesting that Sensation Seeking can also be a 'trait'. Arnett (1996) suggested that Sensation Seeking as a 'state' should be considered a developmental process. This instability of personality in young adulthood has been

supported by other research. Van der Velde, Feij and Taris (1995) found that personality is not stable during adolescence and young adulthood, however, stability developed after certain markers to adulthood were passed, such as starting work, marriage, the birth of the first child. The above findings support the biological research involving the reduction of testosterone levels in males in the mid to late twenties (Zuckerman, 1989, 1990; Arnett, 1998) and provide support for the joint effects of biology and environment on the individual's development. The results of Van der Velde et al. support the suggestions in Moffitt (1993) and Arnett (1998) that markers to adulthood produce stabilising effects on the individual.

The suggestion that not all young driver are a problem can also be related to the above. Levels of maturity differ, not simply on chronological age, but also on many other personal variables which can affect the young driver. Therefore a tendency to risk behaviour and risky driving may be a biological predisposition; however, the predisposition requires a specific set of social and cultural factors to enable it to result in risky driving behaviour.

Many personality variables have been researched in conjunction with risky driving behaviour. Arthur and Graziano (1996), described above, considered the personality trait of conscientiousness and found that people high in this trait were less likely to be involved in a motor vehicle accident. Furnham and Saip (1997) investigated convicted drivers on a driver behaviour questionnaire, sensation seeking scales and Eysenck's personality questionnaire. The results of this study revealed that convicted drivers were higher in psychotism and lower on neuroticism scores, they also had higher sensation seeking scores. Therefore conscientiousness and sensation seeking are at different ends of the spectrum when considering their relationships to driving.

Arnett, Offer and Fine (1997) found that a combination of aggression and sensation

seeking, especially in adolescent males, was the foundation for risky behaviour in relation to driving. This was also one of the findings of Deery et al. (1998). It would appear that Sensation Seeking is an important personality variable in the individual's risk for a MVA. Sensation Seeking may be a reliable predictor for MVA.

Sensation Seeking has been found to be correlated to risky driving behaviour (Jonah, 1997; Trimpop & Kirkcaldy, 1997). Jonah (1997) reviewed forty studies from different Western countries on the relationship between Sensation Seeking and risky driving. Of the forty studies only four did not produce a significant positive relationship between the variables. Expression of Sensation Seeking needs in the form of fast driving is available to a high percentage of the populations in most developed cultures where the automobile plays an integral part in daily life. Zuckerman and Neeb (1980) suggested that speeding stimulates visual and interoceptive receptors and maintains central arousal and that driving long distances on straight roads can produce boredom. They also implied that speeding may be a way of maintaining the level of arousal required by high sensation seekers during long boring driving sessions. Zuckerman and Neeb found that non-drivers and drivers who self-reported that they obeyed speed limits had lower levels of Sensation Seeking whereas participants who admitted driving above the speed limit had Sensation Seeking scores which increased incrementally with an increase in speed above the speed limit. Trimpop and Kirkcaldy (1997) found that high scores on the Thrill and Adventure Scale and the Disinhibition Scale of Zuckerman's Sensation Seeking Scale predicted driving violations. High violators also had more accidents than non-violators. Several researchers have suggested that one solution to the problem of risky driving in adolescents and young adults is the provision of constructive outlets for the demonstration of these risky behaviours in a safe environment (Newcomb & McGee, 1991; Arnett et al. 1997; Trimpop & Kirkcaldy,

1997). This could mean that participation in organised motor sport may improve on the road behaviour.

Risky driving as part of a risky lifestyle? Jonah (1990) conducted research on six age groups from 16 to 65+ years and found that the age groups 16 – 19 and 20 – 24 years had the highest accident rates and higher rates of moving violations. Jonah found that for males the risky behaviour peaks in the 20 – 24 year age group and that males are more at risk than females. This risk difference reduces between the ages of 25 and 34 years. This finding was supported by Arnett (1996) who compared school age and college aged students and found that college aged students indulged in more risky behaviour. Jonah's (1990) research also linked risky driving to other risky behaviours such as indulgence in alcohol and illicit drugs. Jonah suggests that by the time adolescents can obtain their driving license, they have already developed a positive attitude to risky driving.

Gregersen and Berg (1994) suggested that social situation and lifestyle played an undetermined part in the young driver's risk for MVA. Using a model by Miegel (1990) they obtained the responses of 1774 twenty year olds. Fifty four percent of the respondents were male and using factor analysis the results indicated that there were ten factors which explained 48 per cent of the variance in lifestyle. A cluster analysis found that there were fifteen clusters within the sample and of these fifteen groups, four were found to have a significantly higher accident risk and two groups a significantly lower accident risk. Males featured as a high percentage in the higher accident risk groups and women featured as a greater percentage in the lower risk groups. The four high risk groups comprised 22 per cent of the respondents. Their share of accidents was 32 percent, representing approximately 50 per cent higher risk. Gregersen and Berg (1994) results indicate that not all young drivers are a high risk, however, the percentage of males is once again higher.

Deery et al. (1998) conducted research similar to that of Gregersen and Berg (1994). This Australian study investigated differences in various personality factors, driving attitudes, driving style and indicators for the indulgence in other risky behaviours such as alcohol abuse, the use of tobacco, and use of illicit drugs. This research found five clusters using the personality and driving attitude questions within the participants who were aged between 16 and 19 years of age. Similar to the results of Gregersen and Berg (1994) males predominated in two of the groups deemed to be high risk, whilst females were mostly represented in the two lowest risk groups. Deery et al. also suggested that driver training needs to be diverse and take into account the differing groups and target increased training appropriately. Blockley and Hartley (1995) who investigated differences between driving errors and deliberate violations also suggested that different interventions were required to provide appropriate training.

Risky driving may only be a small part of a risky lifestyle which involves other risky behaviours (Jessor, 1987; Jonah, 1990; Gregersen & Berg, 1994; Deery et al. 1998). Research by Meadows, Stradling and Lawson (1998) involving young offenders found significant relationships between driving accidents and violations and social deviance suggesting that deviant behaviours have an underlying motive or disposition.

Williams (1998) criticised the research on adolescent risky behaviour which has concentrated on the issues of cigarette smoking, alcohol use, illicit drug use and unprotected sex and almost ignored risky driving behaviours. Arnett (1996) also raised this issue. This is despite the statistics which show that crash rates for 16 year old drivers are higher than older drivers and that the crash rates reduce on an age basis until age 23 (Williams, 1998). Therefore the motor vehicle and risky driving are important contributors to the poor health of adolescents and young adults. The majority of the research on young

drivers has been conducted in conjunction with alcohol use. This type of research does not address the overall problems facing road safety researchers in dealing with the young driver problem. Additionally, Williams claims that many health education programs have only been successful in the short term (Williams, 1998), suggesting that even in areas of considerable research, behaviour change programmes have not truly reached the adolescent's reasons for indulging in risky behaviour.

Adolescent development and risky behaviour are affected by biological age, increasing importance of peer relationships, the development of values, attitudes and inspirations (Moffitt, 1993). More specifically temperament and hormones, family, peer and neighbourhood interact to provide the motivation and opportunity for indulgence (Petersen, Richmond & Leffert, 1993). Moffitt (1993) identified two levels of indulgence in risky behaviour, one level specifically relating to adolescence and early adulthood. These individuals have control over whether or not they indulge and if the perceived rewards are insufficient will cease from the behaviour (Moffitt, 1993), and finally become responsible citizens. The second level involves lifelong risky behaviour. Individuals in this category can be identified at an age as early as five years and comprise in total approximately 10 per cent of the population (Moffitt, 1993). Lifelong risk takers appear more mature to their peers and provide a point of reference for the movement towards adult behaviour (Moffitt, 1993). These adolescents are less confined by their families, make their own decisions and do things of which their parents would disapprove. Their behaviour implies a closeness to adulthood and therefore other adolescents imitate the risky or criminal behaviour regarding it as a passage to adulthood. As the adolescent attains maturity the motivation for risky behaviour reduces and finally ceases. This may explain the decline in risky driving behavior in older age groups. However, those high in sensation seeking may display the

'lifelong' risky behaviour.

The environment and family structures of country youth appear to reduce their risks when compared to city youth. However, there may be increased opportunity for indulgence in risky driving by country youth. This is supported by the West Australian road statistics which reveal that twice as many young people die on country roads compared to the city area.

Therefore, risky driving has been found to be associated with other risky behaviours and a general risky lifestyle. The motor vehicle plays a large part in the life of many adolescents in Western cultures and therefore the opportunity to indulge in risky driving is available to many. Additionally, many adults themselves have indulged in risky driving and it has become an accepted norm in society. Little has been done to investigate why young drivers indulge in risky driving (Williams, 1998). The concentration has been on enforcing driving laws and punishing those who are caught rather than on understanding why the behaviour prevails.

Peer pressure may also be part of the adolescent's lifestyle. In some groups peer pressure may encourage the adolescent to indulge in risky behaviour. Adolescents and young adults are much more aware of their social standing amongst their peers than are adults. Adolescents may give, what to them is a reasonable defence, for indulging in risky behaviour based on how their peers would view their non participation (Beth-Marom, Austin, Fischhoff, Palmgren & Jacobs-Quadrel, 1993). This peer pressure may lead them to indulge in risky driving behaviours. Doherty, Andrey and MacGregor (1998) found that the presence of parents in a vehicle reduced risky driving behaviour of young people, however, the presence of peers led to higher levels of risky behaviour.

Nighttime driving is another factor which increases the risk for drivers of all ages.

