Predicting Young Driver Behaviour from Pre-driver Attitudes, Intentions and Road Behaviour

by

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ABSTRACT

Drivers under 25 years are over-represented in global road accident statistics. The Theory of Planned Behaviour (TPB) has been used to identify individuals who are likely to engage in behaviours, such as speeding, which are associated with increased accident involvement. In an attempt to investigate adolescents' attitudes and behaviours from pre- to post-driver training, the studies presented incorporate past behaviour into the TPB.

Three questionnaire-based studies were conducted in Scotland and New Zealand. The first study explored adolescent pre-drivers' road behaviour, driving attitudes and speeding intentions. Adolescents' with the greatest speeding intentions frequently engaged in high-risk road behaviour and had more accepting attitudes towards driving violations. The second study explored the development of attitudes and intentions from pre- to post-driver training. Drivers who frequently violated reported more accepting attitudes towards violations and engagement in frequent high-risk road behaviours as pre-drivers. The third study assessed the stability of pre-drivers' driving attitudes and speeding intentions. Adolescents' attitudes and intentions fluctuated significantly; however, males reported riskier driving attitudes and greater speeding intentions.

This research suggests that the role of road safety education and pre-driver interventions on future driving behaviour has been under-estimated. Interventions that simultaneously reinforce safe road practices and motivate the reduction of dangerous practices will influence the future of adolescents as safe drivers.

DEDICATION

This thesis is dedicated to my father, Paul Mann, who passed away in January 2010. He was always available to give me advice and support. He never gave up on me and encouraged me to complete this thesis on a daily basis. Throughout my childhood I was exposed to traffic Police and in some way I'd like to think that I've followed in his gigantic size 10 footsteps….

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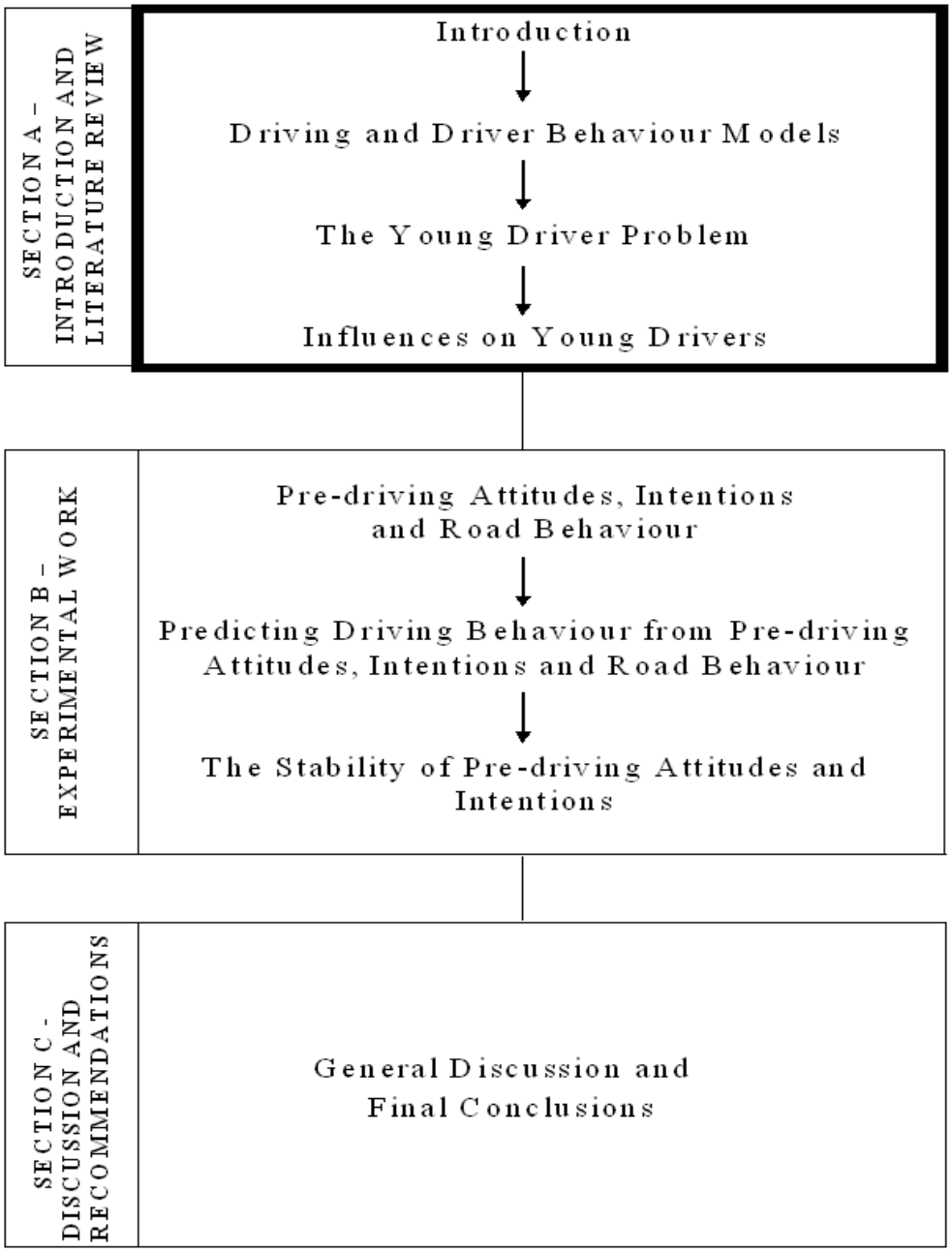
SECTION A INTRODUCTION & LITERATURE REVIEW



SECTION A - SUMMARY

Over the next four chapters literature will be presented that discusses the processes involved in learning to drive, describes various driver behaviour models, highlights young drivers' attitudes and behaviour on the road and introduces some of the factors that influence their behaviour. These chapters aim to introduce the reader to driving behaviour research and identify the problems associated with young drivers' over-representation in road collisions. The gaps in young driver and pre-driver research will also be identified in order to set the context for the studies that are presented in the experimental section (Section B, Chapters Five-Seven).

CHAPTER 1 - INTRODUCTION

1.1 Chapter Summary

This Chapter puts the work into context by describing the background to the research project. It introduces the reader to the area of Driver Behaviour from an Applied Psychological viewpoint. It also summarises the need for research into the effects of past behaviour on future driving behaviour.

1.2 Driver Behaviour

Driver behaviour is the study of motorists and the way that they operate their vehicles on the roads, including the decisions they take whilst driving. Driving is the subject of increasing scientific research. In the domain of applied psychology, studies have explored a wide variety of topics including: the effects of passenger presence on driver behaviour (Baxter, Manstead, Stradling, Campbell, Reason & Parker, 1990; Chen, Baker, Braver & Li, 2000; Doherty, Andrey & MacGregor, 1998; Gardner & Steinberg, 2005; McKenna & Crick, 1994; Parker, Manstead, Stradling & Reason, 1992[b]; Regan & Mistopoulos, 2001; Ulleberg, 2004; Williams, 2000); the commission of violations on the roads (Begg & Langley, 2001; Iversen, 2004; Lourens, Vissers & Jessurun, 1999; Parker, Manstead et al., 1992[b]; Trimpop & Kirkaldy, 1997); the use of seat belts (Jonah, Thiessen and Au-Yeung, 2001; Simpson and Beirness, 1993); and the effect of parents' driving on the subsequent driving conduct of their offspring (Bianchi & Summala, 2004; Ferguson, Williams, Chapline, Reinfurt & De Leonardis, 2001; Wilson, Meckle, Wiggins, & Cooper, 2006).

Speeding is the most common road violation, committed worldwide daily (Lawton, Parker, Manstead & Stradling, 1997; Parker, Manstead, Stradling & Senior, 1998). In Great Britain, driving faster than the legal speed limit, or where the conditions make fast driving unsafe, account annually for over 3,000 road deaths and approximately 31,000 serious injuries (THINK, 2006). Excessive speed is a contributory factor in 12.1% of all injury collisions, 18% of all serious injury collisions and 28% of all fatal collisions (THINK, 2006). According to statistics reported by the Department for Transport (DfT) speeding causes more injuries and deaths than any other single contributor to road casualties (Whitty, Boyack, & Law, 2000). A study carried out in 1998 of vehicle speeds in the UK showed that 69% of cars exceed the 30mph limit in built-up or urban areas, with 29% exceeding 40mph (Whitty et al., 2000).

1.3 The Speeding Problem

As so many casualties on our roads are attributable to speeding, it is not surprising that Governments worldwide invest large sums of money into researching the reasons why people speed and ways in which to prevent them from doing so. Major methods of speed control, such as safety cameras and road humps, have thus far not proven to be as effective as they were intended because a significant number of drivers have been able to find ways around these measures and continue to drive at excessive speeds (Lex Sevice, 1997). The threat of being caught and fined, with fixed penalty points being added to their driving licence or, in excessively high speed cases, a court appearance where eventual disqualification from driving or imprisonment are the net results, have not deterred enough drivers from engaging in speeding behaviour. In Lex Services' (1997) report on motoring, one third of their sample of drivers claimed that on seeing a speed camera they reduced their speed suddenly and then accelerated away from the camera site and another third stated that they ignored speed cameras and continued driving at speeds above the designated limit.

The attitude to speeding held by most drivers is that it is one of the least serious of all traffic offences (Brown & Copeman, 1975; Parker, Manstead et al., 1998; Rothengatter, 1991). Consequently, in the United Kingdom speeding is the most prevalent driving behaviour committed on the roads (DETR, 2000[a]). Education is often one of the first approaches chosen by road safety professionals to reduce speeding. Campaigns and interventions can be designed to change drivers' attitudes to speeding behaviour by highlighting the inherent risks involved in this anti-social conduct. The second approach involves engineering the roads and designing out speeding through the introduction of traffic calming measures. The third approach involves targeted Police enforcement.

1.4 Drivers' Attitudes to Speeding

Attempting to influence changes in drivers' behaviour and attitudes to fast driving is a potentially mammoth task. Researchers have, therefore, tried to identify those drivers who are high-risk road-users, and then target them directly through specially designed interventions.

There are two main theories or methodologies used to explain driver behaviour, which are described within this thesis. One is to explain the commission of driving violations in terms of rational cognitive processes. The Theory of Planned Behaviour (TPB), a social psychological model (Ajzen, 1985) used to describe behaviour and its predictors, assumes that

people take account of available information in evaluating the outcomes and consequences of their actions, together with the social pressures on them to perform specific behaviours. In this model, attitudes are a core predictor of an individuals' intention to engage in various behaviours (both social and anti-social); positive intentions lead to behaviours being carried out. Parker, Manstead, Stradling and Reason (1992[ab]) applied the theory to the commission of traffic infringements, where they found that drivers who had negative (safe/low risk) attitudes towards committing speeding offences, and who felt that people close to them would disapprove, reported weak intentions to commit violations.

The second approach used to understand driver behaviour is to explain differences in behaviour as being the result of individual personality traits, such as sensation seeking (Yagil, 2001). A commonly held belief is that speeding is motivated by the thrill or excitement associated with breaking the law by driving faster than the legal speed limits (Meadows, 1994). High sensation seekers, described by Zuckerman (1979) as people who need *"varied, novel and complex sensations… [and thus] … take risks in order to gain such experiences"*, are frequently studied in relation to risky behaviours such as speeding. A positive correlation has been found between sensation seeking and speeding (Arnett, Offer & Fine, 1997; Clement & Jonah, 1984; Zuckerman & Neeb, 1980). Sensation seeking has also been associated with attitudes towards the commission of traffic violations on the road (Yagil, 2001). High sensation seekers have more positive (high-risk) attitudes towards committing violations on the road than low sensation seekers (Yagil, 2001).

1.5 Young Drivers

In 2008, 2538 people were killed in road traffic collisions in Britain – an average of seven deaths daily (DfT, 2009). Drivers were involved in 861 of these fatalities, with young drivers aged between 17-24 years being involved in 635 fatalities (DfT, 2009). Several studies have reported that speeding is a major contributory factor in young drivers' collision involvement (AAA, 1994; Rothe, 1986). Some researchers think that the problem with young drivers[1] lies in their attitudes and mindsets, with *"the way [that] some young drivers think about driving [being] a significant problem"* (Christmas, 2007). There are some young drivers who believe that after passing the driving test it is normal for accidents to occur and others who lack

[1] In this thesis the term "young driver" will apply to any driver under the age of 25 years. The Department for Transport in the UK recognise this subgroup of drivers as anyone aged 17-25 years (House of Commons Transport Committee, 2007)

awareness for other road users and over-estimate their driving skills to justify their risk-taking behaviour (Christmas, 2007; Emmerson, 2008). It is well-known that some young drivers have a poor conception about what good driving is and it has been suggested that during the driver training process they should be made to think about what good driving means and why it matters (Christmas, 2007; Emmerson, 2008). They should also be given guidance as to how they can continue to learn after the driving test (Christmas, 2007). Parker, Manstead et al. (1998) believe that by persuading drivers that committing violations is a bad idea, the prevalence of driving violations and the number of road traffic accidents could be reduced.

In Christmas' (2007) report it was concluded that individuals who are over-confident in their driving ability are impervious to facts, evidence and argument. The author suggested that challenging these individuals using ridicule and shame could be an effective method of reducing confidence levels. This highlights the powerful influence of subjective norms (an individual's perception about whether important people would approve or disapprove of something) and peer pressure (social influence) on behavioural change (Christmas, 2007).

Habitual behaviour has also been shown to have a powerful influence on subsequent behaviour, for example, Triandis (1977) stated that *"..as behaviour repeatedly takes place habit increases and becomes a better predictor of behaviour than behavioural intentions"*. Young drivers often pick up bad habits after they have passed their driving test. Matsuura, Ishida and Ishimatsu (2002) found that novice drivers' seat belt usage decreased after licensure and increased again only after a few years of driving. They concluded that individuals who are over-confident in their own driving skills are often those drivers who do not use seat belts. Matsuura et al.'s (2002) results highlighted that self-assessed driving skill is also an important predictor for seat belt usage.

Thus as well as the influence of subjective norms on predicting young drivers' behaviour, intentions, habits and self-assessed driving skills also have to be accounted for. These factors should be taken into consideration when designing interventions so that changes in subjective norms, intentions, habits and self-assessed driving ability can be brought about as well as changes in attitudes. Personal responsibility should also be emphasised in safety education (Blair, Seo, Torabi & Kaldahl, 2004).

1.6 Past Behaviour

Several social psychological theories imply that attitudes motivate and guide behaviour; one such model is the Theory of Planned Behaviour (TPB, Ajzen 1985; 1987; 1991). As mentioned (section 1.4), the TPB postulates that positive intentions lead to behaviours being carried out. Bentler and Speckart (1979), however, believed that this attitude-behaviour relationship accounted for by Ajzen could be further improved by incorporating the influence of past behaviour on subsequent behaviour. They proposed that previous behaviour has a direct influence on intentions and subsequent behaviour. Various researchers have supported these claims and have provided evidence to show that past behaviour increases the TPB's ability to predict subsequent behaviour by up to 9% (Budd, North & Spencer, 1984; Fredricks & Dossett, 1983).

One way in which past behaviour can affect current and future behaviour is through behavioural association. According to Jessor and Jessor's (1977) Problem Behaviour Theory (PBT) young people who engage in one form of risky behaviour (for example smoking) are at a higher probability of practicing another type of risky behaviour (for example dangerous driving). The reason for this association is that problem behaviours, defined as "*behaviour that is socially defined as a problem, as a source of concern, or as undesirable by the social and/or legal norms of conventional society and its institutions of authority; it is behaviour that usually elicits some form of social control response*", share the same set of personality, perceived environment and behavioural variables (Jessor, 1987[ab]; Jessor, Donovan & Costa, 1991[ab]). Several studies have found an association between high-risk driving behaviour and other problem behaviours (Beirness & Simpson, 1988; Bingham & Shope, 2005; Jessor 1987[ab]); by understanding the antecedents of risky driving behaviour it may be possible to target interventions so that the formation of any associated forms of undesirable problem behaviours are discouraged and thus prevent the onset of all forms of risky behaviour including high-risk driving behaviour.

1.7 Cross-cultural and cross-national research

It is generally accepted that attitudes, behaviour and cognitive processes are all influenced by cultural background (Berry, Poortinga, Segall & Dasen, 1992). The term 'culture' refers to recurring patterns of behaviour that differ from place to place and thus identify "the shared way of life of a group of people" (Berry et al., 2002; Breslin, 1990). Cross-cultural psychology is *"the study of similarities and differences in individual psychological functioning in various cultures and ethnocultural groups; of relationships between*

psychological variables and socio-cultural, ecological and biological variables; and of ongoing changes in these variables" (Berry et al., 2002). In a similar vein, studies conducted in two or more culturally similar countries are known as cross-national research (Frijda & Jahoda, 1966). For example research conducted in Scotland-Ireland or Scotland-New Zealand would be classed as cross-national research. West, Reeder, Milne and Poulton (2002) conducted cross-national research in Scotland (Glasgow) and New Zealand (Dunedin) looking at physical activities among adolescents. They stated that cross-national research is important because it provides basic information about the range of activities engaged in by people in different contexts and helps address fundamental questions about factors (climatic, material and cultural) that might underlie differences between countries and between sub-groups within a country.

One of the primary goals of cross-cultural and cross-national research is *"to test the generality of existing psychological knowledge and theories"* (Berry et al., 2002). Transporting hypotheses and findings to different cultures allows Psychologists to test the validity and applicability of their research. Consequently this is known as the 'transport and test goal' (Berry & Dasen, 1974). Many psychological measures have been tested both cross-culturally and cross-nationally. One such tool, from the field of transport psychology, is the Driver Behaviour Questionnaire (DBQ). The DBQ was designed to obtain a self-reported measure of drivers' engagement in risky driving behaviour (Reason, Manstead, Stradling, Baxter & Campbell, 1990). The questionnaire consists of three main measures: 'Errors' (non-deliberate mistakes or omissions, such as steering the wrong way in a skid), 'Lapses' (errors made due to lapses in attention, such as reversing into a previously unseen object) and 'Violations' (deliberate deviations from safe driving, such as deliberately continuing to drive through a red traffic light). Some studies use a fourth measure by splitting violations into 'ordinary' violations and 'aggressive' violations.

The DBQ, which was originally devised in the UK by Reason et al. (1990), has been used by many international researchers from countries such as Australia, New Zealand, Greece, Finland, The Netherlands, Sweden, China and Turkey (Lajunen, Parker & Summala, 2004). For example, in New Zealand a 28-item version of the DBQ was used to explore the driving behaviour of truck drivers (Sullman, Meadows & Pajo, 2002). Although the four factor structure of the DBQ was confirmed, reliability analysis conducted by Sullman et al. (2002) showed that aggressive violations (the fourth factor) had a very low alpha coefficient and thus showed poor internal consistency.

Problems associated with cross-cultural studies can be illustrated through the use of the DBQ. Lajunen et al. (2004) noted that previous DBQ studies which had been conducted in different countries had serious methodological problems which made any cross-cultural comparisons unreliable. Several studies had used different versions of the scale, with different measures and different numbers of items. They also employed several different sampling strategies, targeted different populations and some countries had adopted their own scoring keys. For example, in China a 24-item version of the DBQ was used (Xie & Parker, 2003) and in Sweden a 104-item DBQ scale was used (Åberg & Rimmö, 1998). Lajunen et al. (2004) conducted a cross-cultural DBQ study in the UK, The Netherlands and Finland. They used the same 27-item version of the scale, which had a four factor structure (i.e., 'Errors', 'Lapses', 'ordinary' violations and 'aggressive' violations), in all three countries and ensured that the same sampling strategy was used. After conducting exploratory factor analysis their results confirmed that all three countries shared the same four factor structure. However, the agreement between the structures was not perfect so they concluded that it is also important to take into account cultural factors when using instruments in different countries especially when translation is involved.

Even in two countries that speak the same language instruments function differently (Blockley & Hartley, 1995). With regards to driving, traffic cultures vary from region to region. Using some of the items from the DBQ, Lajunen et al. (2004) pointed out that *"brake too quickly on a slippery road"* can mean different things to people from countries where wet weather is frequent, infrequent, or where the predominant weather is snow. Also *"failing to notice cyclists"* can mean different things to people from countries where cycling is a common occurrence in comparison to people from countries where cycling is not very popular.

The Adolescent Road User Behaviour Questionnaire (ARBQ) is another scale which has been used in cross-national research between the UK and New Zealand. The ARBQ was designed by Elliott and Baughan (2004) in the UK to measure the behaviour of children and adolescents on the road. The original version consists of 43 items (although the authors also recommend a shortened 21-item version) and has three main measures of 'Unsafe Road Crossing Behaviour' (behaviours to do with crossing the road in an unsafe manner such as crossing from between parked cars or running across the road without looking), 'Play and Social Activity on the Road' (behaviours to do with playing on the road such as playing "chicken" by lying down in the road until cars come along or holding onto moving vehicles

when riding a bicycle) and 'Planned Protective Behaviour' (behaviours aimed at reducing the risk of being killed or injured on the road such as wearing reflective clothing in the dark or wearing a cycle helmet when riding a bicycle). In 2009, Sullman and Mann conducted a study looking at the applicability of the ARBQ in New Zealand. A similar three-factor solution was found in both the UK and New Zealand. The shortened 21-item scale explained 43.6% of the variance in New Zealand compared to 43.8% of the variance in the UK. However, one limitation of this study was that the age ranges in the English study (12-16 years) were different to that of the New Zealand study (13-18 years) thus slightly limiting the reliability of the comparisons that were made.

Under-taking cross-cultural studies also require an awareness of the differences between socially-collectivist countries and individualist countries. For example, China and Japan are socially-collectivist countries, where their value system is focused on the family and on others. However, in individualist countries like the USA and UK, the value system is focused on the individual (Weber & Hsee, 1998). In a study conducted by Hayakawa, Fischbeck & Fishchhoff (2000) Japanese and American participants had entirely different reasons for buying car insurance. Japanese drivers said that they bought insurance to cover damages or harm done to others whereas the American drivers said that they bought insurance to protect themselves from lawsuits and to cover damages to their vehicles. Therefore it is important to be aware of these differences when selecting countries. Selecting two countries where the value systems are similar (i.e. two socially-collectivist countries or two individualist countries) will increase the reliability of comparisons.

It is also important to be aware of potential differences in traffic environments when selecting countries. For example, in Japan more non-car users are killed than car users because walking and travelling by two-wheel vehicles are the most popular forms of transport (Hayakawa et al., 2000). Conversely, in the USA, more people drive and therefore they are involved in more collisions with other vehicles on the road (Hayakawa et al., 2000). Hayakawa et al. (2000) believe that the combination of objective differences in risk environments with cultural influences produce cross-cultural differences in risk perception.

It is often difficult to conclude whether studies are reflecting cultural or nationally specific features and whether the findings can be applied to a broader range of countries (Karvonen, Abel, Calmonte & Rimpela, 2000). Connections between different cultures are becoming more intensified due to globalization (i.e., advances in telecommunications, economic and

financial interdependence; Arnett, 2002[b]). Young people in particular are increasingly subjected to a global youth culture. Therefore, it is generally believed that they are more likely to facilitate more general patterns cross-culturally (Karvonen et al., 2000).

Cross-cultural and cross-national studies which explore issues relating to road safety help further our understanding about the cultural and universal factors that affect safety on our roads (Lajunen, Corry, Summala, & Hartley, 1998). In this thesis cross-national research will be conducted on adolescents from two individualist countries, namely Scotland and New Zealand, in an attempt to see whether pre-driving adolescents' driving attitudes, intentions and road behaviours are culturally bound or characteristic of adolescence. To increase the reliability of the findings, the same sampling techniques and questionnaires will be applied in both countries.

1.8 Chapter Conclusions

This chapter has provided some background information on driver behaviour, in particular the problems associated with speeding, young drivers and the influence of past behaviour. It has also addressed the benefits of conducting cross-cultural and cross-national research in order to establish whether adolescents' road behaviour, driving attitudes and intentions are characteristic of adolescence or culturally bound.

The research presented in this thesis ultimately aims to provide a greater understanding of the psychology of adolescent pre-drivers and drivers. It also aims to suggest new approaches to reducing dangerous driving behaviours and attitudes that will ultimately reduce young driver road collision involvement. In the next chapter various models will be presented that have been used to explain driver behaviour.

CHAPTER 2 - DRIVING AND DRIVER BEHAVIOUR MODELS

2.1 Chapter Summary

This section starts by describing the processes that are involved in learning to drive and discusses why novice drivers have problems with mastering the task. Several models are presented that have been used to explain variations in driving behaviour. These models are of particular use in aiding comprehension of how people acquire driving skills and why some drivers, particularly young novices, are at higher risks on the road compared to other drivers.

2.2 Driving – How to Master the Task

Driving is largely a habitual activity, where drivers learn to maintain safety margins and try to avoid discomfort and fear (Summala, 1985). The driving task *"is not simply a motor activity it is primarily a cognitive procedure"* (Parkes, 1991). It is considered to be complex because it involves over 1500 different perceptual-motor tasks (McKnight & Adams, 1970[ab]). Whilst the position of the vehicle is controlled through the simultaneous use of the steering wheel, accelerator and brakes, higher level cognitive skills, such as pattern recognition and prediction of future situations, enable the driver to make decisions and safely navigate around the road environment (Figure 2.1).

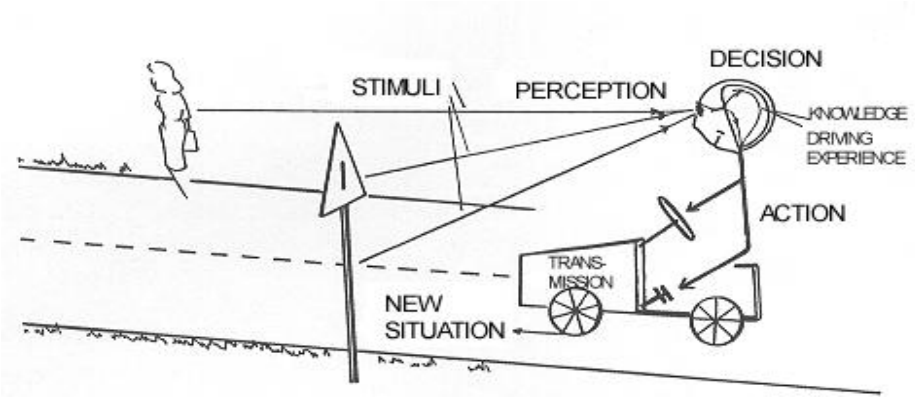


Figure 2.1 – Basic Driver Perception-action Process (Häkkinen & Luoma 1991, cited in Pursula, 1999)

According to Michon (1985) there are three levels in the hierarchy of driving skills which drivers must progress through: the Operational, Tactical and Strategic Levels. Starting with the basic components of driving skills, progression through the hierarchy leads the individual towards becoming a skilful driver. This hierarchical skills model assumes that there is a relationship between experience and the development of driving skills. Therefore, Michon's model assumes that driving skills increase with driving experience.

The Operational Level, the lowest in Michon's hierarchy of driving skills, is where drivers learn to master the fundamental driving skills involved in controlling a vehicle (such as steering and acceleration). At this level the skills of attention, concentration, visual scanning, visual perception, mental tracking, information-processing speed, motor speed and reaction time begin to develop beyond the basic handling and control skills.

The Tactical Level is the second level in the driving skills hierarchy. At this level decisions and behaviours (such as deciding to over-take or adapting driving behaviour according to the weather conditions) are learnt in the traffic environment itself. Skills acquired at this level include control over impulse and temper, mental flexibility, judgment and risk assessment.

The Strategic Level is the highest level in the hierarchy. At this level decisions are made prior to the start of a journey (for example, choosing what route to take and what time of day is best to take the journey with regards to traffic congestion on the road). At this level the skills acquired are judgement, insight into personal limitations, impulse control and planning.

Fitts and Posner (1967) proposed that driving skills are acquired in three phases defined as the early Cognitive Phase, the intermediate Associative Phase and the Autonomous Phase. The Cognitive Phase is where learner drivers familiarise themselves with the location of the vehicle's controls and the outcomes of using each of them. They need this very basic learning before they can attain the remaining phases. Drivers reach the Associative Phase once they are familiarised with the controls; they begin to explore a number of different strategies whilst maintaining full attention on the driving task. During this phase, skills increase through a process of compensatory feedback; drivers monitor the outcomes of their driving actions as they are engaged in and, depending on the feedback received, make any necessary additional inputs. Feedback is obtained not only by observing the outcomes and consequences of a driver's actions, but also from their instructors' verbal instructions.

The final Autonomous Phase, proposed by Fitts and Posner (1967), is reached when a driver has learnt which outputs are produced by what inputs and they know what is required in specific situations. During this phase visual skills as well as the acquisition and perfection of motor skills, are also refined. As behaviour becomes autonomous and fixed, little cognitive effort is required. Tasks at this level are thus performed with only a small fraction of the drivers' attention. At this level the driver is able to perform several other tasks

simultaneously, for example talking to car occupants. However, in an emergency their full attention is immediately re-directed back to the task.

2.3 The Novice Driver Problem

Driving involves mastering a number of key skills such as perceptual, anticipation and risk avoidance skills however these develop gradually as both mileage and driving time increase (Simons-Morton, 2002). The ability to control a car is essential in order to drive safely (Simons-Morton, 2002). There are eight skills that novice drivers need to master in order to maintain safe control of their vehicles and thus to reduce their crash risk (Mayhew & Simpson, 1995). These skills are: steering control, speed control, multi-tasking (or skill integration), visual search, hazard detection, risk assessment, decision-making and risk-taking (Mayhew and Simpson, 1995). Novice drivers (regardless of age) are deficient in a number of these skills and as such they are over-represented in loss of control accidents (Clarke, Ward, Truman, 2002).

Controlling a vehicle places a large number of demands on the driver. Novice drivers feel these demands to a greater extent compared to more experienced drivers and thus have to engage more of their mental capacity on the task (Gregersen, 2003). Novices use up a large amount of mental resources because they have not yet fully automated the driving task and therefore have to pay more attention to activities such as changing gears (Gregersen, 2003). They also encounter many new situations and tasks that they have to navigate their way around. As they come across each new situation, novices further develop their driving knowledge and formulate driving rules. These driving rules are instructions about how to approach a similar situation in the future so that if they were faced with a repeat situation they would know how to handle it safely (Gregersen, 2003). Therefore, even after gaining their licence, novices are still in the process of learning about the driving environment through trial and error (Fuller, 1995).

The recognition of available environmental clues and the perception of danger are necessary skills for all drivers to possess so that they can recognise that *"a potentially dangerous situation might arise and adopt a driving plan to reduce the risk"* (Direct Gov, 2010). Evans (1991) considered that skills, including visual extraction and information processing skills, continue to develop and increase with experience. As mentioned previously, the skills required to identify and extract information from the traffic environment develop more slowly in comparison with components of driving skills, which develop rapidly during early

experience. In view of the fact that 90% of a driver's information input is visual, this implies that novice drivers are unable to process the majority of the information they receive (Mourant & Rockwell, 1972).

Novice drivers have a tendency to fixate on a narrower area in the visual scene compared to experienced drivers (Mourant & Rockwell, 1972). Experienced drivers, however, tend to be more reliant on their peripheral vision for lane positioning cues and concentrate their fixations at the expansion of the roadway ahead. By fixating further ahead of the vehicle, they have extra time to process information compared to novices and are therefore better able to react to situations as they develop. This is particularly important when drivers are travelling at high speeds (Mourant & Rockwell, 1972). In order to maintain their lane positioning, novice drivers tend to visually sample the kerb. This is because they are not yet able to focus on a wider visual area and the road ahead. By restricting their cone of visual acuity to a small area in front of the car they are often unable to anticipate situations occurring in the distance. Therefore this is why novice drivers are renowned for being poor at identifying hazards in the distance (Brown, 1982). They also become easily overloaded with information and are often distracted by objects. This means that they may not be able to respond accordingly and thus their chances of collision or narrowly avoiding collisions are greatly increased. With more experience their eye fixations become concentrated on a much wider area.

Hazard perception is the ability to discover, recognise and react to potential hazards on the road whilst driving in order to avoid collisions (Figure 2.2, Deery, 1999; McKenna & Crick, 1991, 1994). It involves elements from both driving skills (for example, the time taken to react to hazards) and subjective experience (for example, the ability to assess the risk of potential hazards). It has been shown that as driving experience increases hazard perception scores also increase, thus it is widely known that novice drivers have poor hazard perception skills because they have little driving experience (Renge, 1998). In November 2002, the UK Driving Standards Agency (DSA) introduced a hazard perception test into the driving examination. This new section of the British driving test was designed to encourage further development of these skills during driver training.

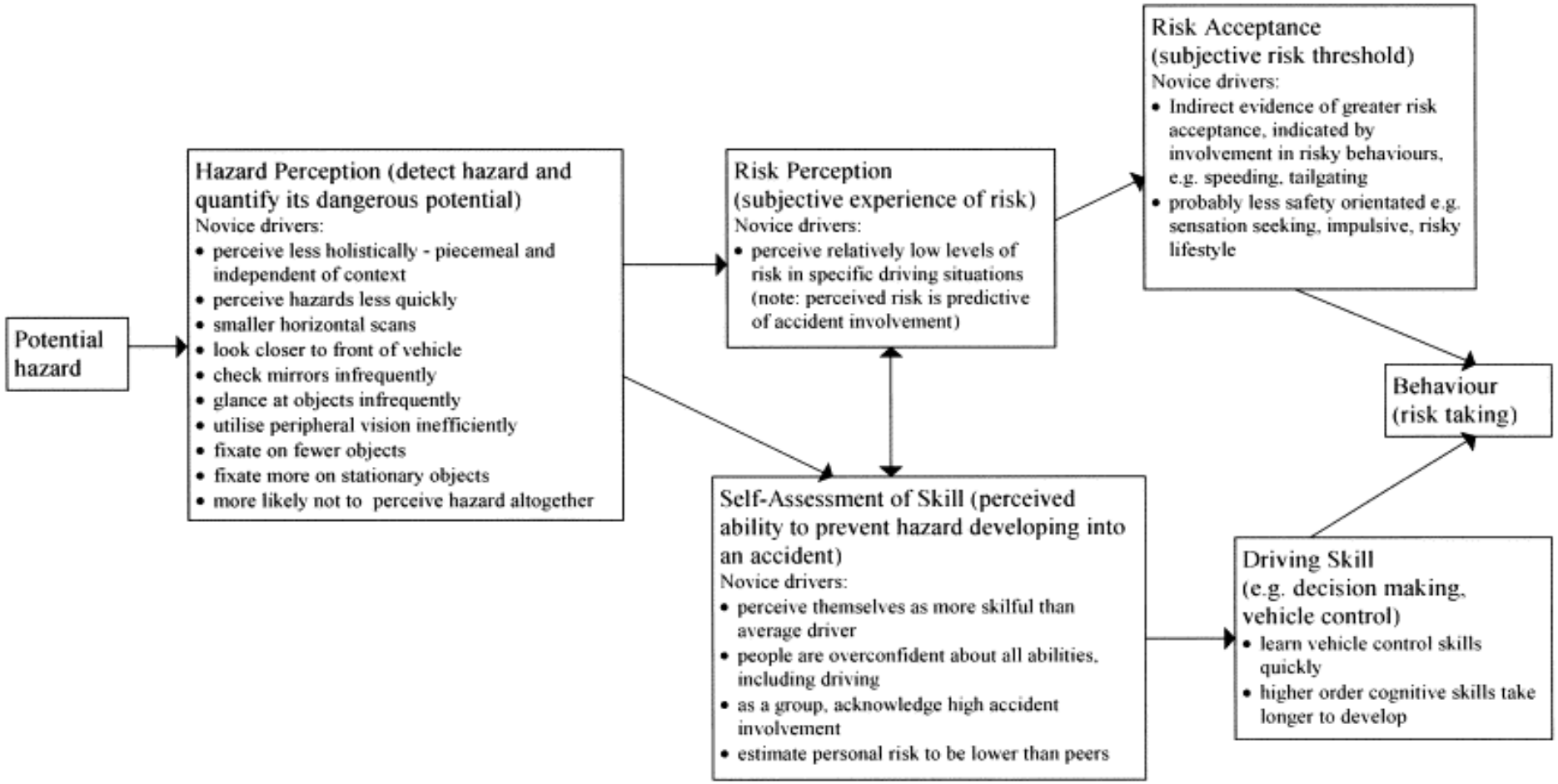


Figure 2.2 – Processes Underlying Novice Driving Behaviour in Response to Potential Hazards (Deery, 1999)

2.4 Novice Drivers: Young versus Old

In the UK, three-quarters of the 750,000 people who qualify for a full driving licence each year are under 25 years of age (DSA, 2008). Although it has been reported that 18-20% of newly qualified drivers crash within a year, young novice drivers (those under 25 years of age) are consistently over-represented in crash statistics (AA, 2009; House Of Commons Transport Committee, 2007; Maycock & Forsyth, 1997; Forsyth, Maycock & Sexton, 1995; Forsyth, 1992[ab]). The House Of Commons Transport Committee (2007) recently stated in their seventh report on novice drivers that although only one in eight UK driving-licence holders are under 25, of those drivers who die in fatal collisions one in three are in the 17-25 age range.