Young drivers in particular are at a higher risk for MVA at night time and at the weekend (Gregersen & Berg, 1994; Doherty et al.1998). This is most likely due to their lifestyle. Friday and Saturday nights are the worst and this may be because these are times when the young driver is more active (Doherty et al.1998). Both the number and the severity of nighttime and weekend accidents was greater. The findings of Doherty et al. were also supported by Preusser, Ferguson and Williams (1998). Preusser et al. used government records from 1990 – 1995 in America (Fatality Analysis Reporting System) of fatal accidents and found that the risk of accident when carrying passengers was increased in all age groups. Drivers aged 16 were 2.28 times more likely to be involved in a fatal crash than drivers aged 30 – 59 if travelling alone. This risk increased to 4.72 times if there was one teenage passenger in the vehicle, and 7.86 if more than one teenage passenger and no adult. The results of Preusser et al., however, did not find increased accident risk for the carrying of passengers between daytime and nighttime driving, although in general adolescents and young adults have approximately three times greater risk of fatal accident after 9 P.M.

In an effort to combat some of these problems for young drivers, some states in America and Canada have placed restrictions and curfews on young drivers. New Zealand as part of its Graduated Licensing System has placed restrictions on the carrying of teenage passengers during both day and night time. These curfews appear to be having some success in reducing the road toll (Preusser et al.1998).

Arnett et al. (1997) also investigated the effects for adolescents carrying similarly aged passengers and found that the presence of friends did not increase self-reported recklessness beyond the level which the individual undertook when alone. As this outcome was the result of self-report, it suggests that there may be a difference between the self-reported

behavior of adolescents and young adults and the actual behavior. Self reported behaviour may not always be accurately reported. However, Arnett et al. results could also be a reflection of the knowledge of young people on what is the 'right' behaviour, despite the fact that it is not their preferred or indulged in behaviour.

Peer pressure may have either a positive or negative effect on risky driving. Clark and Powell (1984) suggested that peer pressure may make those drivers prone to risk more safe. They held group discussions with young drivers who had a history of accident involvement. At these discussions the driver's peers put forward positive attitudes towards the law, other road users and risk taking. A control group did not take part in such discussions. When measured as to improvement in attitude, there was a significant difference between the control and experimental groups. This research however was conducted over only a short period of time (three weeks) and consisted of a one-hour session each week. Whilst the results were positive, it is not known if they were successful in the longer term. Unfortunately a longitudinal study was not completed. The results may only have been temporary.

Protective Factors for Risky Driving Behaviour

When considering risky behaviour, researchers have looked for frameworks which can reduce their effects. Jessor (1993) developed a framework for the interrelated domains which make up the risk and protective factors for adolescents, risk behaviours and the outcomes of risky behaviour. This model includes the individual's biology, personality, behaviour, the social environment and the perceived environment. These five factors interrelate to the adolescent's chosen lifestyle which leads to the outcomes. In addition to the biological effects which can cause indulgence in risky behaviour, the family, school and neighbourhood can provide either a positive or a negative social environment for the

individual. The effects of the social environment may modify the biological pressures on the individual. Jessor's framework is targeted at younger adolescents, however, family and neighbourhood will also affect the older adolescent and young adult. Despite increasing knowledge of the above five factors, successful interventions for reducing the level of risky driving behaviour have not been forthcoming (Gregersen, 1996; Deery et al. 1998). One reason for this may be that the direct reason for the indulgence in risky driving by young men has not been determined.

The opportunity for risky driving is much more available to adolescents than the opportunity for indulgence in some other risk behaviours. As Arnett (1996) pointed out Western Culture is heavily reliant on the independence of youth and in many affluent societies the adolescent has unsupervised access to a vehicle. Society has created the opportunities for youth to indulge in risky driving and now many countries are making efforts to reduce these opportunities by placing restrictions on the young driver's authority to drive in certain conditions. Driving curfews including reducing nighttime driving, have been introduced in some parts of the world and success is being claimed for this as a method of reducing the numbers of young people killed or injured in MVAs (Doherty et al. 1998). Legislation, however, has its limitations. Additionally, education in high schools on the dangers of risky driving appears to be failing our youth (Harre & Field, 1998). It is this lack of success which has forced society to consider other opportunities to make roads safer. The introduction of graduated licensing systems in which the new (as opposed to simply young) driver is exposed to many more hours on the road before the issue of a full license has become an international trend. These systems limit the new driver in relation to speed and carrying passengers, and in some cases as to the times of day the new driver can use the road. As the system applies to all new drivers it is not discriminating against the

young, although in many countries it will significantly only affect young drivers. Graduated licensing systems will reduce the legal opportunities for indulgence in risky behaviour for young drivers as they will increase the amount of training required to obtain a full license and limit the legal driving behaviour of new drivers.

Future Interventions for Young Driver Safety

The identification of predictors for risky driving and MVA involvement in young men is important as identification may lead to an effective intervention to reduce the behaviour. However, there may be ethical issues for the use of restrictions on denying young men the opportunity to drive. There is a current trend in many Western countries including Australia to tackle the problem from a different angle and that is to include driver safety in the high school curriculum. However, Harre and Field (1998) in a New Zealand study found no significant differences in the driving attitudes of schoolchildren who had been exposed to a school-based driver education program. On the other hand, in Western Australia a programme including road safety in the curriculum from kindergarten to year 10 has been in place for some 4 years. This programme commences in kindergarten and primary school with safety as a pedestrian, passenger in a vehicle, cyclist and flows onto high school promoting safety as a driver. There is considerable flexibility in this programme as it can be delivered as part of the health syllabus or linked to other subjects within the school curriculum. How it is delivered is at the discretion of the class teacher. Education to reduce the road toll may be a long process which, if developed properly and consistently, over time may have an impact. It appears to be too late to begin to address road safety issues at high school. Jonah (1986) suggested that encouraging safe behaviour at an early age may be more effective and Jonah (1990) suggested that adolescents have already developed a positive attitude to risky driving. Longitudinal studies should be planned now

to assess the effects of teaching road safety throughout an individual's school years.

Ongoing evaluation of the Western Australian Schools programme is conducted by Curtin University in the State capital, Perth.

On the other hand Arnett (1996) and Arnett et al. (1997) have indicated that the trend for driver training in high school is misplaced. The interventions are being provided too early, at an age when the Sensation Seeking behaviour and needs are not fully developed and therefore the interventions are not effective as they are forgotten by the time the individual is allowed to drive. The fact that risky driving behaviour continues into later adolescence and early adulthood (Arnett, 1996; Jonah, 1990) and can be found in well educated samples (Moore & Rosenthal, 1993) supports this premise. In the short term, strategies to identify those at risk appear to be a better solution. Arnett et al. (1997) suggested that education should concentrate on suggesting alternative ways for adolescents and young adults to discharge their Sensation Seeking behaviours in more positive ways. A combination of opportunities to release tensions and persuasive education on the dangers of risky behaviour on the road may lead to better safety on the road (Newcomb & McGee, (1991); Arnett et al. (1997); Parsons, Siegel & Cousins (1997); Trimpop & Kirkcaldy, (1997)).

Conclusion

This review has considered the recent literature reporting on young drivers. It has considered the environment and culture within which adolescents live and the individual differences which can assist in the prediction of risk for MVA. Age (youth) and gender (male) appear to be primary predictors for those involved in MVA. This review has considered some of the secondary predictors which appear to be linked to risky driving. Predictors discussed include risky driving behaviour, such as speeding and tailgating; the

individual's attitude to driving; personality, in particular, Conscientiousness and Sensation Seeking, which are at opposite ends of the scale when their association with MVA is investigated. Additionally, research (Jessor, 1987; Jonah, 1986; Deery et al.1998) has found that there may be links with other risky behaviours such as alcohol use, tobacco smoking and the use of illicit drugs. Therefore lifestyle, peer associations and other risky behaviours appear to also have a strong correlation with risky driving. Moffitt (1993) suggested that for most of the population risky behaviour was only indulged in during adolescence, however, approximately 10% of the population were likely to continue risky behaviour throughout their adult years.

Some action has already been taken to modify the opportunities for the young driver to participate in risky driving. Systems such as graduated licensing systems and curfews are claiming success in some parts of the world. The disadvantage of these systems is that they do not discriminate between those young drivers who do drive safely and those who do not. Deery et al. (1998) and Gregersen and Berg (1994) conducted research which suggested that not all young drivers are a high risk.

Therefore, further research to determine a reliable predictor, or reliable predictors, for identifying those young drivers at risk would be beneficial to both the individual and society at large.

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**Is there a need for speed? A study of young male drivers and predictors
for motor vehicle accidents.**

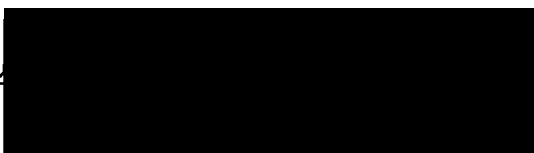
Catherine A. Ferguson

**A report submitted as a partial requirement for the degree of Bachelor of Arts with
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SUBMITTED: October 1999.

I declare that this written assignment is my own work and does not include:

- (i) material from published sources used without proper acknowledgment; or**
- (ii) material copied from the work of other students.**

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**Is there a need for speed? A study of young male drivers and
predictors for motor vehicle accidents**

Abstract

Determining predictors for motor vehicle accident involvement and responsibility may lead to interventions which address risky driving in adolescents and young adults. Three possible predictors for accidents in young males were investigated. Male participants (n = 95) aged 18 – 22, years completed self-report questionnaires covering Driving Behaviour, Driving Attitudes, Sensation Seeking. Using Logistic regression Driving Behaviour predicted 69% accident involvement and 80% responsibility. Driving attitude predicted 67% for accident involvement and 77% responsibility. Sensation Seeking was, to a lesser extent, predictive for accident involvement but not responsibility. In a second analysis Cluster analysis was used to confirm that the above predictors discriminated between groups of young men. A three cluster solution was found indicating that there are important within gender differences for accident involvement.

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Keywords: Young male drivers, predictors for MVA, protective factors for risky driving, lifestyle, education.

IS THERE A NEED FOR SPEED? A STUDY OF YOUNG MALE DRIVERS AND PREDICTORS FOR MOTOR VEHICLE ACCIDENTS

Risky driving has been identified as one of the main causes of motor vehicle accidents (MVAs) (Jonah, 1986) and young men in general have been identified as being a higher risk on the road (Reason, Manstead, Stradling, Baxter & Campbell, 1990; Blockley & Hartley, 1995). MVAs are major cause of death and serious injury worldwide for young males (Elander, West & French, 1993; Vavrik, 1997). In 1998, in Australia, three hundred and fifty six men, aged 17 – 25 years were killed on the road (Federal Office of Road Safety, 1999). Considerable research on young drivers has been conducted; however, to date no lasting intervention for reducing the road toll has been devised (Deery, Kowadlo, Westphal-Wedding, & Fildes, 1998; Williams, 1998). Both Reason et al. (1990) and Blockley and Hartley (1995), in self-report studies, found that males reported more dangerous violations than females and young drivers admitted more dangerous errors and more dangerous violations than older drivers. In particular, males reported more convictions for speeding.

Risky behaviour is complex and it appears that the reasons why young men in particular indulge in risky behaviour have not been fully identified. Until the reasons for the risky behaviour are found it is unlikely that an effective intervention can be designed. It would be useful to be able to specifically identify young people who are at risk of participation in risky behaviours in general and risky driving in particular.

Possible predictors for young men at risk for increased accident involvement have been suggested. For example, driving at high speed and tailgating have been identified as predictive behaviours in which young men have admitted participation or have been

observed (Evans & Wasieleski, 1983; Wasieleski, 1984). Attitude to driving has also been found to have a relationship to accident involvement (Elander et al. 1993; Assum 1997) and the personality variable of Sensation Seeking has been found to have a correlation with risky driving behaviour (Jonah, 1997). The purpose of this paper is to explore these possible predictors.

Behavioural predictors for MVA

Speed has been accepted as a definite component for risk in accidents (Kanellaidis, Golias & Zarifopoulos, 1995; Lajunen, Karola & Summala, 1997). Kanellaidis et al. found that speed limit compliance varied between urban and non-urban roads. Using self-report, 93% of drivers aged 18 to 68 years, and of both genders, reported compliance with speed limits on urban roads, compared to 74% on non urban roads. Additionally, up to 58% of drivers who seldom or never complied with speed limits indicated that they believed that reducing speed limits would reduce accidents.

Lajunen et al. (1997) recruited 195 young men from the Finnish armed forces and had them drive an instrumented vehicle round a test track. Participants had an average age of 19.8 years. Of interest was the speed at which the participant drove through certain areas of the test track. The results of this research showed that those drivers who had admitted to several accidents used higher maximum speeds and higher speeds at the specific sites on the track where a safe driver would have been expected to slow down, such as a crest on the road and a sharp curve. Speed therefore appears to be a good predictor of accident involvement.

Tailgating has been identified as another risky behaviour indulged in by adolescents and young adults (Elander et al. 1993). Evans and Wasieleski (1983) and Wasieleski (1984) conducted extensive observational studies and found that young male drivers, who were

alone in the vehicle and who were driving a newer vehicle, tailgated more than older drivers. Presumably drivers of newer vehicles felt that these vehicles were more reliable and more easily controlled than older vehicles. Female drivers were less likely to tailgate, as were drivers who had passengers. Tailgating and speeding are both risky behaviours because they may not allow the driver to take appropriate action to avoid an accident. Both appear to be associated with young male drivers.

Overestimation of driving skills may also lead to increased accident risk through the process of risk assessment. Both Dejoy (1992) and Gregersen (1996) found that overestimation of driving skills was particularly evident in young males. Gregersen (1996) had participants, aged 18 - 24 years, take part in either a skill training situation (handling driving on ice) or a driving session during which they were shown how their skills (at driving on ice) were deficient (insight training). Results indicated that the drivers who underwent the skill training overestimated their capabilities more than the drivers who participated in the insight training. Therefore, skill training may lead drivers to believe that they have increased skill but in reality they do not. Therefore, Gregersen (1996) suggested that drivers attending skill courses should also be taught that their skills are limited and that they should be encouraged to acknowledge their limitations.

Some young men acquire increased driving skill through participation in motor sport. Motor sport allows the individual to develop, not only skills in handling the vehicle, but also enables development of the cognitive skills associated with driving. Skill may therefore, be a predictor for MVA.

Attitude predictors for MVA

An extensive review of the research involving MVAs and their relationship to differing variables was conducted by Elander et al. (1993). This review concluded that a good

attitude to safe driving was associated with reduced accident involvement. Elander et al. suggested that the evidence linking increased driving skill with lower involvement in MVA was inconclusive. However, as involvement in MVA reduces as a function of age and experience, then it is likely that skill is part of a complex relationship between variables which interact and which, overall, impact upon MVA involvement. It has also been suggested that increases in driving skill may counteract a poor driving attitude, and similarly a good driving attitude may counteract poor driving skill (Deery et al. 1998).

In contrast, Assum (1997) suggested that there is not a direct link between driving attitudes and accidents and that the intervening variable is behaviour. Assum also acknowledged that there is not always a direct relationship between attitudes and behaviour. Assum used 7,425 participants, both male and female, and found that accident risk was partially related to attitudes. However, in this research, when age and annual mileage were introduced they appeared to be more important than attitudes for predicting accident risk. Assum's findings also showed that accident risk decreased with age and that females had better attitudes than males. This is a general finding throughout research which uses the variables of age and gender (Jonah, 1990; Blockley & Hartley, 1995) supporting the premise that young men are a greater risk on the road. Attitude appears to be a possible predictor for MVA involvement.

Personality: Sensation Seeking as a Predictor for MVA

Sensation Seeking may be important as a predictor variable for risky driving. Sensation Seeking has a biological or psychobiological basis (Zuckerman, 1989,1990) and has been linked with higher testosterone and lower platelet monoamine oxidase (MAO) levels (Zuckerman, 1995). Adolescents have higher scores on Zuckerman's Sensation Seeking Scale when compared to adults and males reveal higher scores than females (Zuckerman &

Neeb, 1980).

Sensation Seeking appears to underlie risky behaviour in general (Newcomb, & McGee, 1991) and has been linked to risky driving (Jonah, 1997; Zimbardo, Keogh, & Boyd 1997). Of forty studies reviewed by Jonah (1997), only four did not produce a significant positive relationship between Sensation Seeking and some aspect of risky driving. Ball, Farnhill, and Wangeman (1984) reported that young Australians aged 17 – 19 years old had the highest levels of Sensation Seeking compared to other national samples (U.S.A., Canada and England) and that Australian males overall scored significantly higher compared to all other national groups. Ball et al. suggested that the Australian lifestyle may facilitate Sensation Seeking behaviour.

Arnett, Offer, and Fine (1997) and Trimpop and Kirkcaldy (1997) have suggested that the opportunity for adolescents to indulge in risky behaviour in a safe environment may reduce their need to indulge elsewhere. For risky driving behaviours this suggests that if young men can indulge in risky driving in alternate ways they may improve their on the road behaviour. Racing at Speedway or Motocross provides the thrill and intensity of experience which Zuckerman (1971,1995) has suggested high sensation seekers look for. Motor racing also develops driving skills, especially if the adolescent is introduced to the sport prior to an age at which he or she can drive on the public road.

This research comprised of two studies. The first study was to determine if it was possible to predict MVA involvement and responsibility using a behavioural and skill predictor, attitude to driving questionnaire and/or Sensation Seeking. The second study was designed as a validity check to ensure that the predictors in the first study discriminated between groups of young male drivers. As a measure of control for the effects of skill two groups were used. The first comprised of young men who had motor

racing experience, the second group had no motor racing experience. Motor racing increases driving skill. Study two partly replicated Deery et al. (1998) who identified five different types of young drivers through cluster analysis. In the current research only male participants took part.

Hypothesis – Study One

In study one, it was hypothesized that it is possible to predict accident involvement and accident responsibility from self-report responses to:

the behavioural measure questionnaire (Driving Style)

the attitude measure questionnaire (Driving Attitude)

the Sensation Seeking questionnaire (Sensation Seeking).

On all three measures a high score should predict increased MVA involvement and increased MVA responsibility.

Method

Participants

Two groups of young men participated. One group comprised of speedway and motocross drivers ($n = 26$); the second group students at a TAFE college ($n = 69$); making total of 95. The age of participants was between 18 and 22 years (Mean 19.18, SD 1.45). The groups were matched for age with the mean age for both groups being 19.2 years; age for the racing group had a SD 1.5, and 1.4 for the non-racing group.

Design

The design employed four predictors, of which driving skill was a comparison between racing and non-racing groups. The other three predictors (driving behaviour, driving attitude and Sensation Seeking) were measured using questionnaires.

Measures

Driving Behaviour. The Driving Style questionnaire (Deery & Love, 1996) was used as the measure for this variable. This questionnaire was used in Deery et al. (1998) and has been included in this research as partial replication of Deery et al..

Driving Attitude. A driving questionnaire used in Deery et al. (1998) was used again for purposes of replication. This questionnaire was initially developed by Donovan and Marlatt in 1982 and was used in McMillen, Pang, Wells-Parker and Anderson (1992). Given the prior use and the need for replication, it was considered satisfactory for the purposes of this study, although reliability and validity have not been quantified. This questionnaire also included questions on risky behaviours, risky driving, alcohol use, smoking tobacco and use of illicit drugs.

Personality: Sensation Seeking. The third questionnaire was the AISS (Arnett's Inventory for Sensation Seeking)(Arnett, 1994). Arnett (1994) claims that his AISS (Arnett Inventory of Sensation Seeking) produces higher correlations to risky behaviour than Zuckerman's SSS. The AISS has shown internal reliability of 0.83 to 0.86 and a three-month test-retest reliability of 0.80. The AISS also provides for a wider range of the measure of SS as it uses a Likert Scale rather than forced choice questions.

Coding of responses. The responses to the accident involvement and accident responsibility questions on the risky behaviour questionnaire were coded to reveal 'nil' accident, or 'any' accident and 'nil' responsibility and 'any' responsibility respectively. Therefore the dependent variables were 'nil' or 'any' accident involvement and 'nil' or 'any' accident responsibility. Copies of the questionnaires and scoring instructions are included as Appendix 'A'.