There are several known groups of factors that contribute to young drivers' high accident risk. These include their level of knowledge and skill, maturity level, social situation, lifestyle and the amount of experience that they have gained on the road (Chliaoutakis, Darviri & Demakakos, 1999; Gregersen & Berg, 1994). It is generally believed that immaturity and inexperience are the two main causes of adolescents' traffic collisions. However, whereas maturity levels increase with age, driving experience increases with increased driving exposure (Mayhew & Simpson, 1990). This implies that when young novice drivers are compared to older and more experienced drivers, they have very little driving experience and lower maturity levels. These two factors are therefore thought to account for young drivers' increased accident involvement.

Some researchers however claim that youth and immaturity play a much greater role in accident risk than experience. The implications of their research are that regardless of the amount of driving exposure and practice a young driver may have, it is their level of maturity that has a more profound influence on the driving style that they adopt and the risks they are prepared to take. Subsequently it is widely believed by these researchers that the younger the driver the greater their risk (Arnett, Irwin & Halpen-felsher, 2002; Cooper, Pinili & Chen, 1995; Rutter & Quine, 1995). Clear differences have been found in the accident rates of young drivers from different age groups, for instance in the USA, Williams (1998) found that the crash rates for 17-year-old drivers were 50% higher than the crash rates of 18-year-old drivers.

Compared to older novice drivers, younger novices crash at higher rates (Simons-Morton, 2002). For example, in the UK the probability of being involved in a collision has been found to drop by 6% as young novice drivers turn 18 years old (one year after reaching the legal driving age; Maycock, Lockwood & Lester, 1991). In the USA, McKnight and McKnight (2003) found that accident rates decreased almost two thirds by the time 16 year- old individuals reached 18 years of age.

According to Wells, Tong, Sexton, Grayson and Jones (2008) people starting to drive unsupervised at 27 years old are approximately 30% safer than drivers starting aged 17 years old. Therefore, compared to other novice driver groups the youngest drivers appear to have the highest initial risk of accidents on the road (Cooper et al., 1995). The additions of life knowledge and increased maturity among young drivers have been found to have a marked reduction on their accident rates and their propensity for risk-taking on the roads. This may be due to the fact that as individuals grow older they become more conscious of risks and the effects that their behaviour has on others (Bachman, Wadsworth, O'Malley & Johnston, 1997; Fuller, 1995). Consequently, researchers who believe that driving is age-led think that novices' initial high accident risk is reduced with increased age.

Other researchers believe that, regardless of age, novice drivers are involved in more accidents than any other driver groups due to an initial learning curve rather than the effects of maturation. This initial learning curve is indicative of novices' increasing their driving exposure over time and thus increasing their driving experience. It has been suggested that it can take new drivers approximately 5 to 7 years to gain the driving experience needed to reach mature risk levels (Lonero, 1998). What this research implies is that regardless of age, the maturity needed for driving is an entirely different entity from the maturity that is associated with increased age. In other words, the maturity needed for driving is directly proportional to the gaining of driving experience not to the increase in drivers' ages.

Crash statistics have consistently shown that all newly licensed drivers have a higher crash rate during the first few months of driving compared to other driver groups (Gregersen, 2003; Simons-Morton, 2002). According to the Driving Standards Agency (DSA, 2008), one in five newly qualified drivers are involved in a collision within six months of passing their test. During the first year of driving the probability of crash involvement for all novice drivers, regardless of age, reduces by 30% (Maycock et al., 1991). Even after seven months of driving the probability of being crash involved for all novices has been reported to reduce by

41% (Mayhew et al., 2000). The implication of research in this area is that in order to achieve a successful reduction in accident involvement it is imperative for all novice drivers to gain driving experience (Fuller, 1995; Maycock et al., 1991; Mayhew, Simpson & Pak, 2000).

Although evidence exists to show that accident risk is linked to age and also to experience, there is also evidence to suggest that both of these factors interact with each other to increase accident risk. Among a group of British novice drivers who received their driving licences at various ages, it was found that risk levels dropped as both their age and experience increased (Maycock et al., 1991).

It has been debated for some time that in order to reduce young driver accident figures the driving age in Britain should be raised from 17 to 18 years of age. There are some sectors of society who disagree with this increase, believing that the initial accident rates for 18 year-old novices would remain higher than that of other driver groups for at least two years before they gradually declined because of the need to gain driving experience (Twisk, 1996). The reason for opposing an age increase is that driving experience does not only increase with age, it also increases with driving exposure time and distance travelled. McCartt, Shabanova and Leaf (2001) found that regardless of age, accident rates dropped by two thirds in the first 500 miles after being licensed. Consequently, researchers who consider that driving is experience-led believe that the combination of driving experience and the skills gained by driving on the roads help to reduce novices' initial high accident risk.

In August 2007, the TIMES On-line (2007[ab]) newspaper reported that the Government were planning to increase the minimum driving age to 18 years and were proposing a minimum 12 month training period for all new drivers (in order to appease people who do not agree with increasing the minimum driving age). At the time of going to print the Times stated that the Driving Standards Agency (DSA) were finalising details for a consultation document which contained these proposals however it was only in May 2008 that the DSA released their consultation paper into the public domain. The paper concluded that *"simply delaying people from obtaining their full driving licence has a limited effect on casualty reductions [and that]….neither imposing a minimum learning period, nor raising the age at which someone can obtain a full licence can guarantee that any extra or better learning is taking place"* (DSA, 2008). The debate continues.

2.5 Driving Behaviour Models

Driver behaviour models were designed to help understand the driving task and to explain how people learn to drive. Older models perceived driving as a purely perceptual-motor skill-based task however the more current and accepted view of driving is that it is a self-paced task where drivers are responsible for selecting the amount of risk that they are willing to accept in a given situation (Michon, 1985). Older skill-based models proposed that the level of driving skill in relation to the situational demands determined driver safety. They believed that by increasing drivers' skills and decreasing environmental demands safety on the roads could be improved (Michon, 1985). Current models of driving behaviour, however, emphasise the role of the driver and what they do to satisfy their motives. They do not simply concern themselves with what level of skill the driver has reached or the demands of the traffic environment.

There are two taxonomic groups of driver behaviour models, "Performance" and "Motivational" (Michon, 1985). Performance models, or behavioural Task Analysis Models, are concerned with inputs and outputs whereas motivational models, or psychological Trait Models, are focused on individuals' motivations and internal states. Both of these approaches will be discussed briefly along with justifications for choosing to adopt a motivational approach in this thesis.

2.5.1 Performance Models (Behavioural Task Analysis Models)

Task Analysis Models describe specific goal-directed human activities and are data driven. They describe the task according to the task requirements (facts about driving), the performance objectives (behavioural requirements) and the enabling objectives (aptitude requirements) that are needed in order to perform the task successfully.

These models of driving behaviour depict driving as being part of a physical system. They are concerned with how drivers perform specific tasks and what causes them to make errors (Rothengatter, 2001). To understand how specific tasks are performed, they are broken down into a series of less complex tasks (Kirwan & Ainsworth, 1992; Robertson & Thoreau, 2003). The chronological order of these tasks may change depending on the circumstances the driver is faced with. McKnight and Adams (1970[ab]) formulated a Task Analysis Model of driving by partitioning driving into forty-five major tasks. These tasks were composed of 1700 elementary tasks. The enabling objectives that were required in order to perform the driving task successfully were knowledge and skills.

According to Robertson and Thoreau (2003), Task Analysis Models do not only have to take into account recommendations from the Highway Code they can also incorporate informal road rules. In a study exploring pedestrian and driver behaviour whilst crossing roads, Robertson and Thoreau (2003) incorporated tasks into their Task Analysis Model, which have become part of the way people use road crossings (Figure 2.3). For example, some drivers wave at pedestrians to signal to them to cross the road, or may flash their headlights at other cars to signal them to go ahead. These actions, whilst not recommended by the Highway Code, have become unofficially accepted as a norm through common usage. Task Analysis Models can therefore consist of both formal and informal road rules.

Task Analysis Models of driver behaviour are one of the main driving forces behind the development of computer simulation in traffic analysis as they continue to evolve and become more sophisticated. For more than four decades computer simulation has aided research, planning, demonstration and the development of traffic systems (Pursula, 1999). Task analysis models have been influential in the design of driver training simulators and in-vehicle devices such as adaptive cruise control (ACC), automatic warning systems (AWS) and automatic braking systems (ABS).

2.5.2 Servo-Control and Information Flow-Control Models

The Adaptive Control Models describe driving as either Servo-Control Models (a set of continuous or intermittent tasks) or Information Flow-Control Models (a set of flow charts or decision trees).

Servo-Control Models represent skills involving steering or obstacle avoidance. They have been particularly important in understanding the interaction between the driver and the vehicle, for instance they identify how drivers' react and respond to cues from the external environment and from the input signals experienced from the vehicle. These models act on input signals represented by cues from the lateral position of the vehicle on the road, compensatory tracking or cues from the visual scene about the roads geometry and pursuit tracking. Drivers' anticipation and slowness to react are accounted for by lead and lag components. Klein, Vincent and Isaacson (2001) found that experienced drivers are more attentive to environmental cues than novices who tend to use heuristics and basic signals.

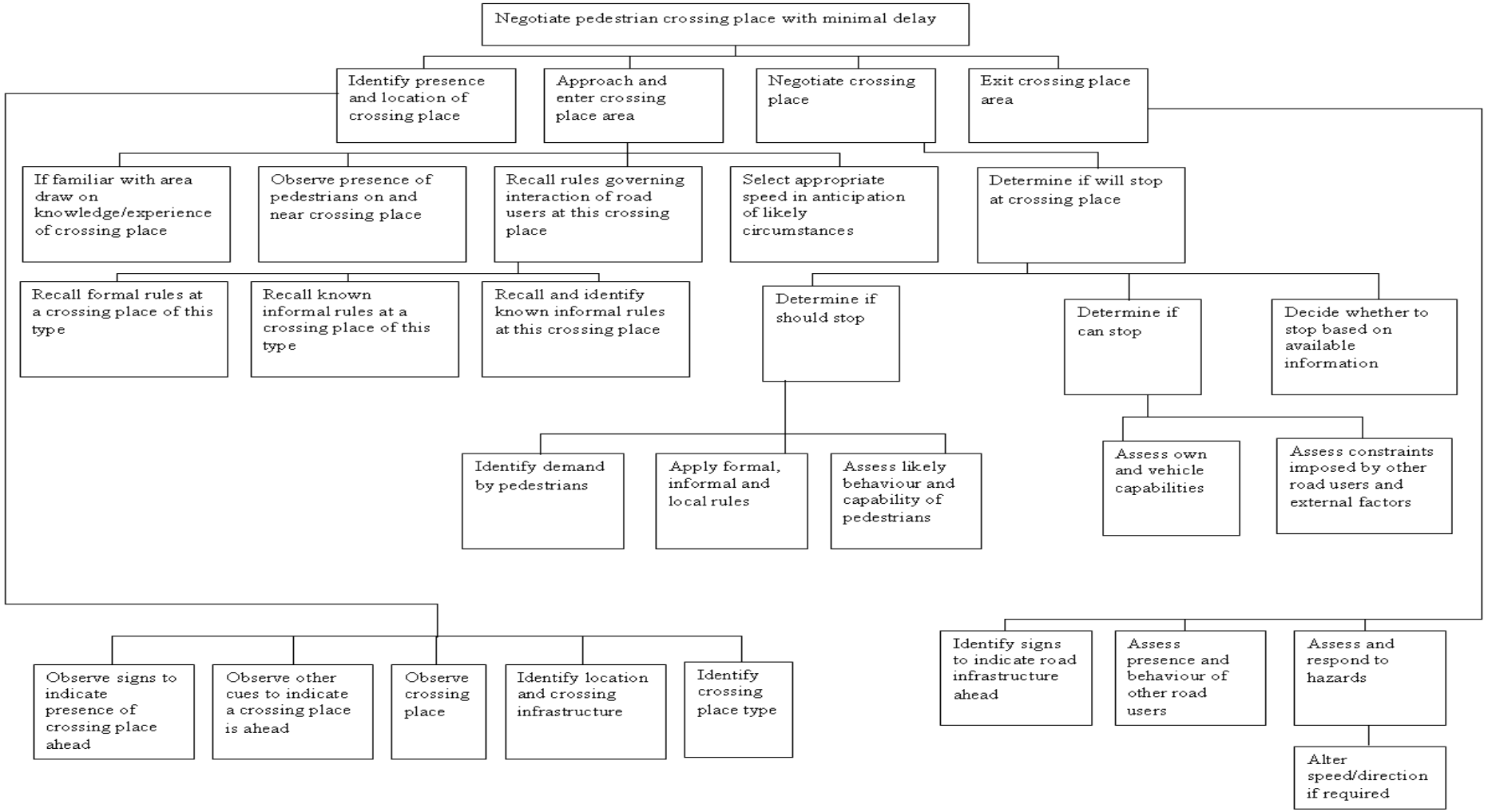


Figure 2.3 – An Example of a Task Analysis Model for a Driver Encountering and Negotiating a Crossing (Robertson & Thoreau, 2003)

The Threaded Cognition Model (TCM) proposed by Salvucci and Taatgen (2008) is a contemporary servo-control model. Threaded Cognition is an integrated theory concerned specifically with non-deliberative concurrent multitasking performed at the sub-second to second time scale (i.e., performing more than one task simultaneously, such as driving and dialling a number on a mobile phone). This computational model was designed to understand, model and predict performance during concurrent arbitrary tasks. It can also be used to explain how multitasking behaviour can result in interference. This model has been praised for its ability to test predictions.

Salvucci and Taatgen's theory proposes that streams of thought are represented as threads of processing. Complex dynamic tasks like driving incorporate multiple task threads (Salvucci & Taatgen, 2008).

According to the TCM, information threads are coordinated by a serial procedural resource. This procedural resource is employed to do several things:

1) to allow the concurrent execution of the threads across available resources (e.g., motor and perceptual resources),
2) to acquire resources and,
3) to resolve conflicts.

Salvucci and Taatgen's model proposes that multiple tasks can be processed in parallel. Threads acquire resources in a greedy manner by requesting resources as soon as possible. Conversely, when the resource is no longer needed the threads release them politely. When a thread requires a specific resource that is busy, it waits until the completion of the current process before acquiring the resource. Two or more threads may have to wait to acquire the same resource.

Resource acquisition can only occur through rule firing. The least recently processed thread (i.e., the thread which has not recently fired a rule on the procedural resource) is allowed to proceed first. This provides a parsimonious balance between threads. Conflicts arise when tasks require the same peripheral resource or when multiple tasks require attention from the central procedural resource. Conflicts for resources reduce parallelism and lead to processing delays. When two tasks require common perceptual or motor resources dual-task performance for one or both tasks will be impaired (Salvucci & Taatgen, 2008).

There are four cognitive resources that are required in the Threaded Cognition model which are modules from Anderson's ACT-R (Adaptive Control of Thought-Rational) architecture (Anderson, 2007). According to Anderson each task that humans perform consists of a series of discrete cognitive and perceptual operations. The four resources in the Threaded Cognition Model are as follows (Salvucci & Taatgen, 2008; Taatgen, Juvina, Schipper, Borst & Martens, 2009):

1) Visual module – to perceive items (input)
2) Procedural memory – where conditions from the other modules are mapped into actions. Information is integrated here and, with practice, the task instructions that were encoded as chunks in declarative memory can be changed into production rules that can affect new behaviour. Production rules can discriminate when a particular resource is in use (i.e., when the module is busy or the buffer is full).
3) Declarative memory – determines whether items are targets or distracters and stores factual knowledge in chunks that can be recalled or forgotten. Requests to retrieve information chunks based on partial patterns can be processed here one-at-a-time.
4) Imaginal module – a limited working memory store that is important in memory consolidation

According to Salvucci and Taatgen (2008), driving requires the repeated firing of four rules that iterate in sequence. Each of these rules provides updates for adjustments that need to be made to steering and acceleration. These four rules are as follows:

1) Find the near point.
2) Find the far point of the current lane (information about nearby and upcoming lane configurations to help calculate steering angle).
3) Motor commands are sent to specialised motor modules for steering and pedal movements and also directs visual attention to encode the information at the far point (i.e., a road point or lead vehicle).
4) Check for the stability of the vehicle by monitoring the vehicle's lateral position and velocity – if stable this process iterates after some delay.

To illustrate how the driving rules operate and the impact of performing a secondary task, Salvucci (2001) conducted a study that looked at the impact of dialling a number on a mobile phone whilst driving (Figure 2.4). Salvucci found that when two tasks were performed simultaneously which required different resources they could be performed successfully (for example, noting that the vehicle is stable requires the procedural resource and retrieving

telephone digits requires the declarative resource). However, if the two tasks required the same resource they would need to compete for it (for example, finding the road near point and retrieving blocks of numbers both require the procedural resource). In this situation only one of the tasks would successfully acquire the resource whilst the other would have to wait until the resource was given up (in the aforementioned example, when the driving task has won the resource the retrieval task must wait and vice versa). In a similar study, Salvucci and Macuga (2002) concluded that due to competing for resources, performing the dialling task had a significant potential to result in driver distraction and ultimately decreased performance on the primary driving task.