Procedure

Proposed participants, males aged 18 – 22 years, were identified by the motor racing clubs who agreed to assist with the research. The questionnaire was posted to speedway and motocross participants throughout Western Australia. Participants were requested to complete the questionnaire and return it in a stamped addressed envelope. The questionnaire included instructions for its completion. Male college students, similarly aged, were asked in class by their lecturers to participate or were approached on campus by a young female student who had volunteered to assist in the collection of the data. Participation was voluntary. Each student was provided with a sealable envelope in which to place the completed questionnaire. No differences were found in responses between the groups given the questionnaire by lecturers or by the student on campus. Moreover, no differences were found between the speedway and motocross respondents. Response rates for either group cannot be accurately calculated as control of the forwarding was in the hands of third parties. However, from the number of unused questionnaires returned a response rate of approximately 25% was achieved in the motor sport group. Refusal rate for the students is not known, however, it is believed that most students asked to assist did so.

Results – Study One

Initially, independent t tests were conducted to investigate differences in the mean scores between participants who had 'nil' accident involvement and responsibility or 'any' accident involvement and responsibility. Results for Accident Involvement indicated that there were significant differences in the scores of participants who had no accident involvement for all three measures, and significant differences for Driving Style and Driving Attitude for accident responsibility. The results were obtained using SPSS for

Windows 7.5. Tables 1 and 2 below show means and standard deviations for all three measures for Accident Involvement and Accident Responsibility. Table 3 shows the relevant t values and effect sizes.

Table 1

Mean and Standard Deviations for Accident Involvement

	N	Mean	SD
Driving Style – nil accident	61	24.10	7.34
any accident	34	30.22	8.74
Driving Attitude – nil accident	61	13.38	5.38
any accident	34	17.53	5.37
Sensation Seeking – nil accident	61	53.67	6.37
Any accident	34	56.76	7.93

Table 2

Mean and Standard Deviations for Accident Responsibility

	N	Mean	SD
Driving Style – nil accident	68	24.68	7.46
any accident	23	30.91	9.23
Driving Attitude – nil accident	71	13.80	5.42
any accident	24	18.00	5.49
Sensation Seeking – nil accident	71	53.97	6.37
Any accident	24	57.17	8.58

Table 3

Results of independent t test – t values and effect sizes

Measure	Accident Involvement	Effect	Accident Responsibility	Effect
	$t =$	size	$t =$	size
Driving Style	-3.547 (df89), $p < 0.05$	0.73	-3.259 (df89), $p < 0.05$	0.75
Driving Attitude	-3.610 (df93), $p < 0.05$	0.73	-3.271 (df93), $p < 0.05$	0.74
Sensation Seeking	-2.076 (df93), $p < 0.05$	0.43	-1.938 (df93), $p > 0.05$	0.45

The greater effect sizes for Driving Style and Driving Attitude suggest that they are more likely to be better predictors for accident involvement and responsibility than Sensation Seeking. The effect size represents the difference between the means for each group ('nil' accident vs. 'any' accident), in terms of the standard deviation for the total participants. A higher effect size represents a greater difference between the groups.

Following the confirmation that there were significant differences between the groups the possible predictors were further investigated. As the dependent variable ('nil' accident and 'any' accident) is a binomial variable and the independent variables both continuous (Driving Style, Driving Attitude and Sensation Seeking) and binomial (racing vs. non-racing) two Logistic Regressions were the most appropriate statistics to use (Tabachnick & Fidell, 1996). This allowed investigation of both the continuous variables and the effect of motor sport on the dependent variables. Logistic regression requires that variables are not highly correlated and therefore a Spearman's Ranked Correlations was used to investigate the level of correlation between Driving Style, Driving Attitude, Sensation Seeking and Group (racing vs. non-racing). Details of the correlations are shown in Table 4 below.

Table 4

Spearman Ranked Correlations

	Driving Style	Sensation Seeking	Group (racing vs non-racing)
Driving Attitude	.774	.453	.138
Driving Style		.347	.093
Sensation Seeking			.097

As Driving Style and Driving Attitude were highly correlated, it was decided to investigate each of these variables further using Stepwise Logistic Regression. A Logistic Regression was conducted dropping Driving Attitude. The Logistic Regression revealed that Driving Style accounted for 28% of the variance in Accident Involvement and Sensation Seeking 16%. There were no effects of group (racing vs. non-racing). Prediction rate was 69%. For Accident Responsibility, Driving Style accounted for 27% of the variance and Sensation Seeking 17%, with no difference for group. Prediction rate for Driving Style and Accident Responsibility was 80%.

Secondly, stepwise Logistic Regressions were conducted in which Driving Style was dropped. The first Logistic Regression revealed that Driving Attitude accounted for 28% of the variance in Accident Involvement and Sensation Seeking 13%. However, there was no effect for group differences (racing or non-racing). In this instance Driving Attitude correctly predicted MVA involvement in 67% of cases.

In the next stepwise Logistic Regression predicting Accident Responsibility, the results revealed that Driving Attitude accounted for 27% of the variance and Sensation Seeking 13%. Again, the effects of group membership (racing vs. non-racing) were not present. Prediction rate was 77%.

There is little difference between the above predictors, however, as the Driving Attitude questionnaire comprises of six factors, it was considered that these factors within themselves may also provide some clues as to the better predictor for MVA involvement and responsibility.

Investigation of the factors in Driving Attitude commenced with a Spearman correlation. Results of these correlations are shown in Table 5 below.

Table 5

Spearman Correlation between factors in Driving Attitude questionnaire

	Comp. speed	Externality	Inhibition	Internality	Tens. Reduct
Aggression	.379	.209	.127	.358	.179
Comp. speed		.289	.237	.034	.446
Externality			-.069	.279	.303
Inhibition				-.047	.004
Internality					.091

Whilst some of these correlations are in the medium range, none of the correlations was too high to prevent use in a Logistic Regression. Therefore a stepwise Logistic Regression was conducted to further explore the predictors for Accident Involvement. This revealed that Competitive Speed accounted for 24% of the variance and Inhibition (lack of) accounted for 16%, with a prediction rate of 71%.

For Accident Responsibility, a Logistic Regression found that Competitive Speed was the prime predictor accounting for a variance of 21%, and a prediction rate of 75%.

Study Two

The second study involved a partial replication of Deery et al. (1998). Deery et al. conducted a cluster analysis of 198 young people of both genders to identify different types of young drivers. In Deery et al. adolescents aged 16 – 19 years, mean age 17.9 years (SD 0.76) were presented with a questionnaire investigating personality, driving attitudes, driving style, demographic details and other risky behaviours. Fifty five percent of the participants in this study were male. Deery et al. found five groups best fitted the data when they conducted a cluster analysis. Of these five groups, two revealed poor driving attitudes and these groups were predominately male. Another two groups revealed good driving attitudes and personality structure. These groups consisted of mostly females. Sensation Seeking was one of the personality variables which Deery et al. found to be significantly higher in those groups with poor driving attitudes.

The present study is a limited replication of Deery et al. (1998) due an abbreviation of the personality section of the questionnaire and the inclusion of male only participants. This was done for three reasons, first, because of practical limitations involving the total length of the questionnaires used in the study, second, because Sensation Seeking had been associated with risky driving in many prior studies and third, to determine within gender differences. This means that whereas the clusters in Deery et al. were based on several personality factors and the driving attitude questionnaire; the current study included only Sensation Seeking and the Driving Attitude questionnaire to determine cluster membership.

The second study also considered the effects of lifestyle on risky driving. This was conducted through the analysis of the risky behaviour questionnaires which formed part of the measures used in Deery et al. (1998). Jonah (1986) reviewed the research on young drivers and suggested that risky driving was associated with other risky behaviour and was

possibly part of a risky lifestyle. Jessor (1987) found relationships between risky driving and other risk behaviours. Whilst other risk behaviours are unlikely to be predictors particularly for risky driving, it is important that correlations between risky driving and other risky behaviours have been found. Jessor (1987) found that risky driving produced medium correlations with problem behaviour measures. Correlations of .56 for males and .49 for females were found, representing 31% and 24% respectively of the variance in risky driving.

Further evidence supporting the importance of the association between risky driving and other risky behaviours was provided by Gregersen and Berg (1994). Gregersen and Berg conducted a cluster analysis on 1774 20 year olds, of both genders and found that there were differences in lifestyle and that certain lifestyles appeared to have a strong association with risky driving. In Deery et al. (1998) risky behaviours appeared to be associated with cluster membership. Therefore those clusters which displayed poor personality construct, anti-social behaviour and risky driving practices also revealed higher alcohol use, greater tobacco smoking and greater use of illicit drugs. Therefore, whilst not a direct predictor, there appear to be strong relationships between risky driving and other risky behaviours.

Research questions for Study Two

The research question in Study two is to determine how well Driving behaviour, Driving Attitude and Sensation Seeking discriminate between clusters of young male drivers. It was expected that the current study would reveal a similar data structure to that found by Deery et al. (1998). A second question will consider how well the other risky behaviours fit with the cluster analysis.

Method

The Participants, Methods and Procedure were the same for this second study as for

study one. Data analysis involved the use of SPSS for Windows 7.5 to conduct a cluster analysis using the responses to the Driving Attitude questionnaire and the Sensation Seeking questionnaire. Thereafter, the scores of Driving Style and responses to other risky behaviours will be compared on the basis of cluster membership.

Results - Study Two

The second part of the research involved a Cluster Analysis of all cases (racing and non-racing). In replication of Deery et al. (1998) a five cluster analysis was sought using SPSS for Windows 7.5 – k cluster. Standardized scores were used for this analysis as the measures used different scales. This initial solution produced five clusters whose mean scores on Sensation Seeking and Driving Attitude are shown in Table 6 below:

Table 6

Mean scores on Sensation Seeking and Driving Attitude for 5 cluster

	<u>solution</u>				
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Sensation Seeking	43.00	62.35	53.84	52.71	63.58
Driving Attitude	10.38	14.24	19.00	10.04	23.25

The SPSS ANOVA did not show significant differences between Clusters 1 and 4 on Driving Attitude, and Clusters 2 and 5, and Clusters 3 and 4 on Sensation Seeking, and it was decided to reconsider a solution which produced significant differences between the clusters on at least one of the measures (Driving Attitude or Sensation Seeking).

Further analyses using SPSS for Windows 7.5 were conducted and the most promising result was a three cluster solution which produced significant differences between all three

clusters on Driving Attitude; however, there was no difference between Clusters 2 and 3 on Sensation Seeking. It was therefore decided to continue with the analysis on the basis of these three groups. The mean scores for the three cluster solution are shown in Table 7 below, together with the cluster means of the six components of the Driving Attitude scores.

Table 7

Mean scores on Sensation Seeking and Driving Attitude for 3 cluster solution and mean scores on the six factors of Driving Attitude

	Cluster 1	Cluster 2	Cluster 3
Sensation seeking	47.63	58.24	56.06
Driving Attitude	9.17	19.14	14.24
Six components are:			
1. Aggression	3.29	7.95	4.35
2. Competitive speed	2.21	4.95	4.82
3. Externality	0.71	1.32	0.85
4. Inhibition	1.54	1.95	2.74
5. Internality	0.44	0.86	0.54
6. Tension Reduction	1.26	1.47	1.36

Following allocation of cases to the three clusters, and following part of the procedure in Deery et al. (1998), Driving Style was analysed using SPSS for Windows 7.5 ANOVA and analysis of the risky behaviour questions (Questions 1 – 10) was conducted. Chi Square was used for these latter analyses and frequency distributions were used to highlight

differences between the Clusters. The full frequency analyses tables are shown in Appendix 'C'.

Driving Style revealed significant differences between the groups, using a one- way ANOVA, ($F(2,88) = 23.924, p < 0.05$). A Scheffe post hoc test confirmed that there were significant differences between all three groups ($p < 0.05$). Mean scores and standard deviations for Driving Style are shown in Table 8 below.

Table 8

Mean Scores for Driving Style per cluster

	Cluster 1	Cluster 2	Cluster3
Driving Style	18.65 (SD 5.31)	31.19 (SD 8.48)	26.16 (SD 5.45)

The results for the chi-square for Questions 1 – 10 are shown in Table 9 below.

Table 9

Chi square results for risky behaviour questionnaire

Ques1	Ques2	Ques3	Ques4	Ques5	Ques6	Ques7	Ques8	Ques9	Quest10
9.98**	4.12	7.57**	0.31	N/A	N/A	2.46	1.60	4.56	N/A

Significant at $\alpha = 0.05$.

Significant differences were found between the clusters for Accident Involvement and number of Violations only.

A final analysis of the data was conducted to consider frequency of events. This enables direct comparison of results in this research with the results of Deery et al. (1998). Full Frequency Tables are shown in Appendix 'C'. Table 10 below shows the frequency of the risky behaviours in a format that allows comparison with the results of Deery et al..

Table 10

Risky behaviours for clusters

	Cluster 1 'Good'	Cluster2 'Bad'	Cluster3 'Medium'
Driving Style	18.65	31.19	26.16
Driving Record			
% Accident Involvement	16.7%	32.4%	52.9%
% Accident Responsibility	12.5%	24.3%	35.3%
% Traffic Violations	70.8%	56.8%	70.6%
Traffic Violations (Means)	1.5	2.03	2.56
Alcohol Use			
No of drinking occasions per month	7	12.3	12.3
No of drinks per occasion	5.6	7.4	6.6
Total quantity per month	39.2	91.02	81.18
Other drug use			
% ever smoked tobacco	29.2%	43.2%	29.4%
% now smoke tobacco	20.8%	32.4%	17.6%
% use of prohibited drugs	16.7%	51.4%	35.3%
Age	19.58 (SD1.50)	18.97 (SD1.33)	19.16 (SD 1.53)

As there were differing numbers of clusters in each study, it was considered that the most relevant method of drawing comparisons between the studies was to compare the range of scores in each category. Table 11 shows comparative details by showing the ranges between clusters in each study.

Spearman's correlations were used to reveal the relationship between the risky behaviours, risky driving, alcohol use, smoking tobacco, and illicit drug use. The correlations are shown in Table 12 below.

Questions 1,2 and 3 related to risky driving; question 4, alcohol use; questions 7 and 8 to smoking tobacco; and question 9 the use of illicit drugs. Questions 5, 6, and 10 provided frequency data for alcohol and illicit drug use and were excluded from the correlations.

Table 11

Comparison between Deery et al and current research

	Deery et al. (1998) 5 Clusters	Ferguson (1999) 3 Clusters
Aggression	1.5 – 6.7	3.29 – 7.95
Competitive Speed	0.6 – 4.2	2.21 – 4.95
Externality	0.4 – 1.0	0.71 – 1.32
Inhibition	1.1 – 2.7	1.54 – 2.74
Internality	2.5 – 2.7	0.44 – 0.86
Tension Reduction	0.8 – 1.6	1.26 – 1.47
Driving Record		
% Accident Involvement	2 – 19	16.7 – 52.9
% Accident Responsibility	1.7 – 10.5	12.5 – 35.3
Traffic Violations (Mean)	0.0 – 0.9	1.5 – 2.56
Alcohol use		
No of drinking occasions per month	2.2 – 5.6	7 – 12.3
No of drinks per occasion	2 – 6.6	5.6 – 7.4
Total quantity per month (standard drinks)	8.1 – 43.6	39.2 – 81.18
Other Drug Use		
% ever smoked tobacco	20 – 52	29.2 – 43.2
% now smoke tobacco	14 – 43	17.6 – 32.4
% use of prohibited drug	7 – 37	16.7 – 51.4

Table 12

<u>Correlations between risky behaviour questions</u>						
	Acc. Resp	Violation	Alcohol use	Smoking ever	Smoking now	Illicit drug use
Acc. Inv	.804	.451	.052	.123	.029	.158
Acc. Resp		.437	.173	.144	.022	.117
Violations			-0.62	.170	.074	.164
Alcohol use				-.106	-.194	-.262
Smoke ever					.775	.359
Smoke now						.383

Discussion

Study One

The results of the first study showed that Driving Behaviour, Driving Attitudes and Sensation Seeking are all predictors for MVA involvement and responsibility. However, the Driving Style questionnaire, representing behaviour, produced the highest accountability for the prediction, closely followed by Driving Attitude which has six factors, all of which appeared to have some predictive power. There was a high correlation of .774 between the Driving Behaviour and Driving Style questionnaires.

Of the subscales in the Driving Attitude questionnaire, Competitive Speed and (lack of) Inhibition appeared to be the best predictors for MVA involvement and Competitive Speed the best predictor for MVA responsibility. The questions on Inhibition relate specifically to careful driving. Sensation Seeking was considerably less effective than Driving Attitude

and Driving Behaviour in the prediction, however the amounts of variance reported in the current study are similar to those reported elsewhere (Jonah, 1997).

Hence, the results of several previous studies (Elander et al. 1993; Jonah, 1997; Lajunen et al. 1997) have been supported by the present study. Elander et al. indicated that a good Driving Attitude was associated with reduced accident involvement. Jonah (1997) reviewed studies which linked Sensation Seeking to risky driving and found that 36/40 studies reported a relationship between these two variables.

It was also expected that the increased skill which the racing group has for driving would have made some impact on the predictors; however, this was not revealed in the Logistic Regressions. A separate examination of the racing vs. non-racing groups revealed that there were no differences on any of the measures used in this research, except for a Chi Square calculation based on the numbers of accidents reported by each group. In the Chi Square, there was a significant difference between the groups for accident involvement, ($\chi^2 = 4.88$ $p < 0.05$). This was based on the number of accidents which each group reported. The racing group ($n = 26$) reported a total of 10 (mean 0.38) accidents whereas the non-racing group ($n = 69$) reported a total of 56 (mean 0.81). It would appear that this difference was weak as it was not revealed in the Logistic Regressions. Alternatively, the high numbers in both groups who had no accident involvement may also have skewed these results. In the racing group 19 participants (73.1%) reported no accident involvement; this compares to 42 participants (60.9%) in the non-racing group. This issue requires further investigation.

The ability to predict the young people who are likely to indulge in risky driving is an important issue. Firstly, further research involving participants who reveal these tendencies

on questionnaires may result in the design of more appropriate strategies or interventions to overcome the apparent current resistance of young men to messages about safe driving. The importance of educating or training young drivers must be emphasised in light of the risks which they pose, not only to themselves, but also to other members of the community.

Study Two

In the second study a cluster analysis was performed to further confirm the findings in study one. In this study, the predictors for MVA were used to discriminate clusters of young men within the sample which included college students with no motor racing experience, and young men who participated in either Speedway or Motocross. Whilst there were no significant differences between the groups, racing or non-racing, the predictor, Driving Attitude clearly identified three clusters within the sample.

There is no evidence in the results of this research to support the suggestion of Arnett et al. (1997) and Trimpop and Kirkcaldy (1997) that participation in risky behaviour in a safe environment reduces either Sensation Seeking scores or risky behaviour. It was also surprising that there was not a difference in Sensation Seeking between the racing and non-racing groups. Straub (1982) found high Sensation Seeking in an older sample of motor racers compared to other groups of similar or lesser age. However, in this research there was no significant difference in the mean Sensation Seeking score for the racing and the non-racing groups. If Arnett et al. were correct in their suggestion, the expectation would be that the racing group would have revealed significantly lower Sensation Seeking scores than the non-racing group and that the racing group would also have less accident involvement, less accident responsibility and report less violations. As there were no significant differences on any of these measures (except for a weak result on the chi-square for accident involvement) it suggests that the Arnett hypothesis requires further

investigation.