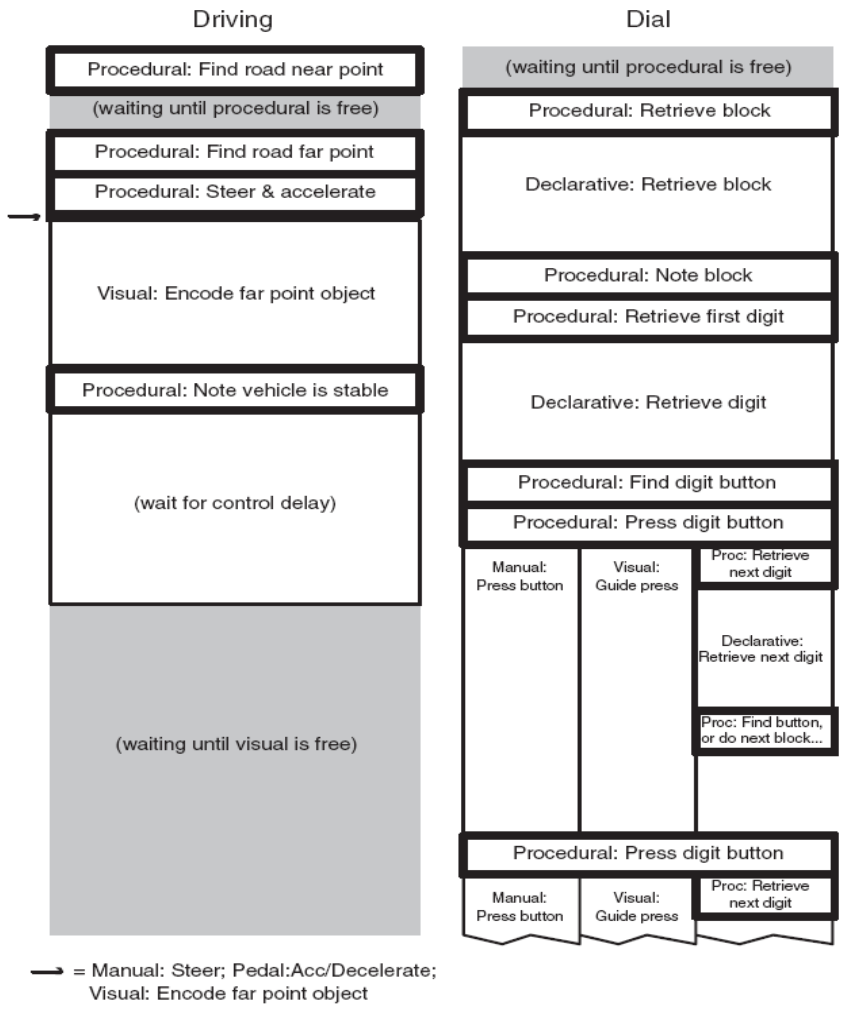


Figure 2.4 – Driving-dialling study: Model timeline (Salvucci 2001, cited in Salvucci & Taatgen, 2008)

Information Flow-Control Models use digital computer simulations in their attempt to simulate driver behaviour. The Kidd and Laughery (1964) information flow model is a dynamic Task Analysis Model which specifies that when particular conditions are fulfilled certain acts will follow. For example, drivers receive vital visual information as they drive

along which needs to be processed. The angles of approaching objects, such as other vehicles, need to be checked and the points of intersection calculated. If the visual angle remains constant (i.e., the distances from vehicles/objects to the point of intersection remains the same), a collision is imminent and the driver cannot take any evasive actions.

Michon (1985) criticised the Kidd and Laughery (1964) Information Flow-Control Model for being too data driven and for having little to do with cognitive modelling. Once parameters are determined the program runs on fixed algorithms and there is no room for either intelligence or learning in the model. In the presence of pedestrians the model would not stop to allow them to cross the road, instead it would continue moving and thus run them over. This is the result of the inflexibility of the program, which does not have any real priority interrupts and is too rigid in its approach.

The Task Analysis Models, Information Flow-Control Models and Servo-Control Models are useful for furthering our understanding of how people drive (from a cognitive perspective) and why errors are made. However, they are unable to take into account the effects of individual differences (e.g. personality, age, gender) and motivations (e.g. choosing to drive fast to get to a meeting on time) on driving styles.

2.5.3 Trait Approach

The Trait Approach was established over 70 years ago in traffic psychology and incorporates both motivational and cognitive driving models (Shaw & Sichel, 1971). These models are concerned with the reasons why drivers perform specific tasks in the way that they do and attempt to capture the effects of individual personality characteristics on driving behaviour. Trait models are, however, not concerned with driver errors and assume that safe driving behaviour is attainable for all drivers (Rothengatter, 2001).

To understand accident involvement, trait approaches look at the effect of personality, as well as attitudinal and motivational factors. Some of the effects of personality on driving were demonstrated by Iversen and Rundmo (2002) and Ulleberg (2002). Iversen and Rundmo (2002) found that sensation seeking, normlessness (the belief that socially unapproved behaviours are required to achieve certain goals), and driver anger were linked to risky driving, specifically speeding and ignoring traffic rules.

Ulleberg (2002) ran a cluster analysis on personality characteristics of young drivers aged between 18-23 years and revealed six subtypes of drivers. The personality characteristics included measures of self-reported levels of anxiety, altruism, sensation-seeking, aggression, driver anger and normlessness. The six clusters of young drivers were compared on behavioural, attitude and risk perception measures related to driving. The results showed that the subtypes differed according to the subject's risky driving behaviour, their attitudes towards road safety, their perception of risk, their estimation of their own driving ability and their reported accident involvement. High-risk groups were characterised by low levels of altruism and anxiety, and high levels of sensation-seeking, irresponsibility, driving related aggression and anger.

With the narrow age range of drivers examined by Ulleberg there was no examination of the effect of age on the clustering to see if the subtypes differed with age. The effect of gender was, however examined and the high-risk groups mainly consisted of male drivers.

2.5.4 Motivational Models (Psychological trait models)

Motivational models of driving behaviour emerged as an alternative to skill-based models (Summala, 1985). They assume that driving is a self-paced task where drivers select the amount of risk they are prepared to tolerate in any situation (Ranney, 1994). Motivational models examine the products of cognitive functions, beliefs, emotions and intentions. These models are synonymous with risk-taking and therefore differ from other models that deal with performance under normal conditions.

Motivational models are often used to try and explain decisions made by drivers at the Tactical Level of driving (an example of the second level in Michon's hierarchical Cognitive Driving Behaviour Model). Decisions made at this level are critical for supporting the Operational Level, where actions are taken to achieve the goals and objectives set at the Strategic Level. These models attempt to understand what the motivation was for some drivers to engage in certain actions, whilst others did not. They also investigate ways in which to encourage drivers to be motivated to engage in safe driving practices.

Five motivational models will be described briefly: the Risk Homeostasis Model, the Zero Risk Model, the Threat Avoidance Model, the Hierarchical Risk Model and the Theory of Planned Behaviour.

2.5.4.1 Risk Homeostasis Model

Wilde (1982) put forward a risk compensation model called the Risk Homeostasis Model based upon his Risk Homeostasis Theory (RHT, Figure 2.5), which had been used to explain why many accident countermeasures have failed.

According to the Risk Homeostasis Theory (RHT), humans are strategists and planners who optimise risk-taking in any given situation to maximise the benefits that can be obtained (Wilde, 1994[a], 2001). In any activity individuals accept subjectively estimated amounts of risk to their health and safety in return for the benefits they can receive. This subjectively estimated amount of risk is known as their 'target risk'. For example, drivers use information to anticipate the situations they might find themselves in and form estimations of their accident risk by comparing their perceived level of risk with their target level of risk.

People continuously check the amount of risk that they are exposed to against their target risk level (Figure 2.5). This allows them to try and reduce or increase their exposure to risk and ensure that the amount of risk that they are being exposed to matches their accepted level (i.e. the difference between their perceived level of risk and target risk are zero). If an individual perceives that the level of risk that they are being exposed to is higher than their target level, they will not carry out adjustment behaviours/manoeuvres. However, if they perceive that the level of risk that they are being exposed to is lower than their target risk level, the adjustment behaviours/manoeuvres will be put into practice with more risk and thus align the two kinds of risk levels. Consequently, RHT assumes that whilst an individual is always adjusting their performance, their subjective level of risk is relatively stable (Ranney, 1994).

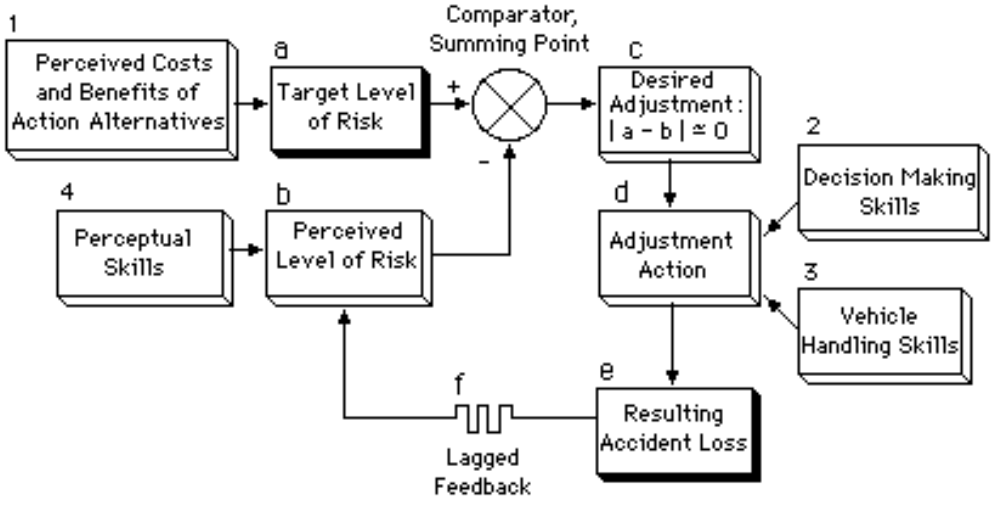


Figure 2.5 – Risk Homeostasis Model (Wilde, 1994[ab], 2001)

People are motivated into engaging in risky behaviour by economic, cultural, social and psychological factors. These motivating factors are internalised by people and so they are often unaware of them. According to RHT, people do not arrive at their target level of risk by explicitly calculating the probabilities of different outcomes. Therefore it is believed that people do not necessarily take risks for the sake of taking risks (Wilde, 1994[a], 2001).

People select a target level of risk that is above zero, which provides them with the maximum net benefits (Figure 2.6; expected net benefits = expected gain – expected loss). At zero there are no net benefits. The target risk level must always be above zero because no behaviour has a certainty of a specific outcome. Target risk levels often vary between individuals (e.g. due to differences in age or personality) but they can also vary within individuals in the short-term (e.g. due to the purpose of the trip) and even momentarily.

Target risk levels are derived from three sources: past experiences, assessment of the immediate accident potential and an individual's perceived confidence in their decision-making and skills (Wilde, 1994[a], 2001). With regards to driving, a driver's past experience with traffic will leave them with an impression about the riskiness of the road. Their perceived levels of risk will be lower if they are confident about their driving skills and higher if they doubt their ability.

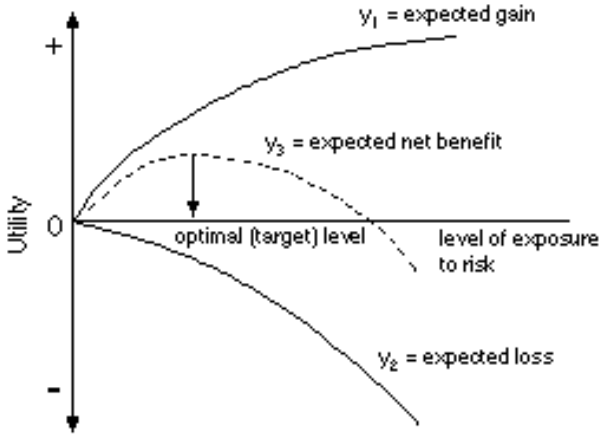


Figure 2.6 – Road Users as Net Benefit Maximizers and Risk Optimizers (Wilde, 1994[a], 2001)

The RHT model proposes that behaviour can change if people are motivated into altering their target risk level. People have different target risk levels and, at different time periods, an individual can accept different levels of risk (Wilde, 1994[ab], 2001). Target risk levels will be higher when the perceived benefits from taking risks are high, the expected costs are low and

there is a higher cost associated with engaging in safe behaviour (e.g., they think that their friends would think less of them). Conversely, target risk levels will be lower when the perceived costs associated with risky behaviour are high and individuals perceive that there are increased benefits from engaging in safe behaviour (Wilde, 1994[ab], 2001). If people perceive risk incorrectly they can under-estimate or over-estimate the potential riskiness of a situation. The RHT proposes that the art of any effective safety management would be the reduction of target risk levels among individuals (Wilde, 1994[ab], 2001).

This model is controversial because it implies that any traffic safety improvements made by transport agencies will not have lasting impacts because drivers will compensate by driving less cautiously. According to the RHT, the addition of safety measures (e.g., airbags and automatic braking systems) into the driving domain could cause drivers to under-estimate the levels of risk that they are exposed to. If they perceive themselves to be in a situation that is lower than their target risk level, drivers will be more likely to make adjustment behaviours/manoeuvres that will put themselves at increased risk (Ranney, 1994; Wilde 1982, 1994[ab], 2001).

2.5.4.2 Zero Risk Model

The Zero Risk Model (ZRM) (Näätänen & Summala, 1976) is a risk-threshold model, which operates within safety margins. It differs from risk compensation models such as Wilde's (1982) Risk Homeostasis Model, because the incorporation of a threshold level means that risk-compensation models are only employed once this level has been exceeded (Ranney, 1994; Summala, 1988).

The ZRM proposes that drivers attempt to maintain a balance between subjective, objective and perceived risk. The Subjective Risk Monitor (SRM) is the core component of the model and is activated only when a particular threshold value is reached. The SRM influences drivers' subsequent and future driving behaviour because drivers' will try to keep under the threshold value. Perceived risk is calculated by weighing up the subjective probability of a hazardous event and the subjective importance of the consequences. According to the model, behaviour is directly related to the level of perceived risk. Perceived risk is generally equal to zero and therefore drivers tend to drive as if there are no real risks (Näätänen & Summala, 1976; Ranney, 1994).

Motivations influence driver perception on the road, particularly with regards to desired actions such as over-taking. Desired actions will be carried out unless drivers' subjective risks exceed the SRM monitor threshold, and decisions will be taken by weighing up whether or not to engage in the desired action.

2.5.4.3 Threat Avoidance Model

The Threat Avoidance Model (TAM; Fuller, 1984, 1988) assumes that a driver is motivated by two responses: avoiding hazards and making progress towards their destination. The model focuses on avoidance of threats and looks at an individuals' probability of becoming accident-involved. It focuses on avoidance because it is impossible for drivers to drive in a straight line and arrive at their destination without having to avoid hazards and obstacles (Ranney, 1994).

In any given situation that the driver perceives themselves to be in they can choose to either engage in a behaviour/manoeuvre (a non-avoidance response) or to continue onwards without engaging in a behaviour/manoeuvre (anticipatory avoidance response) so as to avoid hazardous situations such as head-on collisions (Fuller, 1984). Having begun the behaviour/manoeuvre the driver then reverts back to their original behaviour (the delayed avoidance response). Drivers' learn to identify risks through repeated exposure and driving experience. The rewards and punishments they estimate as outcomes for engaging in specific behaviour/manoeuvres also motivate them. Michon (1989) criticised Fuller's model for only being applicable to single-instance situations and unable to handle "nested behaviour", such as when a driver is faced with more than one problem at a time (Ranney, 1994).

2.5.4.4 Hierarchical Risk Model

Van der Molen and Botticher (1987) postulated the Hierarchical Risk Model (HRM). At the Strategic Level, judgements are made using internal representations of the physical environment, expectations (e.g., the probability of arriving on time or late), and motivations (e.g., the benefits of being on time or late). Comparing the alternatives makes a decision; if one of these is considered to be impossible a new strategic route occurs.

At the Tactical Level there is a strategic plan motivation, accident expectations and safety motivations for alternatives. Risk judgements are the integration of accident expectations and safety motivations.

At the Operational Level manoeuvres are executed. One function of this level is the "emergency relais" (Van der Molen & Botticher, 1987). In normal everyday driving, little attention may be paid to driving as the task has become automated. However in emergencies, attention is redirected or switched back to the driving task by the "emergency relais" so that decisions can be made and emergency behaviours executed. For young novice drivers with little driving experience, it is more difficult to recognise emergency situations and thus it may be more difficult to redirect their attention to the task.

As with the RHT, Michon (1989) criticised this model for not distinguishing between aggregate and individual levels of analysis.

2.5.4.5 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB), (a derivative of the Theory of Reasoned Action or TRA) states that human action is guided by beliefs (Ajzen, 1985, 1991; Figure 2.7). These beliefs are characterised by evaluations of the outcomes of specific behaviours (behavioural beliefs), expectations and motivations of others to comply (normative beliefs) and beliefs about the presence of factors that may facilitate or impede performance, and their perceived power (control factors or perceived behavioural control). According to Ajzen (2002[b]) perceived behavioural control (PBC) can be viewed as the combined influence of self-efficacy (ease or difficulty of adopting a behaviour) and controllability (the extent to which the behavioural performance is controllable by the executor). The TPB and TRA are very similar however the TRA was designed to explain the determinants of wilful behaviour and did not incorporate a measure of perceived control (Yagil, 2001). Correlations between the three core predictors of TPB in 16 studies investigated by Ajzen (1991) ranged from 0.43-0.94 with an average of 0.71.

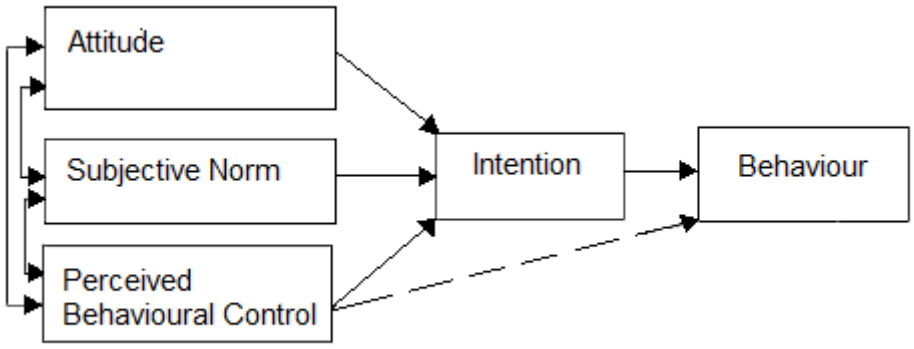


Figure 2.7 – The Theory of Planned Behaviour (Ajzen, 1991)

The TPB (Ajzen, 1985) is a social psychological model used to describe behaviour and its predictors. It assumes that people take account of available information when evaluating the outcomes and consequences of their actions, together with the social pressures on them to perform specific behaviours. Many theories believe that subjective norms (norms that are thought to exist in the social sphere among friends and family) have a powerful influence over behaviour. They are not actual norms but are what an individual perceives as being the norm (Gregersen, 2003).

Behavioural beliefs are said to produce a favourable or unfavourable attitude towards behaviour. Beliefs are central in the TPB and provide the cognitive and affective foundations for attitudes, subjective norms and perceptions of behavioural control. Beliefs can thus be relied upon to obtain an indirect belief-based measure of these constructs (Ajzen, 2002[ab]).

Intentions to engage in behaviour are stronger the more favourable an individuals' attitudes, their perceptions of the social pressure to perform the behaviour (subjective norm) and the more perceived control they have over performing the behaviour. Intention is assumed to be the immediate antecedent of behaviour, and is considered to be a combination of attitudes towards specific behaviours and subjective norms (Yagil, 2001).

Several studies have shown that intentions are the best predictors of subsequent behaviour (Ajzen, 1991; Ajzen & Fishbein, 1980; Parker, Manstead, & Stradling, 1995). The stronger the intention to perform the behaviour the more likely it is that the behaviour will be performed. Intentions can only influence performance to the extent that the person has behavioural control; therefore behavioural intentions can only find expression in behaviours that are under volitional control. Consequently, performance should increase with control.