Sensation Seeking, which was the second variable in the cluster analysis (the first being driving attitude) failed to discriminate between the middle and the worst cluster which suggests that Sensation Seeking is a poor predictor for involvement in MVA. This result may have been affected by the age of the participants, who, because of their youth were expected to display high Sensation Seeking. Sensation Seeking reduces as a function of age (Zuckerman & Neeb, 1980; Trimpop, Kerr, & Kirkaldy, 1999).

Whereas Deery et al. (1998) found five distinct clusters, this researcher found three. Cluster 1 could be described as consisting of 'good' drivers, with low Sensation Seeking Scores and low Driving Attitude scores (low scores reflect good attitude). The second Cluster (2) had higher Sensation Seeking scores and high Driving Attitude Scores. This cluster could be described as 'poor' drivers. The third cluster had high Sensation Seeking scores and medium scores on Driving Attitude. This cluster could be described as somewhere between 'good' and 'poor', that is 'medium'.

The main distinction between all three clusters was on the Driving Attitude questionnaire, with no significant differences between the means of Clusters 2 and 3 on Sensation Seeking. As discussed above, Deery et al. (1998) divided the driving attitude scores into six components: aggression, competitive speed, externality, inhibition, internality and tension reduction. The mean scores for the current study on these measures are included in Table 7. Significant differences were also found between the clusters on these measures suggesting that the Driving Attitude questionnaire may be able to be shortened and still retain its predictive qualities. Further research in this area is required. The differences between clusters for these components are shown in Table 13 below.

Table 13

<u>Differences in clusters on Driving Attitude factors</u>			
	Significant		Not significant
Aggression	Clusters 1 and 2	Clusters 2 and 3	Clusters 1 and 3
Competitive speed	Clusters 1 and 2	Clusters 1 and 3	Clusters 2 and 3**
Externality	Clusters 1 and 2	Clusters 2 and 3	Clusters 1 and 3
Inhibition	Clusters 1 and 3	Clusters 2 and 3	Clusters 1 and 2**
Internality	Clusters 1 and 2	Clusters 2 and 3	Cluster 1 and 3
Tension Reduction	Clusters 1 and 2	Clusters 2 and 3	Clusters 1 and 3

** indicates results which require explanation.

Most of the above differences would have been expected. However, the lack of difference between Cluster 2 (bad) and Cluster 3 (medium) for competitive speed suggests that many of these young men indulge in fast driving. This has been found in other studies involving self-reported driving behaviour (Blockley & Hartley, 1995). This lack of difference may also be the result of the effects of the motor racing group on the cluster analysis. Cluster 1 had 10 racing participants representing 42% of its total; Cluster 3 had 10 racing participants, representing 29% of its total and Cluster 2 had 6 racing participants representing 16% of its members. Therefore 76% of the racing group were in the good and medium cluster. The lack of difference between Clusters 1 and 2 on inhibition may also be attributed to the increased confidence which the motor racing group have in driving.

Driving Style scores were significantly different between all three clusters, with an effect size of 1.50 between Cluster 1 (good) and Cluster 2 (poor). The effect size between

the best and the worst in Deery et al. (1998) was over 2 SD (group SD not quoted to enable accurate calculation). This suggests that there is less difference between the Clusters in the current research and that of Deery et al.. This may be a reflection of the differences between the samples. The large difference between the good and the poor clusters also indicates high variability in the Driving Styles of young men as do the significant differences for Accident Involvement and number of Violations on the chi-square.

Table 10 showed the mean Driving Record scores for each cluster. These scores are again considerably different to those provided by Deery et al. (1998). Some of these differences may relate to the male only sample in this research and also the inclusion of young men who have had involvement in motor sport. Cluster 1 appears to follow the trend of good driving, apart from on the measure of violations, where a high percentage (70.8%) of the group had reported at least one violation. However, the mean number of violations was the lowest for Cluster 1 at 1.5. The high number of racing drivers in this group may have inflated the result. The racing group had higher frequency of violations than the non-racing group (refer to Appendix 'B' for comparisons). The fact that Cluster 3 has worse scores may perhaps also be attributed to the numbers of racing drivers in this cluster, although this does not explain the frequency results for accident involvement or accident responsibility.

In addition to the driving data collected, both Deery et al. (1998) and the current study investigated on other risky behaviours. Jessor (1987) found that an individual who indulges in one risky behaviour frequently indulges in others. This finding has been supported by other research (Jonah, 1990; Deery et al.). The results of the cluster analysis in the current research support this premise, as did the results of Deery et al.. The results of alcohol use partly follow the trend of a risky lifestyle with Cluster 1 reporting considerably

less alcohol consumption compared to the other two clusters between which there is little difference. Illicit drug use followed the expected trend of increased participation linked to poorer driving, although the differences between groups was not significant on the Chi Square.

The correlations shown in Table 12 in the results section revealed that there was a high correlation between Accident Involvement (Q1) and Accident responsibility (Q2). However, the correlations for the other risky behaviours were only in the low to mid range, apart from questions 7 and 8. However, a high correlation would have been expected between these as these questions related to current tobacco smoking and any tobacco smoking in the past. Therefore, this sample does not appear to follow the overall trend as suggested by Jessor (1987) who found that risky driving produced medium correlations of .56 for males and .49 for females with other measures of problem behaviour.

There were however large differences between the mean scores and frequency results of the current research and Deery et al. (1998). As there were differing numbers of clusters in each study the most relevant method of comparing results was to compare the range of scores in each category. These results were shown in Table 9 in the Results section of this paper.

The higher scores in the current research indicate increased risky behaviour in all areas, driving, alcohol use and illicit drug use. The findings for tobacco smoking were different with there being a narrower range of use within the participants in the current research. This once again may be related to the fact that almost one third of the participants have an involvement with either Speedway or Motocross. The Western Australia Health Department's Quit Smoking campaign sponsors events in both these sports.

The differences between the current results and those of Deery et al. (1998) may be

explained by three important differences between the samples used in the research. Firstly, Deery et al. had 55% male participants, whereas in the current research, 100% were male. Secondly, Deery et al. had 80% of their participants with driving experience whereas in the current research 100% of participants had a drivers license and driving experience. This difference may partly explain the increased accident involvement, accident responsibility and numbers of violations which were evident in the sample used in the current research. Thirdly, there were differences in the mean age of participants. Mean age in the current research was 19.2 years, mean age in Deery et al. was 17.9; an increase of (1.3 years). Females do not indulge in risky behaviour to the same extent as do males (Jessor, 1987) and female attitudes to driving have been found also to be different to males (Assum, 1997). The difference in 'internality' is notably in the opposite direction to the other scores, however, when reviewing the questions which made up this factor, it is evident that a low score indicates low internality resulting in a tendency to avoid responsibility for actions. The reason for this difference is not known. It may be another effect of gender where females are more responsible than males, but requires further investigation to determine if this is the case.

It was expected that there would be some differences between the outcome of this research and that of Deery et al. (1998) due to the male only sample in the current research. The main finding in this research is that in support of Deery et al. and Gregersen and Berg (1994) distinct clusters were identified. It should be noted however that this research was a partial replication, using Sensation Seeking as the only personality measure and male only participants. Therefore, there may be some limitations in the comparisons made between the current research and that of Deery et al.. The current research concentrated on Sensation Seeking only, partly to reduce the length of the questionnaire and partly because Sensation

Seeking had been found to correlate to risky driving (Jonah, 1997; Jonah, Thiessen, Au-Yeung & Vincent, 1997) and risky behaviour in general (Newcomb & McGee, 1991). Additionally, Sensation Seeking was a possible predictor for accident involvement as investigated in Study One. However, it should be emphasised that this was the only difference in the measures used and that the driving questionnaires and the other risky behaviour questions were the same in both this research and Deery et al..

In the current study there were significant differences between all three groups of drivers on the driving attitude measure. There were also differences between Cluster 1 and Clusters 2 and 3 on Sensation Seeking, but no difference between Clusters 2 and 3. Deery et al. (1998) had 55% male participants and two of their five Clusters were predominately female. Therefore a three cluster solution appears to be realistic for the current research given the male only sample.

Other differences between the studies included the residential base of participants. Deery et al. (1998) recruited in metropolitan areas of Melbourne, Australia whereas the current research included both city and country drivers in Western Australia. The above factors may have all played some part in the differences between the results of the two studies.

Overall, it would appear that risky driving may be different to other risky behaviours. The risky driving measures produced some unexpected results between Cluster 2 and Cluster 3; however, other reported risky behaviours between Clusters 2 and 3 follow the expected trend of increased risky behaviours linked to high Sensation Seeking and poor driving attitude. Some reasons for the unexpected results may be that the sample was small ($N = 95$). Other reasons for the difference between risky driving and other risky behaviours may be the result of societal acceptance of risky driving and less acceptance of other risky

behaviour such as smoking tobacco, drinking alcohol or illicit drug use. Indulgence in risky driving may not be as obvious to parents as other risky behaviour and therefore may be one way of the young man setting his own agenda. Alternatively, parents may be aware of their sons' risky driving but take the attitude that it is culturally expected that young men will abuse the privilege of driving, and that they will 'grow out of it'. Historically, society has done little to educate the young about the risks of driving, although this issue is now receiving more attention. Parental and peer acceptance of the young risky driver may encourage indulgence in this behaviour.

However, the differences between the results of the current research and that of Deery et al. (1998) is most likely a function of both gender and age and supports Arnett (1996) and Jonah (1990) who found that risky behaviour continues into the early twenties. There was a marked increase in the frequency of risky behaviour between the current research and Deery et al. and this may be due to the difference of 1.3 years in the mean age between the studies. The years between the ages of 16 and 19 years are full of developmental change. During this period some participants may have left school and commenced work, others may have left the parental home and lost the restrictions which parents place on the behaviour of the adolescent. Arnett (1998) has suggested that this period, between leaving the parental home and establishing a permanent relationship, is the prime time in which indulgence in risky behaviour occurs. These issues are important as the association between risky driving and other risky behaviours has been recognised (Jessor, 1987; Jonah, 1990).