The relative importance of intentions and perceived behavioural control vary across behaviours and situations, for instance, when a behaviour or situation affords complete control, intentions alone should be sufficient to predict behaviour. As volitional control over the behaviour declines perceived behavioural control becomes increasingly useful as a means to predict behaviour (Ajzen, 1991).

The TPB has been applied to a wide range of studies that have endeavoured to understand and promote behaviour change. Its primary usage has been in understanding society's health-related behaviours, for example, adolescents use or non-use of contraceptives (Rosengard,

Adler, Gurvey, Dunlop, Tschann, Millstein, & Ellen, 2001). It has also assisted in the design of interventions aimed at changing attitudes and behaviours. As well as its use in health promotion, the TPB has been utilised in other areas of applied psychology including driver behaviour (especially with regard to understanding and reducing the occurrence of speeding and drink-driving behaviour).

The TPB has been used in several psychological studies examining intentions to commit driving violations; Rutter, Quine and Chesham (1995) found that attitudes towards the commission of violations and subjective norms were positively related to intentions to commit the violating behaviour. Other road-user behaviours, such as pedestrian crossing behaviour (Moyano-Diaz, 2002), have also been explained using the TPB. Moyano-Diaz (2002) found that young people had a more positive (high-risk) attitude towards the commission of pedestrian violations than adults and perceived the subjective norm to be less inhibitory, had less control over violations, had a more positive (high-risk) intention to commit violations, and reported more violations, errors, and lapses than adults. Males reported more frequent violations than females.

Parker, Manstead, Stradling, Reason and Baxter (1992[a]) designed a questionnaire using the key constructs of the TPB to research the ability of the models to account for intentions to drink and drive, speed, follow too closely (tail-gating), and overtake under risky conditions. Their results showed that the relationship between subjective norms and behavioural intentions were consistently stronger than that between attitudes toward many such behavioural intentions. For instance the most difficult violations to resist were speeding and dangerous over-taking. These researchers reported that the more control driver's felt over the behaviour the less likely they were to commit the violation.

The TPB has been used to look at drivers' compliance with speed limits by comparing drivers' self-reported prior behaviour with self-reported subsequent behaviour (Elliott, Armitage & Baughan, 2003). Subject's attitude, subjective norm, and perceived control were found to be positively associated with their behavioural intention to comply with the speed limit. Intention and perceived control were thereby shown to be significant predictors of self-reported compliance. The results also found that prior behaviour moderates the relationship between perceived control and intention, as well as the relationship between perceived control and subsequent behaviour. In a study by Vogel and Rothengatter (1985), behavioural intentions and reported speeding behaviour were highly correlated (0.79).

Parker et al. (1992[ab]) applied the TPB to the commission of traffic infringements. Their results showed that drivers who had weak intentions to commit violations reported negative (high-risk) attitudes towards the commission of speeding offences and had people close to them who would disapprove of their engaging in speeding behaviour. It may therefore be expected that young drivers who have positive attitudes to speeding and an absence of people close to them who disapprove of their behaviour will have the strongest intentions to commit violations whilst driving.

One criticism of the TPB, put forward by Parker et al. (1995) was that it failed to address individual beliefs about what constitutes right and wrong. To overcome this problem, they extended the TPB to include a measure of internalised beliefs (moral norms) and expectations about the affective consequences of breaking moral rules (anticipated regret). They also expressed the belief that where individuals knew that specific actions were morally wrong, and anticipated feeling regret after engaging in them, there should be lower behavioural intentions. The opposite could also be true if individuals knew that specific actions were morally wrong but expected positive affective consequences, they would be more inclined to intend to commit these actions.

The results from the Parker, Manstead et al. (1995) study supported these beliefs in that the more inherently wrong the behaviour the less likely their intentions to engage in it; this same pattern applied to anticipated regret. Attitude, subjective norm and perceived behavioural control (PBC) accounted for between 34-37% of the r^2 variance in intention to perform driving violations. PBC alone accounted for 3-8% of the r^2 variance, with moral norm and anticipated regret adding a further 10.6-15.3%. Therefore, anticipated regret and moral norm are considered to be important predictors of behavioural expectations.

Trait models such as the Zero Risk Model, Risk Homeostasis Model, Threat Avoidance Model, Hierarchical Risk Model and Theory of Planned Behaviour Model have helped to explain the impact of human motivation on driving and the effects of individual differences (e.g. gender, age, sensation seeking tendencies). However, unlike the Task Analysis Models, these models do not explain why errors occur in driving and presume that all drivers have the ability to drive safely. The most popular model is the TPB because of the ease with which the relationship between the core components (attitudes, subjective norms and perceived behavioural control) and intentions/behaviours can be tested. The other Trait Models are not as easy to test as the TPB and do not take into account the effects of attitudes or norms on

behaviour. They also focus more on risk and with individuals weighing up the risks involved in taking (or not taking) actions. Consequently, the TPB has been used frequently over the years to test the effects of personality, attitudes and motivations on a variety of health related behaviours.

2.6 Chapter Conclusions

This chapter has introduced the driving task and the problems that novices have with regards to mastering the task. Differences between younger and older novices were also explored. Michon's hierarchy of driving skills was used to describe the process through which the driving task is mastered. Fitts and Posner's three phases of skill acquisition was also used to demonstrate how drivers must pass through phases in order to acquire and proceduralise the necessary skills for driving. Differences between novices and more experienced drivers were also highlighted so as to show the importance of experience on perfecting drivers' skills and moulding their behaviour. This chapter has also given a brief overview of various models that have been used to understand driving behaviour.

Driving is a complex procedure. Once the basic skills have been gained they are applied in different ways according to the driver and their experience. Since the driving environment is a dynamic one, drivers are constantly being tested to react to new situations or to recall how they responded in a similar situation in the past.

Around the world road traffic collisions cost the public millions of pounds every year, but by investing in the prevention of accidents the extent of these financial losses can be reduced. For example, in the UK the total cost–benefit value from the prevention of road accidents in 2006 was estimated to be £18,079 million (DfT, 2007[a]). Given that young drivers are well known for their over-inflated liability on the roads, and the road safety strategies of various Governments worldwide have been less effective in reducing young driver deaths and injuries, road safety professionals are now directing some of their effort towards establishing the causes of young driver collisions and designing various methods of prevention (DfT, 2007[b]; Emmerson, 2008).

Driver behaviour research broadly discusses two principal lines of enquiry, namely, Performance (or Task Analysis) and Motivational (or Trait Approach) approaches. Both of these approaches to researching driving behaviour ultimately seek to achieve the same goal of reducing driver error and accident risk. However, one of them looks specifically at breaking

down the driving task to look for driver errors, whereas the other looks at human influences outside of the actual task, such as the presence of passengers or elements of the drivers' own personality.

Young driver collision-involvement cannot be due to poor driving skills alone as, compared to other novice drivers, their collision liability remains higher for longer (Cooper et al., 1995; Maycock et al., 1991; McKnight & McKnight, 2003; Wells et al., 2008). Whilst the Performance (or task analysis) models of driving behaviour presented earlier in this chapter are often used to understand how people learn to drive and the cognitive processes that are involved, they do not help to explain why some young drivers choose to engage in safe behaviour and others choose to take risks on the road. Accordingly, the preferential models in this thesis are the motivational (or trait approach) models because they can provide a social psychological approach to understanding why young drivers drive as they do. In the next chapter, the specific problems of young drivers are described in detail.

CHAPTER 3 - THE YOUNG DRIVER PROBLEM

3.1 Chapter Summary

In this chapter the young driver problem will be introduced. The sub-group of drivers with the highest accident rates and the highest perceived accident risks on the roads are those in the under 25 year age group.

3.2 Global Road Traffic Accident Problem Related to Young Drivers

Global statistics show that, regardless of age, deaths and injuries on roads are a worldwide problem. Globally there is on average approximately 3242 fatalities per day resulting from road traffic collision injuries (WHO, 2004). Annually 1.3 million people die in road traffic collisions and approximately 50 million are injured (Clark, 2009).

In 2004, road traffic collisions were estimated to be the eleventh leading global cause of death (WHO, 2004). It is predicted that road traffic injuries will be the sixth major cause of deaths worldwide by 2020 (WHO, 2004); and, the problem is predicted to worsen by 2024 with an increase in road accident casualty figures of about 65% (WHO, 2004). It is increasingly evident that road-related deaths are a global problem that needs to be addressed.

The WHO (2007) reported that, globally, road accidents and injuries are the eighth leading cause of death among those less than 25 years of age, which includes pedestrians, motorcyclists, cyclists, vehicle passengers and car drivers. Over 30% of those killed and injured globally on the roads are under 25 years old (WHO, 2007). Fatal road accidents are the leading cause of death among 15-19 year olds and the second cause of death in 20-24 year olds (WHO, 2007). According to the DfT (2007[a]) 16% more drivers aged between 16 and 19 years are killed today compared to fifteen years ago. Young people however not only have very high rates of involvement in road traffic accidents as drivers or motorcyclists; they also have very high mortality rates in all road related accidents (Chliaoutakis et al., 1999; Gregersen & Berg, 1994; Mayhew & Simpson, 1989; Williams, 2003). As adolescents are known for their engagement in risky behaviours this could partially account for their over-representation in road traffic accidents.

In 2008, young drivers aged 17-24 years old were involved in 73.8% of driver fatalities on Britain's roads (DfT, 2009). Although drivers in this age group make up only 7% of British driving licence holders they are involved in over 13% of all injury traffic accidents (DETR, 2000[b]). Compared to other sub-groups of drivers, 17-24 year olds cover a lower than average mileage (Carcary, Power & Murray, 2001). The majority of the collisions that 17-21 year olds are involved in occur during their first year of driving (Achara, Adeyemi, Dosekun, Kelleher, Lansley, Male, Muhialdin, Reynolds, Roberts, Smailbegovic & van der Spek, 2001).

These high accident figures for teen and young adult car drivers are not specific to Great Britain; they are mirrored throughout the world, which demonstrates that this phenomenon is very widespread (Wilde, 1994[b]). In New Zealand, where the minimum driving age is 15 years, 35% of all fatal motor vehicle collisions in 2008 involved drivers aged 15-24 year olds (MOT, 2009). This age group represent only 16% of New Zealand licence holders (MOT, 2009).

3.3 Establishing the Causes of Young Driver Collisions

Several studies have been conducted to try and identify the causes of young driver crashes. For instance Rothe (1986) used data on the causation of crashes to summarise the faults of young drivers. These were found to be firstly failing to keep in the proper lane and running off road; then failing to yield at right of way; followed by speeding; driving on the wrong side of the road; failing to obey traffic signs; reckless driving; inattentiveness; overtaking; fatigue; and, finally, poor equipment. Similarly in 1994, the American Automobile Association (AAA), in the American State of Michigan, investigated collision data for young drivers aged between 15-18 years, the minimum age for driving in this State being 15 years. Six pre-crash hazardous actions were identified as: following too closely; failing to yield; driving too fast; improper driving lane usage; improper turning; and improper reversing or starting off. The order of these actions changed according to the type of crash. For example, in fatal crashes the order of pre-crash hazardous actions became: speeding too fast; failing to yield; following too closely; and improper lane use. Both of these studies support Lonero and Clinton's (1997[a]) suggestion that skill deficiencies and inadvertent errors play an important role in novice driver accidents.

Collision data has also been used to attempt to discover the reasons behind high accident rates among young drivers, and the frequency of certain behaviours, to highlight those influential

factors that recur in crashes. In New Zealand, the Land Transport Safety Authority (LTSA - now known as Land Transport New Zealand or LTNZ) identified three factors that made an important contribution to crash fatalities from their Road Safety Programme of 1997-98 (LTSA, 1997). These factors were found to cover abuse of alcohol whilst involved in driving activity; driving at excessive speed; and failure to use seat belts.

A review of research conducted mainly in Europe revealed that young drivers appear to be over-represented in only a few types of crashes. These crashes were either speed related, caused by loss of control, or they occurred at night (Tränkle, Gelau & Metker, 1990). High collision rates among young drivers could in part be explained by the fact that they are the group of drivers on the roads who are most likely to drive faster than other drivers and over-take dangerously (Gullone & Moore, 2000; West, Elander & French, 1993; Williams, 1998). Another reason that young drivers may be more vulnerable is that that they are more likely to drive around in cars that offer less protection (Fuller, 1995).

To develop an understanding of why young drivers have a higher than average accident risk on the road, it is necessary to comprehend what driving means to them. It is generally believed that young people view driving not only as a rite of passage, but also as a ticket to freedom (Arnett, 2002[a]; Insurance Institute, 2005). By becoming a driver it is perceived that a major step has been taken in the direction of adulthood, leading individuals towards increased responsibility and an escape away from parental control (Insurance Institute, 2005).

Apart from providing a means of transportation, driving serves the psychological function of influencing self-image and helps to create the young driver's sense of identity (Moller, 2002). Young drivers are not simply *"…isolated individuals… [they are] … part of a close knit social structure…[where]…his or her position in this social structure influences his or her current behaviour, attitudes and beliefs*" (Twisk, 1994).

Michon (1985) emphasised the social aspects of driving and the importance of transportation in the functioning of society, in his four levels of Human Systematic Interaction with the transport and traffic system. These levels demonstrate that humans are firstly active road users, secondly transportation consumers, thirdly active social beings and, finally, psycho-biological organisms that are trying to satisfy their basic needs. It has been proposed that young drivers' high rates of collision are the product of both individual and social factors

which thus influence cognitive abilities and motivations, ultimately affecting their driving behaviour (Lonero, Clinton, Brock, Wilde, Laurie & Black, 1995).

Results from a focus group study, showed that people relate driving to their individual sense of visibility, status, control and mobility (Moller, 2002). Since the young believe that driving represents a tool for the creation and maintenance of self-image and identity, it is apparent that it is a very socially orientated activity (Green & Dorn, 2008; Moller, 2002).

In considering what young people regard driving to represent, several factors, which may influence their driving behaviour, have become apparent. Research has demonstrated that where driving forms part of a young person's personal goals and aids them in achieving self-enhancement, lifestyle and societal pressure are the two influences that they are confronted with. This therefore may be another plausible explanation as to why car-orientated young people become particularly risky drivers (Gregersen & Berg, 1994).

There are two important processes considered to affect novice drivers' behaviour and accident involvement. Firstly the learning experience, where through education and training, novices acquire the skills that are necessary for driving. Secondly when novices begin to apply aspects of their life to driving, namely social influences and individual circumstances (Gregersen & Bjurulf, 1996). If one or both of these processes are not completed satisfactorily, or the novice driver has not been educated correctly during driver training and post-licensure, or they have been exposed to bad social influences, then their accident involvement may well increase.

Differences in the degree of parental supervision, or unregulated freedom from parental influence may also be factors adversely influencing the outcomes of driver training and thereby contribute to the young drivers' risk susceptibility (Lonero & Clinton, 1997[a]). Novice drivers who have little parental supervision during either pre- and/or post-licensure are probably more apt to take risks on the roads (Lonero & Clinton, 1997[a]).

Individual factors such as the lack of experience, risk awareness, knowledge and insight, are proposed as being among the main causes of novice drivers' road traffic accidents. Other than skill-deficiencies, differences in personality and emotional control are also thought to contribute to an individual's preference for risky driving. Low self-esteem, poor self-control and social irresponsibility, as well as irrational beliefs, have been found to characterise risky

drivers (Rolls & Ingham, 1993). Age-related factors such as an individual's lifestyle, peer group association and level of immaturity are also thought to contribute to high accident risk (Chliaoutakis et al., 1999; Engstrom, Hernetkoski, Keskinen & Nyberg, 2003; Mayhew & Simpson, 1990; Wilde, 1994[b]).

Lonero and Clinton (1997[a]) proposed that the decision-making processes of young novice drivers who choose to operate in risky ways are of critical concern. However, Näätänen and Summala's (1976) Zero Risk Theory (ZRT) postulated that drivers do not normally perceive any risks when they drive, suggesting that although young people engage in risky behaviour they may not necessarily know that it is risky or they may simply underestimate the risks involved. The ZRT explains driver behaviour as being influenced by extra motives, such as those that push at acceptable boundaries, or involve deliberate deviation from the rules, for motives of pleasure. These motives are thus likely to encourage an individual to commit violations especially due to reasons such as peer pressure.

It has also been reasoned that the explanation for young people choosing to engage in violations on the road are purely motivational (Summala & Näätänen, 1988). As an example, engaging in speeding may give rise to positive feelings thus motivating the driver to continue with this behaviour and even to repeat it in the future. Engaging in violating behaviour could also bring about aggressive competition, tension reduction, showing-off, sensation seeking and deliberate risk-taking (Lawton et al., 1997; Näätänen & Summala, 1975; Summala, 1987).

Motives that influence driving may be largely divided into ***wh*y** we drive and ***how*** we drive (Gregersen, 1996). The effects these influences have on driving behaviour are controlled by the rewards or punishments that engaging in specific behaviours promote. Consequently, a driving style that is generally considered to be dangerous may not necessarily be perceived as such by the individual driver (Wahlqvist, 1996). Näätänen and Summala (1976) consider that drivers' will always try to exploit extra margins that arise in order to satisfy their motives, however they tend to exclude motives for increased safety. This is mainly because safety motives are generally perceived negatively because there are never any immediate rewards from engaging in such behaviour. The need to get to a destination quickly is a 'positive' motive and by engaging in speeding behaviour it is possible to obtain a relatively immediate reward (Gregersen, 1996).

According to Fuller (1995) there is a sub-group of young drivers who deliberately take risks and are therefore over-involved in both traffic violations and accidents. One reason for their choosing to engage in risky driving behaviour is that they are provided with valuable social rewards from their peers (Basch, DeCicco & Malfetti, 1987).

3.4 Risk-taking and Risk Perception

Being at risk, according to Furedi (2006), is "*a condition of life*". Contact with hazards on a daily basis increases "*the probability of damage, injury, illness, death or other misfortunes*". Thus hazards threaten the things that people value and therefore exposure to risks is generally avoided whenever and wherever possible. To avoid hazards and hazardous events, people use risk perceptions, or intuitive risk judgements, to help them evaluate the potential for such events. The more risks become associated with danger, the greater the tendency to adopt risk-avoidance strategies.

Heuristics, or mental strategies, are used in conditions of uncertainty by individuals to try and make sense of their surroundings (Kahneman, Slovic & Tversky, 1982). Occasionally these heuristics can, however, lead to large and persistent biases, which interfere with the ability to make accurate risk assessments. Thus situations may arise where the risks are either over or under estimated.

When comparing themselves to others, young drivers tend to have what could be termed as an "*unrealistic optimism*" (or optimistic bias) about their encountering risks (Weinstein 1980; Weinstein & Klein, 1996). The more undesirable the consequences of an event, the more they believe that compared to others their chances of encountering such negative events are smaller (Weinstein 1980; Weinstein & Klein, 1996), with the opposite being true for desirable events. The more desirable the consequences of an event, the more the belief that compared to other persons the chances of encountering such positive events are greater (Weinstein 1980; Weinstein & Klein, 1996).

These distortions help to protect self-esteem and reduce anxiety about risk, but in some circumstances these biases can have negative consequences. For example, when young drivers underestimate the likelihood of experiencing negative events they tend to increase their exposure to risks and when hazards are more salient, their optimistic biases tend to become stronger (Weinstein 1980; Weinstein & Klein, 1996).

Prior experience affects unrealistic optimism as it makes it easier for individuals to imagine situations in which the event could occur, and increases their perceived probability of possible future reoccurrences of events. Thus, when they are in a similar situation they can draw upon their past experiences and use the knowledge that they gained (this is known as the "*availability heuristic*" as described by Tversky & Kahneman, 1974).

Perceived controllability also influences these biases, the more control an individual perceives that they have over a negative event the greater their beliefs that their chances of encountering it are close to zero. For example, young drivers who believe they are good drivers and would not get themselves into a collision situation, report greater beliefs that they will not be involved in a collision (Brown, 1982; Deery, 1999; Mayhew & Simpson, 1995). The opposite is true of positive events, the more control an individual perceives that they have over a positive event the more they believe that they will encounter it (Brown, 1982; Deery, 1999; Mayhew & Simpson, 1995). Stereotyping also affects bias. By placing people into groups that are more or less likely to encounter specific negative events, an individual's belief about their own chances of experiencing the same event are either increased or decreased.

When optimism biases reduce actions that are self-protective, and the likelihood of negative consequences (such as illnesses and injury) increase, the need arises to find methods for reducing them. Young drivers may be more inclined to engage in risk behaviours when they believe that they are exempt from risk or that their actions reduce their level of risk below that of others (Brown, 1982; Deery, 1999; Mayhew & Simpson, 1995).

There are a number of causal factors that have been proposed to explain why some drivers are more prone to risk than others. Iversen (2004) found that attitudes toward rule violation and speeding were strong predictors of engagement in risk-taking behaviour among a random group of Norwegian drivers (who were on average aged 45 years). Drivers with positive (high-risk condoning) attitudes towards rule violations and speeding engaged in more risky driving behaviours than those with negative (safe) attitudes.

Other risk factors regularly emphasised in the published risk literature include: the actual commission of violations, age, gender, controllability and sensation seeking.

Committing traffic violations on the road and therefore taking risks have been shown to be good predictors of accident involvement (Begg & Langley, 2001; Trimpop & Kirkaldy,

1997). Lourens et al. (1999) reported that drivers who received fines were more accident-involved than drivers who had not. High mileage drivers were also more likely to be fined and to have higher accident risk than other road users. In the Lourens et al. (1999) study, the difference in accident involvement between drivers who had been fined and those who had not, was found to be much greater among younger drivers. A difference of 11-13% was found for 18-24 year olds. As age increased, this difference became less pronounced but it remained significantly higher for accident-involved drivers (Lourens et al., 1999).

In a longitudinal study by Iversen (2004), drivers that had been involved in traffic accidents or crashes during the previous year were found to engage in significantly more risky driving behaviours. They also took more risks while driving compared to those drivers who had been non-accident involved at the onset of the study.

Research by Begg and Langley (2001) found that among a group of 21 year-old New Zealand drivers, there was a relatively high prevalence of risky behaviours. These included driving after drinking alcohol; driving after using marijuana; driving fast for a thrill; driving faster than the legal national speed limit; and following closely behind slower drivers. The prevalence of these risk behaviours among the males in the group significantly declined in the five-year period between the ages of 21 and 26. Significant decreases in this age group were noted, which included the frequency of drinking and driving where the ability to drive safely was impaired; high speed driving just for the thrill of it; and those who often drove faster than the legal speed limit on the open road.

When comparing themselves to their peers or to older drivers, young drivers tended to under-estimate their risk of being involved in a crash (Finn & Bragg, 1986; Mathews & Moran, 1986). They also tended to estimate their risk of receiving a speeding ticket as being lower than other drivers (Arnett, 1991).

These studies highlight the problems of unrealistic optimism in younger drivers. Since young drivers' under-estimate the likelihood of negative events occurring, they increase their exposure to risks and thus simultaneously increase their potential of experiencing hazardous events. These factors therefore increase their potential for being accident-involved.

Engaging in risky driving behaviour without incident or punishment has also been shown to reinforce anti-social conduct (Kulick & Rosenberg, 2000). Kulick and Rosenberg (2000)

assessed a group of university students and found that after drinking and driving, drivers who arrived at their destination without incident or arrest were more likely to repeat the behaviour in the future because their perceived chances of being caught or accident-involved were very low. These results thus imply that in order to change drink-driving behaviour, more needs to be done to make drivers perceive that the chances of being caught are high.

After content analysing 1000 narrative accident reports from 16-19 year olds, McKnight and McKnight (2003) put forward another explanation for the high accident rates among young drivers. They found that drivers in this age group were at risk simply because they did not employ safe driving practices and could not see the danger in failing to do so. They often drove too fast for the conditions and paid inadequate attention to other cars on the road. McKnight and McKnight (2003) also found that only a small minority of the reported accidents had involved drivers deliberately engaging in risk behaviour. Therefore they suggested that sensation seeking and risk-taking may not always be adequate explanations for young novice driver accident-involvement.

In considering young driver attitudes, gender differences in risk taking behaviour and accident involvement have been reported in various studies. Males are reported to have a higher mean number of accidents in comparison to female drivers; chose to drive at higher speeds, and report significantly higher scores on desirability for control (Chliaoutakis et al., 1999; Hammond & Horswill, 2002). Begg and Langley (1999, 2001) concluded that risky driving behaviour is predominantly a young, male, driver problem. They found that over a five-year period between the ages of 21 to 26 years, females had fewer significant increases or decreases in the prevalence of risky behaviours compared to males whose risky behaviour decreased. There was only a slight decrease in the prevalence of driving fast for the thrill of it. The fact that the prevalence of these behaviours in females was low to begin with supports the prevailing view that risky driving is more of an issue for younger males.

In conclusion it has been suggested that risky driving behaviours are part of a syndrome of problem or reckless behaviours (Arnett 1992, 1995; Jessor 1987[ab]; Jessor & Jessor, 1977). Adolescents who engage in these behaviours are considered to be trying to attain an adult-like status, however, once they have attained the desired status they are thought to discontinue engaging in problem behaviours. Arnett (1991) explains the changes in behaviour from adolescence into adulthood as a developmental process. It was proposed that characteristics known to promote reckless behaviours, such as egocentrism and sensation seeking, decline

with maturity (Arnett, 1991). Throughout adult life and until the age of around 70, crash risk is negatively correlated with age (Begg & Langley, 2001). This latter research supports Arnett's developmental explanation of risky driving, as reckless behaviours among males in their research group appeared to have "matured out" by the time they reached 26 years of age.

3.5 Risk-taking and Driving

To aid in the comprehension of why young people choose to engage in frequent risk-taking behaviour it is necessary to distinguish what constitutes risk-taking behaviour. Research by Evans (1993), Simpson (1995) and Hirsch (2003) provided evidence to suggest that there are four distinct sources of driver risk-taking behaviour that reflect the diversity of drivers and the variability of the driving task:

1) the miscalculation of risks,
2) intentional risk taking,
3) intentional self-destructive acts or suicide, and
4) unintentional risk-taking behaviour outside of the driver's awareness or control.

Miscalculation of risk or the inability to avoid collisions may be associated with poor information processing skills such as, hazard detection, slow reaction times and poor selective attention (Arthur & Doverspike, 1992; Fergenson, 1971; Rumar, 1990). Rumar (1990) suggested that hazard detection errors (failure to recognise and respond to other road users or objects) only occur when people who are trying to complete a planned course of action fail to detect other road users and thus do not have enough time to avoid collision. These failures in detection (known as late detection errors) fall into two categories, namely cognitive and perceptual. Cognitive errors occur when drivers fail to look for specific types of road users or fail to look in the appropriate directions of oncoming vehicles or other road users. Perceptual errors occur when drivers fail to detect road users in their peripheral vision or in situations where the light is reduced or intensified (at night or in bright sunlight).

Drivers use their visual system to formulate hypotheses regarding the driving environment (Rumar, 1990). For example, a driver can use their experience and expectations to guide their attention and visual focus to hypothesise how the driving environment might change in the near future. Younger drivers differ in their visual focus compared to older and more experienced drivers as they focus more closely on the road in front of the vehicle and more towards the nearside of the vehicle's direction of travel (Mourant & Rockwell, 1972).

Human visual systems were not developed for artificial environments like driving. Humans existed before cars and roads were created and were designed to live in relatively less complex surroundings than the present day. Therefore, the attention required to successfully navigate the road environment must be directed in a consciously planned and controlled fashion. The search patterns that are needed for driving are neither as fast nor as effective as those needed for detecting objects in the natural environment, because they need to be learnt in a controlled and rule-based fashion (Rumar, 1990). Cognitive detection errors occur frequently whilst driving because slower search patterns are vulnerable to errors. The speed of objects in the driving environment and the masses that are involved mean that errors are frequent and it is difficult for drivers to compensate once they occur. Cognitive detection errors also occur when road users know where and when to look but not what they are looking for; or when road users are distracted by internal thoughts and problems meaning that although they might be looking they do not see (Rumar, 1990).

Perceptual detection errors sometimes occur because the visual system in artificial environments is not always able to detect road users (Rumar, 1990). In some situations road users are presented at levels below the visual detection threshold. For example, at night, when contrast sensitivity is lower it is difficult to detect objects and people. The detection of objects may be enhanced due to brightness contrast. Reduced vision and contrast sensitivity at night can be overcome by use of retro-reflective materials (for example, high visibility jackets worn by cyclists or luminous road signs). Research conducted by Dahlstedt and Rumar (1973) emphasised that increased brightness contrast makes detection easier. They found that drivers were able to detect other cars more quickly and easily if they had their headlights on low (dipped) beam than if they had no headlights on. They also found that in some backgrounds certain coloured cars were easier to identify than others but the use of headlights, regardless of the colour of car or the background, was more effective at being detected. Therefore, as Rumar (1990) states, "*light intensity, rather than colour, determines detectability*".

Fergenson (1971) conducted a study that examined the relationship between accidents, traffic violations and information processing skills (reaction time). The results showed that subjects who had the highest accident records (3 or more accidents) processed information at a significantly lower rate (18.41 bits/sec) than non-accident involved subjects (32.38 bits/sec). Subjects, who had many violations, but no record of accidents, were the best information

processors (38.67 bits/sec). Fergenson's results therefore highlight the relationship between vehicle accidents and information processing.

Across situations the amount of information needed to be processed varies. When the amount of information exceeds the drivers' processing capacity, the likelihood of being accident involved increases (Fergenson, 1971). Drivers with lower information processing capacities can be frequently overloaded, and the more frequently this occurs the more they put themselves in high-risk situations, the greater their potential for being accident involved. Fergenson (1971) suggested that the reason non-accident involved violators score best on information processing ability is that due to their driving style they often put themselves in critical situations; but because their information processing capacity is not over-loaded, they are able to avoid accidents. These results need to be interpreted with caution as Fergenson (1971) only studied a small all-male population within a narrow age range.

Complex decision-making tasks such as driving require the ability to selectively attend to specific information (Arthur & Doverspike, 1992). Selective attention skills, or lack of them, can therefore identify high and low task performers. In a meta-analysis, Arthur, Strong and Williamson (1991) found a significant relationship between locus of control and accident involvement ($r = 0.20$) and between selective attention and accident involvement ($r = 0.26$).

Arthur and Doverspike (1992) investigated the validity of both locus of control and selective attention as predictors of accident involvement. They measured selective attention using a dichotic information-processing selective attention test known as the Auditory Selective Attention Test (ASAT), which predicted performance on several different complex real world perceptual-information-processing tasks. Their results showed that the ASAT was a better predictor of accident involvement compared to locus of control (measured using Montag & Comrey's (1987) 'Montag Driving Internality and Driving Externality Scale') as it was significantly correlated with the 1989 and 1990 combined total ($r = 0.24$), at-fault ($r = 0.20$) and not-at-fault ($r = 0.15$) collisions. It was also significantly related to the 1988 total ($r = 0.19$) and at-fault *(*$r = 0.23$) collisions and the 1990 not-at-fault collisions ($r= 0.20$). These results also found that internal locus of control rather than external locus of control scores were associated with the 1990 not-at-fault accident rates. Like Arthur et al. (1991), Arthur and Doverspike (1992) concluded that selective attention was a better predictor of driving accident involvement than locus of control.

Treat (1980) ranked human errors into four main types: recognition errors, decision errors, performance errors and other errors (inappropriate acquisition and processing of information from the environment) being the most prominent. Improper lookout and excessive speed were the two most frequently occurring driving errors followed by inattention, false assumptions, improper manoeuvres and internal distractions.

French, West, Elander and Wilding (1993) found that poor decision-making skills among inexperienced drivers correlated with higher rates of collision involvement. They investigated the decision making processes and driving styles used by a random selection of British drivers to ascertain if there was a relationship between decision-making style and road traffic accident liability. They researched aspects of general decision-making, not just decision-making whilst driving, and accident records over the previous three years. They found that, for those under 60 year of age, less thoroughness in decision-making (planning ahead, working out the pros and cons) and less planning in driving style (using a map, planning rest stops) were associated with higher accident rates.

French et al. (1993) also found that instinctiveness in decision-making (reliance on gut feelings), speeding and deviance in driving style (exceeding the speed limit, driving fast, running the lights and under-taking drivers) were associated with accident rates. Their study concluded that global decision-making style is carried into the driving domain and that reliance on instincts to form decisions should be reduced and thoroughness increased. This suggested that low thoroughness may be a reflection of a more global trait of impatience and that this may lead people to drive fast.

According to Hirsch (2003), whilst it is plausible that the majority of adolescents' accident involvement may be explained by their need to seek out thrills on the road, it may also be due to their miscalculation of their own collision risk. Hirsch (2003) believed that adolescents might not fully understand the potential losses that could occur from engaging in risk-taking behaviour. For example, whilst some adolescents may only consider speeding to be a legal sanction, others may understand that it is associated with an increased potential for injury.

Intentional risk-taking is also related to high accident involvement. Some prospective studies have found that drivers' collision likelihood can be predicted one to three years in advance by measuring their intentions and beliefs (Maycock, 1995; Rutter & Quine, 1996; West, Elander & French, 1993; West & Hall, 1997). A disregard for legal driving rules and regulations

among adolescents is often related to a driver's intentional risk taking behaviour (Hirsch, 2003).

Maycock (1995) researched the accidents experienced by a cohort of novice drivers during their first three years of driving. A number of different factors found during the early stages of driver training, and during the driving test itself, were associated with accident liability. Length of time learning to drive among men was associated with a reduced accident rate. For example, a male driver who had learnt for nearly nine years had an accident rate 28% lower than that of a male driver who had only learnt for two months. Gaining driving practice with friends was also associated with an 18% higher accident rate among male drivers. Maycock's (1995) results show that regardless of age, those who had received more professional tuition before taking their driving test had a higher accident liability compared to other drivers. The authors concluded that novices' inflated accident liabilities were due more to their inabilities than the type and quality of tuition they had received. Among female drivers, Maycock's (1995) results showed that females who had been taught by several instructors had higher accident liabilities. If females were taught by four or more instructors their accident liability was 63% higher than another female who had been taught by only one instructor.

Maycock (1995) found that errors made during driving tests, particularly those involving a lack of awareness (for example, inadequate observations while reversing, turning in the road or at junctions and disregarding other traffic or road users), were positively associated with both male and female drivers' accident liabilities. Manoeuvre errors made during the driving test (for example, errors made whilst moving off, reversing, turning in the road or stopping in an emergency) were also associated with higher accident liability but this was only significant among female drivers.

According to Maycock (1995) a willingness to violate informal codes of good behaviour (for example, failure to comply with signs, signals and markings) was strongly predictive of accidents for both genders. It was also found that among female drivers, self-reported errors of awareness and perception were positively associated with accident liability. High scores on violations were associated with increased accident liability in both men and women. Males scoring at the upper end of the violation scale (95^{th} percentile) had an accident liability 75% higher than those at the lower end of the scale. Females scoring at the upper end of the violation scale had an accident liability that was double the liability of those at the lower end.

Rutter and Quine (1996) looked at motorcyclists to see how beliefs and perceptions at 'Time 1' predicted self-reported riding behaviours one year later at 'Time 2'. At 'Time 1' half of the participants were sent a questionnaire designed using the Health Belief Model (HBM), which is widely used in health behaviour to explain changes and maintenance of behaviour and to guide interventions (Ogden, 2000; Rosenstock, 1966; Strecher & Rosenstock, 1997; Figure 3.1). The other participants were sent a questionnaire designed using the Theory of Reasoned Action (TRA; the predecessor of the TPB). Like the TPB and TRA, the HBM is a value expectancy theory where behaviour is considered to be the net result of calculations between the subjective value of an outcome and the subjective probability that an action will achieve that outcome (Ogden, 2000; Strecher & Rosenstock, 1997). The HBM prescribes that people will take action if they feel susceptible to a condition, perceive the consequences of the condition to be severe, believe that taking action would reduce their susceptibility or the severity of the condition and believe that the barriers to taking action are outweighed by the benefits (Ogden, 2000; Strecher & Rosenstock, 1997).

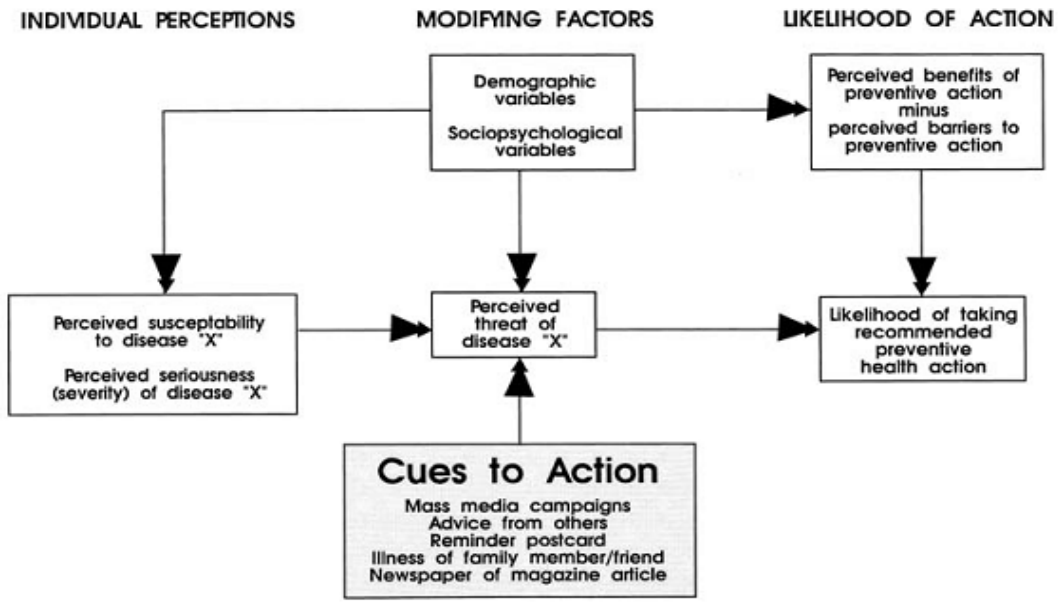


Figure 3.1 – The Health Belief Model (Rosenstock, 1966)

In Rutter and Quine's (1996) study the HBM and TRA questionnaires examined beliefs and perceptions regarding safe riding. The motorcyclists were organised into three age groups: 19 years and under, 20-24 years and 25 years and over. At 'Time 2' the youngest group had consistently higher rates of accident involvement and were three times more accident-involved than the oldest group. Regardless of how many years experience the drivers had, the youngest group always had higher accident involvement. These results show that age and accident involvement are not mediated by experience.