Limitations of this research

There are several limitations to this research. The first involves the use of self-report questionnaires. Where questionnaires are self-report some participants may provide socially acceptable answers, in this case by under-reporting traffic violations, accidents and other

risky behaviour. However, anonymity of responses is usually sufficient to generate truthful answers. As the questionnaires in this research are anonymous, the concerns about self-report are considered and highlighted but the responses are considered to be honest. Further limitations relate to the male only sample and the partial replication of Deery et al. (1998). A further limitation of the current study was that Sensation Seeking scores for the racing group were not determined before they commenced their participation in the sport and the scores which were reported may have been lowered as a result of their participation in motor sport. The only way in which this limitation could have been overcome is through longitudinal research monitoring Sensation Seeking scores in individuals over a number of years.

Conclusion

This research comprised of two studies, the first considered the relationship between accident involvement and the predictors of Driving Attitude, Driving Behaviour and Sensation Seeking. The second study used cluster analysis as a confirmatory tool to determine how well these measures discriminated between groups of young male drivers. The results of study one have added further support for Driving Attitude and Driving Behaviour as predictors of MVA involvement and responsibility in a sample which is high risk (young males). Each of these measures accounted for similar amounts of variance and similar levels of predictability. Whilst Sensation Seeking has been found in many other studies to have a relationship with risky driving its relationship in this research was much weaker than that of Driving Attitude and Driving Style. Therefore the use of Sensation Seeking as a prime predictor for MVA involvement is not recommended. Of further note is that Driving Skill, as represented by the inclusion of the motor racing participants, was not a predictor for either accident involvement or accident responsibility. This supports

previous suggestions that attitude is more important than skill for accident avoidance (Elander et al. 1993; Gregersen, 1996).

The results of study two support the work of Deery et al. (1998) and Gregersen and Berg (1994) who both found that there were differences between groups of young people which also related to their driving histories. The added value of this research is that differences were found in an all male sample, confirming that there is also variability within genders for driving attitudes and behaviours. Acknowledging that there are differences in the attitudes of young drivers, and the link to accident involvement, is the first step to developing appropriate strategies to identify those who would benefit from increased training which should be targeted at improving their attitude to driving, rather than their level of skill. Attitude may not always translate into appropriate behaviour. However, the high correlation between the attitude and behaviour measures in this research suggests that there is a strong relationship for driving.

Overall, these predictors require further investigation in a larger sample and research should also consider gender differences. Therefore, further research should replicate the above study using participants of both genders.

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Appendix 'A'

INSTRUCTIONS: Circle the True (t) next to the item if it is generally characteristic or true of your opinion about driving or of your behaviour as a driver; circle the False (F) next to the statement which is not characteristic or true of your opinion about driving or your behaviour as a driver.

- | | | |
|--|---|---|
| 1. Skill in handling a car is less important to safety than an attitude of carefulness | T | F |
| 2. I often make rude signs at other motorists who annoy me | T | F |
| 3. I find driving a form of relaxation which I use often when I feel tense | T | F |
| 4. It's fun to manoeuvre and weave through traffic | T | F |
| 5. I lose my temper when another driver does something stupid | T | F |
| 6. During the past few months I have gone driving to "blow off steam" | T | F |
| 7. I am not easily provoked or angered when driving | T | F |
| 8. It's fun to outwit other drivers | T | F |
| 9. I have given chase to a driver who has annoyed me | T | F |
| 10. I find it difficult to control my temper when driving | T | F |
| 11. Taking chances while driving is just asking for trouble | T | F |
| 12. I have been known to flash my car lights at others in anger | T | F |
| 13. When driving on a highway I normally get passed by more cars than I pass myself | T | F |
| 14. Driving helps me forget about pressures | T | F |
| 15. Most drivers who have accidents are just unlucky | T | F |
| 16. I like to pass other cars on the highway even if I'm not in a hurry | T | F |
| 17. I swear out aloud at other drivers | T | F |
| 18. The driver who breaks the law should be held responsible for an accident in which they are involved | T | F |
| 19. I use my horn a great deal | T | F |
| 20. When I am feeling annoyed or angry I tend to drive more carefully because I am afraid of losing control of the car | T | F |
| 21. It's not reasonable to blame 'conditions' for accidents since it's up to the driver to allow for them | T | F |
| 22. If a driver follows too closely, I might hit the brakes to teach him or her a lesson | T | F |
| 23. Modern highways are so good you don't have to worry about the conditions of the road when you drive | T | F |
| 24. It's fun to beat other drivers when taking off from traffic lights | T | F |
| 25. I get annoyed if the traffic lights change to red as I approach them | T | F |
| 26. When I am angry or stressed I make a conscious effort to make sure I drive safely | T | F |
| 27. Driving at high speeds is exciting | T | F |
| 28. I swear under my breath at other drivers | T | F |

Appendix 'A'

- | | | |
|---|---|---|
| 29. I generally become more cautious while driving when I am upset | T | F |
| 30. If the driver behind me has his lights shining in my mirror, I pay him back in some way | T | F |
| 31. When I am upset, driving helps soothe my nerves | T | F |

PLEASE COMPLETE THE FOLLOWING INFORMATION

1. In how many traffic accidents have you been involved while driving
2. Have you been responsible, to any degree, for a traffic accident while you were driving?
YES ☐ NO ☐
If yes, how many:
3. How many fines have you received as a driver (excluding parking fines)?
4. Do you drink alcohol?
YES ☐ NO ☐ (If No, go to Question 7)
5. How often do you have a drink containing alcohol?
Please answer by circling the statement that most applies to you.

Less than once a year	Three or four times a week
Less than once a month but at least once a year	Nearly every day
About once a month	Once a day
Two or three times a month	Three or more times a day
Once or twice a week	
6. On a typical occasion when you drink alcohol, how many standard drinks of alcohol do you have? (a standard drink is a midi of beer, a nip (30ml) of spirits or two-thirds (120 ml) of a glass of wine)
Please circle the statement that best applies

I never drink alcohol	5 or 6 drinks
1 or 2 drinks	7 to 9 drinks
3 or 4 drinks	10 or more drinks
7. Have you, at any time in your life, smoked tobacco regularly (cigarettes, cigars or pipes)?
☐ YES ☐ NO (If No, go to Question 9)
8. Do you currently smoke tobacco regularly?
☐ YES ☐ NO

Appendix 'A'

9. Do you use prohibited drugs (e.g. marijuana)?

☐ YES (Please answer question 10) ☐ NO

10. How often do you use prohibited drugs (e.g. marijuana)?

Please circle the most applicable response

Less than once a year

Three or four times a week

Less than once a month but at least once a year

Nearly every day

About once a month

Once a day

Two or three times a month

Three or more times a day

Once or twice a week

Please advise your age:.....

Occupation:.....

How many years driving license held:

(Speedway drivers only) Please specify what time of year any accident or violation took place. Was it within the race season?

What is the highest level of education that you have completed? Please circle.

High School yr 10

TAFE

High School yr 11

University Degree

High School yr 12

Appendix 'A'

For each item, indicate which response best applies to you:

4 = describes me very well; 3 = describes me somewhat; 2 = does not describe me very well; 1 = does not describe me at all.

- | | | | | |
|--|---|---|---|---|
| 1. I can see how it would be interesting to marry someone from a foreign country. | 4 | 3 | 2 | 1 |
| 2. When the water is very cold, I prefer not to swim, even if it is a hot day. | 4 | 3 | 2 | 1 |
| 3. If I have to wait in a long line, I'm usually patient about it. | 4 | 3 | 2 | 1 |
| 4. When I listen to music, I like it to be loud. | 4 | 3 | 2 | 1 |
| 5. When taking a trip, I think it is best to make as few plans as possible and just take it as it comes. | 4 | 3 | 2 | 1 |
| 6. I stay away from movies that are said to be frightening or highly suspenseful. | 4 | 3 | 2 | 1 |
| 7. I think it is fun and exciting to perform or speak before a group. | 4 | 3 | 2 | 1 |
| 8. If I were to go to an amusement park, I would prefer to ride the rollercoaster or other fast rides. | 4 | 3 | 2 | 1 |
| 9. I would like to travel to places that are strange and far away. | 4 | 3 | 2 | 1 |
| 10. I would never like to gamble with money, even if I could afford it. | 4 | 3 | 2 | 1 |
| 11. I would have enjoyed being one of the first explorers of an unknown land. | 4 | 3 | 2 | 1 |
| 12. I like a movie where there are a lot of explosions and car chases. | 4 | 3 | 2 | 1 |
| 13. I don't like extremely hot and spicy foods. | 4 | 3 | 2 | 1 |
| 14. In general, I work better when I'm under pressure. | 4 | 3 | 2 | 1 |
| 15. I often like to have the radio or TV on while I'm doing something else, such as reading or cleaning up. | 4 | 3 | 2 | 1 |
| 16. It would be interesting to see a car accident happen. | 4 | 3 | 2 | 1 |
| 17. I think it is best to order something familiar when eating in a restaurant. | 4 | 3 | 2 | 1 |
| 18. I like the feeling of standing next to the edge on a high place and looking down. | 4 | 3 | 2 | 1 |
| 19. If it were possible to visit another planet or the moon for free, I would be among the first in line to sign up. | 4 | 3 | 2 | 1 |
| 20. I can see how it must be exciting to be in a battle during a war. | 4 | 3 | 2 | 1 |

Appendix 'A'

INSTRUCTIONS: For the questions below, circle the number in the column that best describes how you typically drive.

	Not at all	Some of the time	moderately	most of the time	all the time
1. I take risks	1	2	3	4	5
2. I race other cars	1	2	3	4	5
3. I cut in and out of the traffic	1	2	3	4	5
4. I pass other cars	1	2	3	4	5
5. I get angry with slow drivers	1	2	3	4	5
6. I like to drive fast	1	2	3	4	5
7. I obey the road rules	1	2	3	4	5
8. I swear at other drivers	1	2	3	4	5
9. I exceed the speed limit	1	2	3	4	5

SCORING INSTRUCTIONS FOR QUESTIONNAIRES

Driving attitude (True or False)

True = 1

False = 0

High score = poor attitude.