Two factors from the TRA predicted breaking the law and rules, namely: a negative correlation for obeying the law and rules and a positive correlation for taking care (showing consideration for other road users, wearing crash helmets, maintaining the bike and riding in the manner they were taught; Rutter & Quine, 1996). The HBM had five factors that predicted breaking the law and rules, namely: positive correlations for perceived vulnerability, benefits such as having fun and good bike performance and safety and a negative correlation for feeling safe and risk of accident. Both models accounted for between 27-34% of the r^2 variance in explaining breaking the law and rules.

Rutter and Quine (1996) concluded that young people were involved in accidents because of their age and not because they lacked experience. Regardless of age, they found that the factor "breaking the law and rules" measured at 'Time 1' was the most reliable predictor of accident involvement at 'Time 2', followed by "carelessness" (losing concentration, riding too close, bike maintenance and drink-riding). The Rutter and Quine (1996) study showed that behaviour could be predicted by beliefs measured approximately one year previously.

Path analysis of Rutter and Quine's (1996) data revealed that in the TRA model, age directly predicted behaviour (breaking the law and rules) but was also mediated by beliefs about obeying the law and rules (negative beliefs predicted behaviour). Regardless of age, beliefs about taking care whilst riding directly predicted behaviour. Rutter and Quine (1996) believed that these results showed that young motorcyclists behave less safely than older motorcyclists as a direct result of their age but also indirectly via their negative beliefs in obeying laws and rules. However, irrespective of age, positive beliefs about taking care whilst riding also predicted behaviour. They explained this unusual result by stating that beliefs in taking care could lead to over-confidence, risk compensation or breaking laws to avert danger.

A second path analysis on Rutter and Quine's (1996) data revealed that in the HBM there was also a direct effect of age on behaviour and indirect effects via three beliefs: beliefs in the benefits of feeling safe, about having fun and the costs of risking an accident. Irrespective of age, perceived vulnerability and benefit of performance and safety directly predicted behaviour. Their results show that as age increases, there is a need to feel safe and there are more barriers towards engaging in risky behaviours. The safer a subject felt, and the more the risks of accident are perceived, the less likely it is that individuals will engage in breaking the rules and violations. With increasing age there is also a decrease in perceived benefits about

having fun whilst motorcycling and this leads to an increase in breaking of the law and rules. Increasing age has a direct effect on breaking the law and rules, with older age groups engaging in less of this behaviour.

The Rutter and Quine (1996) study showed that behaviour (and ultimately accident liability) can be predicted from beliefs measured at least one year before the behaviour is self-reported. Their results also show that youth is more influential than experience and that collisions are associated with a willingness to break the rules and violate safe driving rules. Beliefs play a mediating role between age and behaviour and are the strongest paths compared to direct paths between age and behaviour. They therefore concluded that age produces beliefs that create particular behaviours. This is evidence to suggest that desirable beliefs need to be created and moulded as early as possible, possibly even before learning to drive.

Social psychological theories such as the Theory of Planned Behaviour (TPB - Ajzen 1991), Risk Homeostasis Theory (RHT - Wilde 1982, 1994[ab], 2001) and Problem Behaviour Theory (PBT - Jessor, 1987[ab]) are often used by researchers and road safety professionals to try and explain intentional risk-taking, because these models assume that intentions and beliefs predict behaviour.

Unintentional risk-taking behaviour occurs outside of the driver's direct awareness or control, thus Ranney (1994) believed that since driving can become habitual or automatic, risky driving habits might develop unintentionally. Consequently this could explain why some drivers are more prone to errors and lapses in their cognitive functioning than others (Elander, West & French, 1993). Personality traits such as impulsiveness; sensation seeking; and emotional instability can lead to increased unintentional risk-taking in adolescence as it is possible that adolescents are unable to understand or control their own risk-taking behaviour (Hirsch, 2003). This is particularly apparent in those who are sensation seekers, or those who have personal problems, who do not view their behaviour as being risky and therefore continue to engage in risky practices (Irwin & Millstein, 1986; Jessor, 1987[ab]).

3.6 Sensation Seeking and Driving

Sensation seeking and risk are closely related, which is summarised succinctly by Tillman and Hobbs (1949) who said, "*people drive as they live*". Two of Costa and McCrae's (1985) 'Big Five' personality factors, Extraversion and Openness have shown very strong relationships to sensation seeking (Aluja, Garcia & Garcia, 2003). In the revised Neuroticism-Extroversion-

Openness Personality Inventory **(**NEO-PI-R) (Eysenck, 1990), a 240-question psychological personality inventory is used to measure the big five personality measures. These traits include: Agreeableness, Conscientiousness, Neuroticism, Openness to Experience and Extraversion (including excitement-seeking behaviour as an inherent primary trait).

The personality trait of sensation seeking has been defined by Zuckerman (1979) as "*the pursuit and taking of risks leading to increases in the experience of a variety of new sensations*". It has been conceptualised in two different models by Zuckerman (1979) and Arnett (1994). Zuckerman developed the Sensation Seeking Scale form-V (SSS-V) and Arnett produced the Arnett Inventory of Sensation Seeking (AISS). Both of these models agreed that there is a biological pre-disposition to engage in sensation seeking, however, Arnett believed that the concept could be extended further.

The proposed extension emphasised that as well as sensation seeking being characterised by a need to seek out new and novel experiences, a desire for intensity of sensory experiences should also be included (Arnett, 1994). Arnett also highlighted that socialisation and the environment effect the expression of sensation seeking by shaping and guiding it. For instance, in a narrow and restrictive environment, sensation seeking behaviour is often suppressed.

Sensation seeking provides a potential link between norm-breaking behaviours and biological processes (Rosenblitt, Soler, Johnson & Quadagno, 2001). For example, a relationship has been found between sensation seeking and a variety of risky behaviours (Arnett, 1994). Using the AISS, Roth (2003) found that 'Intensity' in sensation seeking predisposed people to frequently change workplaces. Andrew and Cronin (1997) found that alcohol frequency and binge drinking were predicted by 'Intensity' in sensation seeking. Andrew and Cronin (1997), Arnett (1994) and Roth (2003) were however all unable to find a significant relationship between risk behaviour and the 'Novelty' Scale. Roth (2003) said that "*the validity of this* [Novelty] *subscale must therefore be viewed with some scepticism*". However, Mallet and Vignoli (2007) found that 'Novelty', along with 'Intensity' and a measure of impulsiveness, were significant predictors of substance use in females. They also reported a significant relationship between 'Intensity' and risk behaviours such as "*driving without lights*", "*driving without helmets*" and "*driving without a licence*". Consequently as well as the ability to seek out 'Intensity' and 'Novelty' in experiences, the defining feature of sensation seeking is a willingness to take risks (Zuckerman 1979).

Deviant behaviour can be considered as a reflection of sensation seeking tendencies (Deery & Fildes, 1999; Newcomb & McGee, 1991), and has been labelled by Trimpop and Kirkcaldy (1997) within two subscales of Zuckerman's Sensation Seeking Scale Form-V (SSS-V). These are Thrill and Adventure Seeking (TAS) and Dis-inhibition (Dis), both described as 'risk-orientated' personality variables as they relate to, and are predictive of, 'moving violations' on the road.

In addition to being related to anti-social risk behaviours, such as risky driving and drug usage, sensation seeking has been linked to socially acceptable forms of risk behaviour, such as participation in high-risk sports and gambling. For example, the risk and uncertainty involved with gambling could be considered highly arousing. According to Zuckerman's Arousal Theory (McDaniel & Zuckerman, 2003), situational factors such as these attract sensation seeking personalities. McDaniel and Zuckerman (2003) found confirmation of this in their study on gambling and sensation seeking, where the high sensation seekers participated in a much greater range of gambling activity compared to low sensation seekers. Once the term sensation seeking has been applied to a particular behaviour, it is therefore important not to automatically assume that the behaviour is norm-breaking or anti-social (Arnett, 1994).

Impulsivity and sensation seeking have been linked as they both predict the same kinds of behaviours (Zuckerman, 1994). For example, based on the premise that gambling is a form of sensation seeking, several studies have shown that impulsivity is linked to gambling related attitudes and behaviour (Breen & Zuckerman, 1999; Vitaro, Arseneault & Tremblay, 1999). The nature of gambling involves a lack of advance planning and, occasionally, an under-estimation of the risks involved. This therefore demonstrates that there is a link between sensation seeking, impulsivity and gambling.

Impulsive Sensation Seeking (ImpSS) was included in Zuckerman and Kuhlman's (2000) sensation seeking scale, forming part of the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ). The results of this study show that there is a link between impulsive sensation seeking and a number of risky behaviours such as drinking and smoking. As young people are often stereotyped as being impulsive, it is entirely possible that the co-occurrence of impulsivity and sensation seeking traits could be linked with risky driving behaviour.

Impulsive sensation seeking has been found to decline with age in both men and women (McDaniel & Zuckerman, 2003). Compared with adults, adolescents show higher levels of sensation seeking (Arnett, 1994); with the 16-24yr age group being most susceptible to risk-taking (Trimpop & Kirkcaldy, 1997). Higher levels of sensation seeking in adolescents also correlated with aggression (0.32); juvenile drivers were found to tend towards thrill seeking and adventurous behaviour (Renner & Anderle, 2000; Zuckerman 1994). Sensation seeking has also been found to predict alcohol use among adolescents and young adults (Brook, Brook, Gordon, Whiteman & Cohen, 1995).

Offenders convicted of driving at high speed and/or of reckless driving offences have been shown to score higher on personality traits such as Psychoticism and Thrill and Adventure Seeking (from SSS-V) and lower on traits such as Neuroticism and Boredom Susceptibility (from SSS-V; Furnham & Saipe, 1993). These findings are consistent with Renner and Anderle's (2000) study which found that people scoring higher on Psychoticism were characterised by a low degree of socialisation, disregard for rules, insensitivity to the feelings of others and a tendency to accept high-risks in daily life. Psychoticism refers to anti-social behaviour and is described by Eysenck and Eysenck (1976) using terms such as "hostile" and "troublesome". Traffic offenders also scored particularly higher on traits such as extraversion and venturesomness. They were characterised by a tendency towards impulsive anti-social acts, thrill and adventure seeking, and failing to consider the consequences of their behaviour (Renner & Anderle, 2000).

Several studies have shown a link between risky behaviour and levels of hormones such as testosterone and cortisol (Bogaert & Fisher, 1995; Daitzman & Zuckerman, 1980; Netter, Henning & Roed, 1996). The first report of the link between testosterone and sensation seeking used an earlier version of Zuckerman's Sensation Seeking Scale (Daitzman, Zuckerman, Sammelwitz, & Ganjam, 1978). Dabbs and Morris (1990) and Mazur (1995), found a positive association between testosterone and risk behaviours such as gambling, alcohol use and multiple sex partners. Rosenblitt et al. (2001) studied the relationship between sensation seeking, testosterone and cortisol. They aimed to show that the variability in scores on Zuckerman's Sensation Seeking Scale Form-V (SSS-V) was affected by the variability in individuals' hormone levels (measured by taking saliva samples).

Although the results of this experiment supported the existence of a significant inverse relationship between cortisol and sensation seeking in men, it failed to show a link between

sensation seeking and testosterone levels in either gender. The link between sensation seeking and testosterone remains therefore somewhat tenuous. For this reason, male's higher testosterone levels cannot be used as a sound explanation for their increased sensation seeking behaviour.

Cortisol is a steroid produced by the adrenal cortices and is released when the body is physically or psychologically stressed. This steroid should, therefore, be present when people engage in risky behaviours (Berne & Levy, 1998; Kirschbaum & Hellhammer, 1994). Surprisingly Mazur (1995), in a study of male veterans, reported a negative correlation between cortisol and risk-taking behaviours. The explanation given for this was that people who are accustomed to deviant and norm-breaking behaviours have lower levels of cortisol and engage in more risk-taking behaviours. In contrast, unaccustomed "*nervous*" risk-takers have higher cortisol levels. This inverse relationship has been supported in a number of further studies (Netter et al., 1996; Wang, Mason, Charney, Yehuda, Sherry & Southwick, 1997).

A difference between high and low sensation seekers has also been found among males and females in a study conducted by Jonah et al. (2001). High sensation seeking women drivers reported enjoying overtaking cars more than low sensation seeking women. They were also more likely to drive faster on highways. High sensation seeking male drivers, on the other hand, were observed to drive after drinking more than low sensation seeking males. They were also observed to make more rude signs at other drivers, to drive closer behind vehicles and to drive faster on highways and wet roads.

Gender differences in sensation seeking may be linked to differences in socialisation. Generally females are brought up to repress sensation seeking and risk taking behaviours, whereas males learn to express them through participation in high contact sports such as rugby and football. Various studies into gambling, for example, have shown that males display more favourable attitudes towards gambling, report a greater interest in this activity and participate in it more than females (Chantal, Vallerand, & Vallieres, 1995; Kassinove, 1998; McDaniel & Zuckerman, 2003). Males have also been reported to score higher on risk-taking, perceive lower risks in potentially threatening situations and are involved in more accidents on the road (Tränkle et al., 1990). One important thing to note is that over time the boundaries which have in the past defined typical male and female behaviour have become blurred and both genders are now displaying traits traditionally portrayed as being displayed

by the opposite sex (Adler, 1975; Siegel, Welsh, & Senna, 2005). To this extent evidence from studies and crash statistics have shown that female drivers are beginning to catch up with male drivers and are taking greater risks on the road (Finken, Jacobs, & Laguna, 1998; kostynuik, Molnar & Eby, 1996; Moore, 1994; Popkin, 1991; Shapiro, Siegel, Scovill, & Hays, 1998).

Farley (1973) found a link between sensation seeking, delinquency and creativity in individuals. It was postulated that individuals from low socio-economic backgrounds do not have access to the same outlets for pro-social and anti-social tendencies. This implies, therefore, that the environment to which an individual is exposed may provide an outlet for sensation seeking, be it pro-social or antisocial.

People enter into relationships with individuals who are similar in their preferred activities, beliefs and attitudes. Couples tend to resemble each other in their level of sensation seeking (Thornquist, Zuckerman & Exline 1991). Research conducted by Thornquist et al. (1991), and Lesnik-Oberstein and Cohen (1984), have shown high sensation seeking correlations between spouses (0.38 and 0.46 respectively). Spouse correlations for personality range from 0.10 to 0.20 (Ahern, Johnson, Wilson, McClearn & Vandenberg, 1982). Since sensation seeking is believed to be an inherited trait, parents and offspring are often being jointly studied to identify what is inherited from the parents.

Fulker, Eysenck and Zuckerman (1980) in their study of 442 twins, reported that 58% of the variance in the sensation seeking trait was heritable. The remaining 42% was a product of environmental influences and errors in measurement. Bratko and Butkovic (2003) found that sensation seeking scores of parents and offspring are correlated. The correlations ranged between 0.16-0.33, with the upper limit of heritability being between 32-66%.

It is believed that the development of sensation seeking in children, as well as being linked to genetic inheritance, can be encouraged by parental behaviour. Using the Parental Behaviour Scale (PBS), Bratko and Butkovic (2003) found that offsprings' sensation seeking levels could be linked to the level of parental control that they receive; high sensation seeking children had significantly less parental control. With regards to driving behaviour, these studies would appear to suggest that by increasing parental control, and therefore parental involvement, sensation seeking behaviour among their offspring could be reduced which could ultimately lead to a reduction in their risk-taking behaviour on the roads.

Jonah (1997[b]) reported that out of 38 studies exploring the relationship between sensation seeking and risky driving behaviours, only four studies failed to find a positive connection (between 0.30-0.40). Not only could sensation seeking affect the way drivers perceive and respond to risks, it could also moderate the adaptation of sensation seekers to changes in perceived risk within their driving environment.

Jonah et al. (2001) found that high sensation seekers engage in significantly more risky driving behaviour and exhibited greater aggressive behaviour. They also demonstrated that high and low sensation seekers showed no significant differences on age, gender, annual kilometres travelled, college attended or socio-economic status. High sensation seekers were more likely to: not wear seat belts, drive 120Km/h or faster on a highway if there was no speed limit, drive while they thought their blood alcohol level was over the legal limit, drink between two and seven times each week, believe that they could safely drink five or more drinks before their driving ability was impaired, and consider that the chances of an impaired driver being caught by the police was low. They were also more likely to have committed a traffic violation within the last two years. There were however no apparent differences between high and low sensation seekers in the number of collisions that they were involved in during the preceding two years.

Jonah et al. (2001) also found a link between sensation seeking and aggressive driving (speeding was included in their definition of aggressive driving). High sensation seekers liked to: beat other drivers away from traffic lights, found it fun to weave through traffic, liked overtaking other cars, found driving at speeds exciting, and were more likely to drive fast on highways and wet roads. They reported enjoying outsmarting other drivers and frequently lost their temper whilst driving (including behaviour such as swearing at other drivers). When it came to not being provoked or being angered easily whilst driving, there were only marginal differences between high and low sensation seekers.

Ward, Fairclough and Humphreys (1995) found that high sensation seekers take advantage of devices such as Adaptive Cruise Control (ACC) (which normally controls speed and maintains safe following distances) by driving at higher peak speeds compared to low sensation seekers with lower levels of arousal and effort. Jonah et al. (2001) found that high sensation seekers were more likely to indicate the need to drive in a risky manner if they thought that their car was equipped with an Automatic Braking System (ABS). Jonah et al.

(2001) point out that, even if a safety measure improves 80 or 90% of the driving population, the effectiveness of the new safety measure will be lost by the behavioural adaptation of the remaining 10-20% who are likely to be high-risk drivers and at greater risk of involvement in collisions.