Reverse score questions 1,7,11,13,18,20,21,26,29.

Sensation Seeking

Use scores 1- 4 – high score = high sensation seeking.

Reverse score questions 2,3,6,10,13,17.

Driving Style

Use scores 1 – 5 – high score = poor behaviour.

Reverse score question 7.

FREQUENCY TABLES

Racing (n= 26) VS. Nonracing (n = 69).

Questions 1,2 and 3 relate to driving accidents and violations.

Question 1: "In how many traffic accidents have you been involved while driving?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Quest1- Racing	19 73.1%	5 19.2%	1 3.8%	1 3.8%	0	0	0	0	0	0	0
Quest1- Nonracing	42 60.9%	11 15.9%	9 13.0%	3 4.3%	3 4.3%	0	1 1.4%	0	0		

Question 2: "Have you been responsible, to any degree, for a traffic accident while you were driving?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Quest2 - Racing	21 80.8%	5 19.2%	0	0	0	0	0	0	0	0	0
Quest2- Nonracing	50 72.5%	14 20.3%	3 4.3%	0	1 1.4%	1 1.4%	0	0	0		

Question 3: "How many fines have you received as a driver (excluding parking fines)?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Quest3- Racing	8 30.8%	5 19.2%	5 19.2%	1 3.8%	2 7.7%	1 3.8%	1 3.8%	1 3.8%	0	0	2 7.7%
Quest3- Nonracing	25 36.2%	16 23.2%	7 10.1%	7 10.1%	5 7.2%	3 4.3%	2 2.9%	2 2.9 %	0	0	2 2.8%

FREQUENCY TABLES

Questions 4, 5 and 6 relate to alcohol use.

Question 4: “Do you drink alcohol?”

	YES	NO
Racing	24 (92.3%)	2 (7.7%)
Nonracing	61 (88.4%)	8 (11.6%)

Question5: “How often do you have a drink containing alcohol?”

Level*	0*	1*	2*	3*	4*	5*	6*	7*	8*	9*
Quest5 – Racing	2 7.7%	0	2 7.7%	1 3.8%	4 15.4%	8 30.8%	5 19.2%	3 11.5%	1 3.8%	0
Quest5 - Nonracing	8 11.6%	0	2 2.9%	5 7.2%	1 1.4%	26 37.7%	14 20.3%	10 14.5%	1 1.4%	2 2.9%

* 0 = Never; 1 = Less than once a year; 2 = Less than once a month but at least once a year; 3 = About once a month;
4 = Two or three times a month; 5 = Once or twice a week; 6 = Three or four times a week;
7 = Nearly every day; 8 = Once a day; 9 = Three or more times a day.

Question 6: “On a typical occasion when you drink alcohol, how many standard drinks of alcohol do you have (a standard drink is a midi of beer, a nip (30ml) of spirits or two-thirds (120ml) of a glass of wine).

Level*	0*	1*	2*	3*	4*	5*
Quest6- Racing	2 7.7%		5 19.2%	6 23.1%	2 7.7%	11 42.3%
Quest6- Nonracing	8 11.6%		16 23.2%	6 8.7%	12 17.4%	27 39.1%

* 0 = I never drink alcohol; 1 = 1 or 2 drinks; 2 = 3 or 4 drinks; 3 = 5 or 6 drinks; 4 = 7 to 9 drinks; 5 = 10 or more drinks.

FREQUENCY TABLES

Questions 7 and 8 relate to Tobacco use.

Question 7: “Have you, at any time in your life, smoked tobacco regularly (cigarettes, cigars or pipes)?”

	No	Yes
Racing	21 (80.8%)	5 (19.2%)
Nonracing	41 (59.4%)	28 (40.6%)

Question 8: “Do you currently smoke tobacco regularly?”

	No	Yes
Racing	24 (92.3%)	2 (7.7%)
Nonracing	48 (69.6%)	21 (30.4%)

FREQUENCY TABLES

Questions 9 and 10 relate to Illicit Drug use.

Question 9: "Do you use prohibited drugs (e.g. marijuana)?"

	No	Yes
Racing	20 (76.9%)	6 (23.1%)
Nonracing	40 (58.0%)	29 (42.0%)

Question 10: "How often do you use prohibited drugs (e.g. marijuana)?"

Level	0*	1*	2*	3*	4*	5*	6*	7*	8*	9*
Racing	20 (76.9%)	0	0	3 (11.5%)	0	2 (7.7%)	0	0	1 (3.8%)	0
Nonracing	40 (58.0%)	0	3 (4.3%)	3 (4.3%)	4 (5.8 %)	7 (10.1%)	4 (5.8%)	4 (5.8%)	2 (2.9%)	2 2.9%

* 0 = Never; 1 = Less than once a year; 2 = Less than once a month but at least once a year; 3 = About once a month;
 4 = Two or three times a month; 5 = Once or twice a week; 6 = Three or four times a week;
 7 = Nearly every day; 8 = Once a day; 9 = Three or more times a day.

FREQUENCY TABLES - Cluster Analysis

Questions 1,2 and 3 relate to driving accidents and violations.

Question 1: "In how many traffic accidents have you been involved while driving?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Cluster 1	20 83.3%	3 12.5%	1 4.2%								
Cluster 2	25 67.6%	2 5.4%	5 13.5%	2 5.4%	2 5.4%		1 2.7%				
Cluster 3	16 47.1%	11 32.4%	4 11.8%	2 25.9%	1 2.9%						

Question 2: "Have you been responsible, to any degree, for a traffic accident while you were driving?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Cluster1	21 87.5%	3 12.5%									
Cluster2	28 75.7%	6 16.2%	2 5.4%			1 2.7%					
Cluster3	22 64.7%	10 29.4%	1 2.9%		1 2.9%						

Question 3: "How many fines have you received as a driver (excluding parking fines)?"

No. of Accidents	0	1	2	3	4	5	6	7	8	9	10+
Cluster1	7 29.2%	9 37.5%	3 12.5%	1 4.2%	3 12.5%		1 4.2%				
Cluster2	16 43.2%	4 10.8%	4 10.8%	5 13.5%	3 8.1%	2 5.4%		2 5.4%			1 2.7%
Cluster3	10 29.4%	8 23.5%	5 14.7%	2 5.9%	1 2.9%	2 5.9%	2 5.9%	1 2.9%			3 8.8%

FREQUENCY TABLES

Questions 4, 5 and 6 relate to alcohol use.

Question 4: “Do you drink alcohol?”

	YES	NO
Cluster 1	19 79.2%	5 20.8%
Cluster 2	35 94.6%	2 5.4%
Cluster 3	31 91.2%	3 8.8%

Question5: “How often do you have a drink containing alcohol?”

Level*	0*	1*	2*	3*	4*	5*	6*	7*	8*	9*
Cluster1	5 20.8%		2 8.3%	1 4.2%	1 4.2 %	11 45.8%	3 12.5%	1 4.2%		
Cluster2	2 5.4%			3 8.1 %	2 5.4%	8 21.6%	11 29.7%	8 21.6%	2 5.4%	1 2.7%
Cluster3	3 8.8%		2 5.9%	2 5.9%	2 5.9%	15 44.1%	5 14.7%	4 11.8%		1 2.9%

* 0 = Never; 1 = Less than once a year; 2 = Less than once a month but at least once a year; 3 = About once a month;

4 = Two or three times a month; 5 = Once or twice a week; 6 = Three or four times a week;

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Question 6: “On a typical occasion when you drink alcohol, how many standard drinks of alcohol do you have (a standard drink is a midi of beer, a nip (30ml) of spirits or two-thirds (120ml) of a glass of wine).

Level*	0*	1*	2*	3*	4*	5*
Cluster1	5 20.8%		5 20.8%	4 16.7%	3 12.5%	7 29.2%
Cluster2	2 5.4%		7 18.9%	5 13.5%	5 13.5%	18 48.6%
Cluster 3	3 8.8%		9 26.4%	3 8.8%	6 17.6%	13 38.2%

* 0 = I never drink alcohol; 1 = 1 or 2 drinks; 2 = 3 or 4 drinks; 3 = 5 or 6 drinks; 4 = 7 to 9 drinks; 5 = 10 or more drinks.

FREQUENCY TABLES – Cluster Analysis

Questions 7 and 8 relate to Tobacco use.

Question 7: “Have you, at any time in your life, smoked tobacco regularly (cigarettes, cigars or pipes)?”

	No	Yes
Cluster1	17 70.8%	7 29.2%
Cluster2	21 56.8%	16 43.2%
Cluster3	24 70.6%	10 29.4%.

Question 8: “ Do you currently smoke tobacco regularly?”

	No	Yes
Cluster1	19 79.2%	5 20.8%
Cluster2	25 67.6%	12 32.4%
Cluster3	28 82.4%	6 17.6%

FREQUENCY TABLES – Cluster Analysis

Questions 9 and 10 relate to Illicit Drug use.

Question 9: “Do you use prohibited drugs (e.g. marijuana)?”

	No	Yes
Cluster1	20 83.3%	4 16.7%
Cluster2	18 48.6%	19 51.4%
Cluster3	22 64.7%	12 35.3%

Question 10: “How often do you use prohibited drugs (e.g. marijuana)?”

Level	0*	1*	2*	3*	4*	5*	6*	7*	8*	9*
Cluster1	20 83.6%		1 4.2%	1 4.2%				2 8.3%		
Cluster2	18 48.6%		1 2.7%	3 8.1%	4 10.8%	6 16.2%	2 5.4%	1 2.7%		2 5.4%
Cluster3	22 64.7%		1 2.9%	2 5.9%		3 8.8%	2 5.9%	1 2.9%	3 8.8%	

* 0 = Never; 1 = Less than once a year; 2 = Less than once a month but at least once a year; 3 = About once a month;
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