A positive relationship has also been found between sensation seeking and attitudes towards committing violations on the road showing that high sensation seeking drivers hold more positive attitudes towards the commission of violations (Yagil, 2001).

3.7 Social Deviance and Driving

Another popular explanation for why the majority of young people are high-risk drivers is that they are individuals who generally engage in several different high-risk behaviours simultaneously. The Problem Behaviour Theory (PBT) as originally posited by Jessor and Jessor (1977) was created to explain the relationships between psychosocial characteristics and problem behaviours.

The PBT classifies behaviours as conventional and encouraged or problematic and prohibited. The theoretical model recognises that problem behaviours normally co-occur and that the motivations for involvement or avoidance of problem behaviours come from the Perceived Environment and Personality Systems (Figure 3.2). The major premise is that all behaviour is the result of person-environment interaction (Jessor, 1987[a]).

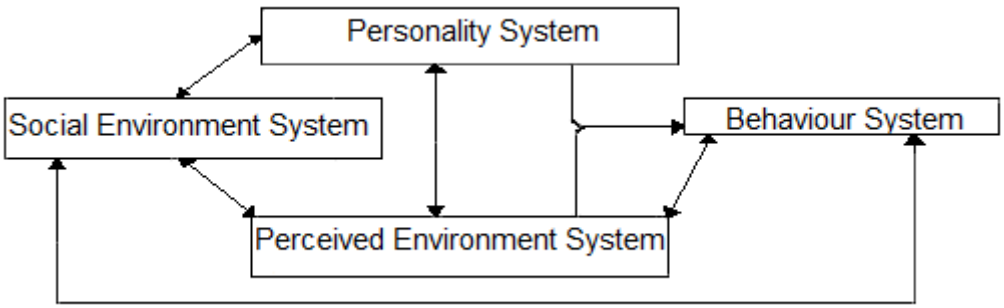


Figure 3.2 – Problem Behaviour Theory (Jessor, Donovan & Costa, 1991)

The PBT is composed of four connected systems: Social Environment System, Personality System, Perceived Environment System and Behavioural System (Jessor, 1987[ab]). The Social Environment System is concerned with the social influences (e.g., peer influence, media influence) that may have an impact on individuals. The Personality System consists of

variables that reflect social meanings and developmental experience. These socio-cognitive variables include: values, expectations, beliefs, attitudes and orientations to self and others. The Perceived Environmental System consists of social norms, expectations, models, sanctions and controls. The Behaviour System consists of two structures representing problem behaviour and conventional behaviour. The conventional behaviour structure includes behaviours oriented toward church and school, which are two conventional institutions of society.

The PBT views risky driving as one of a cluster of problem behaviours, such as delinquency or problem drinking that characterise adolescence. Research conducted in Canada on a group of year 9, 10 and 11 adolescents by Beirness and Simpson (1988) found that risky driving emerged as part of a more general adolescent lifestyle associated with the same set of social, psychological, and behavioural variables as other problem behaviours. A prominent characteristic of this lifestyle was a tendency toward risk-taking and thrill seeking.

Problem behaviours were linked to high-risk driving behaviours and crashes by Bingham and Shope (2005) who found that high crash rates among males were associated with less parental monitoring (supervision) and substance abuse. Low crash rates among males, on the other hand, were linked to better school grades. In females, high crash rates were associated with less parental monitoring, poor school grades, substance abuse and less parental orientation. West, Train, Junger, Pickering, Taylor and West (1998) have also identified a relationship between problem behaviour, risky road behaviour and traffic and non-traffic accident rates in pre-driving adolescents. Adolescents under 15 years of age who reported engaging in problem behaviours (e.g., stealing from shops, breaking into gardens/houses/buildings, using illegal drugs, drunk alcoholic drinks) also reported engaging in risky road behaviours (e.g., crossing the road without looking, running across the road without looking) and were involvement in significantly more traffic (as pedestrians or cyclists) and non-traffic (e.g., falling from a height, playing with matches, playing with or using a knife or sharp object) related accidents.

Jessor (1987[ab]) concluded that problem behaviours such as delinquency, problem drinking and illicit drug use share the same set of personality, perceived environment and behavioural variables. This is a view also shared by West et al. (1998) who found that personality measures of danger seeking, impulsiveness and aggressiveness (through frustration) were all associated with both risky road behaviour (e.g., crossing the road without looking, running

across the road without looking) and problem behaviour (e.g., stealing from shops, damaging or vandalising cars/buildings/public property, using illegal drugs). Jessor (1987[ab]) suggested that because problem behaviours share the same set of variable it is entirely possible that interventions designed to reduce another form of problem behaviour may also reduce the occurrence of risky driving and crash risk. Bingham and Shope (2004) suggested that individual characteristics associated with patterns of crash risk could also be identified and addressed through these behavioural programs.

Another method of counteracting problem behaviour was put forward in the Social Control Theory (SCT) (Hirschi, 1969). The SCT predicts adolescent behaviour and posits that adolescents would fail to conform to the rules and norms of society without adequate motivation. People who become affiliated with conventional social institutions (e.g., school and religious establishments) have the opportunity to develop stable relationships with other institutional members. This type of social bond would provide individuals' with the adequate motivation needed to conform to social rules. Thus the rationale behind encouraging young people to become affiliated to clubs and societies is that they would have more to lose from behaving anti-socially. The stronger the social bonds the more unlikely it is that individuals will break social rules and risk damaging connections with people and institutional ties (Bingham & Shope, 2005, 2004; Jessor et al., 1997).

Social deviance has been linked to risky traffic-related behaviour in young children (West et al., 1998). West et al. (1998) found that a reduction in adherence to responsible social values (e.g., not wanting to obey the law, disregarding other people's feelings) was synonymous with an increase in problem behaviour and risky road behaviour. Therefore, they suggested that interventions designed to raise standards of social responsibility, change attitudes and habits may be more effective in reducing traffic accident rates among children and young people than interventions that focus only on improving their road user knowledge and skills. The personality dimension social deviance has also been linked with risky driving practices and accidents in adults and new licensed adolescent drivers (Robins, 1966; West & Hall, 1994). Bingham and Shope (2005) suggested that interventions that encourage the development of positive relationships between adolescents and social institutions may reduce young driver crash risk.

In a longitudinal study covering 1988-1991, West et al. (1993) examined the role of social deviance in traffic accident risk. At 'Time 1' (1988/89) self-reported measures of

thoroughness, accident risk, driving speed, driving violations, annual mileage, age and gender were taken. At 'Time 2' (1990) self-reported measures of mild social deviance, Type-A behaviour patterns (people who display aggressive and competitive behaviour), driving speed and driving violations were taken. At 'Time 3' (1990/1991) self-reported measures of thoroughness, speed, driving violations, accident risk and annual mileage were taken. These results showed that social deviance, measured approximately 12 months previously (at 'Time 2'), was positively correlated with average scores on driving speed and deviant driving and negatively correlated with age and average score on thoroughness. This suggested that those scoring high in social deviance drove at faster speeds, committed more driving violations, were less thorough in their decision making and were young drivers. Thoroughness was also negatively correlated with speed (i.e. the less thorough, the higher the driving speed). Drivers with Type-A personalities also drove faster.

The numbers of accidents reported over the three-year study were found to be positively associated with average scores on annual mileage, faster driving, social deviance, age, thoroughness and driving deviance. Although average scores were used, the re-test reliability after two years of measurements for thoroughness, speed, driving deviance and annual mileage were between 0.5-0.7 (although it was only 0.3 for driving deviance), which shows that there was a degree of stability over time. West et al. (1993) suggested that even by looking only at the measures taken at 'Time 1' the results would be the same. Therefore they concluded that it is possible to predict behaviour up to three years previously.

West and Hall (1997) assessed attitude to driving violations, social deviance, driving speed, annual mileage and accident rate (accidents over the previous three years). The results showed that attitude towards driving violations correlated closely with fast driving compared to social deviance. Speed and attitude towards driving violations were associated with accidents in general, active accidents (where the driver was at fault), active shunts and active reversing accidents. Attitude to driving violations was also associated with active loss of control accidents and social deviance was associated with accidents in general, active accidents and active shunts. Active accidents were linked to attitudes towards driving violations through driving behaviour. Social deviance contributed to accident risk through its association with attitudes towards driving violations.

West and Hall (1997) believed that the relationship between active shunts (which they defined as a minor accident such as hitting another vehicle from behind), attitudes and social deviance

reflected a consistent pattern of reckless and careless driving. They concluded that drivers who have more positive (high-risk condoning) attitudes towards driving violations and higher levels of social deviance, drive faster and report more accidents. These researchers stated that attitudes towards violations and social deviance were measures that could be taken before an individual has passed their driving test in order to identify future high-risk drivers.

Irwin and Millstein (1986) believed that both the lack of cognitive ability and the absence of life experiences among teenagers underlie all adolescent risk-taking. This is because without both of these core attributes adolescents are unable to understand the risks associated with behaviours. Some adolescents, however, may choose to engage in risk-taking behaviour because they have problems with early or late physiological development. Irwin and Millstein (1986) suggested that the timing of biological maturation has a direct influence over psychosocial factors (cognitive scope, self-perceptions, perceptions of the social environment and personal values). These factors can predict risk-taking behaviour via the effects of peer group characteristics and risk perception. For example, Irwin and Millstein (1986) described how an early developer would be more likely to be cognitively immature and have a poor self-image because they are different to others and perceive a pressure to act older by adults. Ultimately early developers' peer-group selection would be affected as they would be more likely to choose older friends with different values; also their perception of risk may be unrealistic because of their immaturity. Irwin and Millstein (1986) therefore believed that bio-psychosocial factors might provide adolescents with a strong incentive to engage in risk-taking behaviour.

Jessor (1987[ab]) also linked psychosocial factors with the occurrence of high-risk problem behaviour in the Problem Behaviour Theory (PBT). Jessor (1987[b]) stated that "*adolescent problem behaviour is functional, meaningful, purposeful and instrumental, rather than being arbitrary, pathological, or merely perverse*". For example, problem behaviours such as drinking or risky driving can serve a number of functions that are central to normal adolescent development (for instance showing commonality with peers and affirming independence from parents). The PBT shows that some adolescents are more prone to problem behaviours than others and as such engage in intentional and/or unintentional risks (for example, youths prone to problem behaviour place a low value on achievement, have low self-esteem and a high value on independence; Jessor, 1991[ab]). Jessor (1987[ab]) found that risky driving is linked with a wide-range of problem behaviours (for example, drinking, delinquency, drug use, cigarette smoking and sexual precocity) and is part of a syndrome of behaviours that characterise

adolescence. Therefore, youths engaging in one form of behaviour are likely to engage in another form of problem behaviour.

Wilde (1994[a]) stated that young drivers have less to lose from risky driving; they have fewer responsibilities, fewer accomplishments and much more to gain from risky driving behaviour. These gains include peer approval and expression of independence (Lonero & Clinton, 1997[a]). To some extent this can be considered true as Jessor, Turbin and Costa (1997) and Bingham and Shope (2005) identified conventionality among adolescents as an indicator of problem behaviour. By conventionality, Jessor et al. (1997), and Bingham and Shope (2005), meant that adolescents who are connected to social institutions, hold social responsibilities and hold beliefs in line with the values of conventional society are less likely to engage in problematic behaviour. Thus adolescents with greater conventionality are less likely to engage in problematic behaviour (Bingham & Shope, 2005).

From Jessor et al.'s (1997) theory it may be inferred that youths may not always be aware that the behaviour they are engaging in is high-risk, because they have normalised it. Whilst the first occurrence of problem behaviour such as risky driving may be intentional, after a short period of time the behaviour is likely to have become normalised by the individual. The individual may therefore not see their behaviour as high-risk and thus unintentionally continue to engage in it or in other forms of such behaviour. Sensation seekers may not be aware that their behaviour is risky, again because they have normalised the behaviour. Jessor (1987[a]) stated that "*risk-taking whilst driving in traffic is not a unique behaviour, but reflects a more general tendency toward thrill-seeking*".

3.8 Young Drivers' Attitudes

Attitudes function as heuristics that influence interpretations, explanations, reasoning and judgments of situations (Aronson, 2004), they are crucial for helping us to make sense of the world in which we live. In complex situations attitudes selectively interpret and perceive objects in order to aid comprehension. They are also important because they allow individuals' to express their feelings and personal evaluations towards target objects or events (Ajzen & Fishbein, 1977).

Put simply, attitudes are likes and dislikes towards target objects or events. They are a collection of salient beliefs about the relationship between specific behaviours and outcomes and evaluations of these outcomes (Yagil, 2001). They are "*complex*" (Thurstone, 1928),

multi-faceted constructs that are created by combining an individual's opinions or beliefs regarding specific target objects with their evaluative judgments of them (Ajzen & Fishbein, 1977; Crites, Fabrigar & Petty, 1994).

According to Allport (1935), attitudes are "*mental and neural states of readiness*". They exert a "*directive or dynamic influence upon individuals' responses to all objects and situations with which they are associated*". They are far more difficult to change than opinions (Aronson, 2004). This is because they are learnt, enduring feelings that are deeply rooted in the individual (McGuire, 1968).

Attitudes are composed of three independent, but also inter-related, components according to the Rosenberg & Hovland (1960) Tripartite Model (Figure 3.3; Arnold, Robertson & Cooper, 1991; Bernstein, Roy, Srull & Wickens, 1998; Crites et al., 1994; Eysenck, 1998; Marold, Kosaka & Larsen, 1994; Worchel & Shebilske, 1986). These components are: cognitive, affective and behavioural. The cognitive or belief component is concerned with how target objects are perceived by an individual, producing and storing statements that express their beliefs (for example, the cognitive component is where an individual evaluates how easy or difficult, adequate or efficient something is). The affective or evaluation component, places positive or negative meanings on these target objects or events (for example, this is an individuals' instinctual response about their likes and dislikes). Physiological responses also reflect these positive or negative evaluations. Finally, the behavioural or action component is concerned with observable behaviour towards target objects/events and beliefs about how others should act towards them (for example, this is an individuals' readiness or predisposition to behave in a certain way).

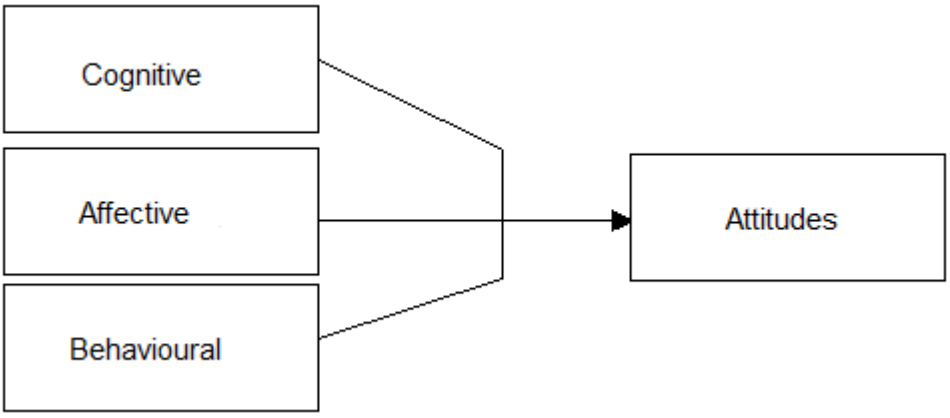


Figure 3.3 – The Components of the Tripartite Model of Attitudes (Rosenberg & Hovland, 1960)

These components form attitudes, which according to Katz (1960) serve four functions namely knowledge, utilitarian (or instrumental), value-expressive and ego-defensive (Figure 3.4). They serve a knowledge function by helping people to try and understand the world in which they live. For example, they organise and construct information and provide frames of reference that guide information processing (Eysenck, 1998; Gross, 1992). Attitudes also serve a utilitarian or instrumental function by helping people to achieve goals, seek rewards and avoid punishment. For example, some individuals may publicly express attitudes which they do not believe in, to comply with other people and seek their approval (Eysenck, 1998; Gross, 1992).

Attitudes are also value-expressive because they are statements about who people are, and validate self-confidence. For example, a sense of personal integrity means that it is important for individuals' to maintain and demonstrate their core values and standards (Eysenck, 1998; Gross, 1992). Attitudes are also employed by people to protect themselves from admitting their own personal deficiencies and thus help them to deny their self-knowledge (Eysenck, 1998; Gross, 1992). Consequently, attitudes have an ego-defensive function.

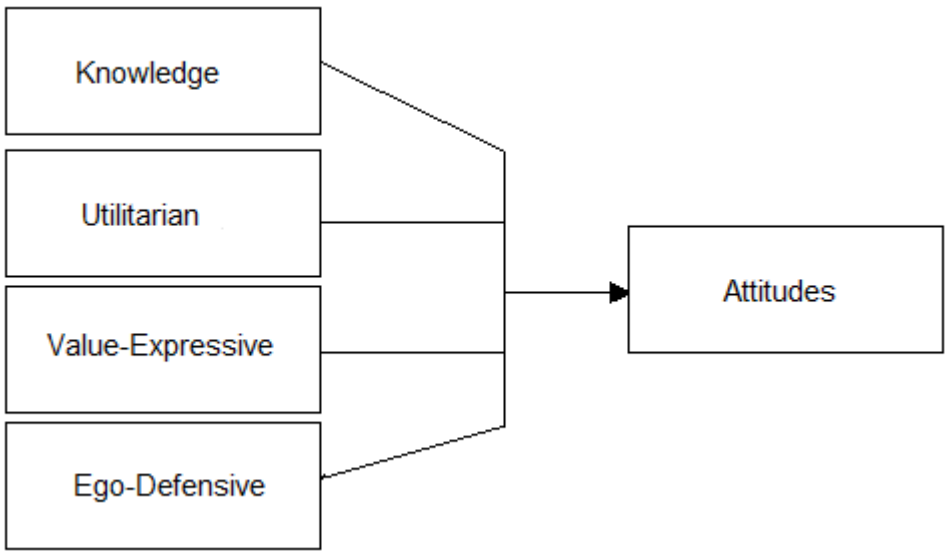


Figure 3.4 – The Four Functions of Attitudes (Katz, 1960)

The 'expectancy-value model' states that behaviour is a function of the expectancies held by individuals and the value they place on the goals they are working towards (Figure 3.5; Palmgreen 1984). It proposes that as new beliefs are being formed about objects and events, evaluative meanings also develop spontaneously without any conscious effort. These beliefs are also associated with attributes. The subjective value of these attributes along with the

strength of their associations help to determine overall attitudes. Ajzen (2001) states, however, that the cognitive processes involved in attitude formation may be misrepresented by assuming that belief and evaluation interact. The importance of assessing attribute evaluations independently of their link to attitude objects is therefore stressed by Ajzen (2001). This view is supported by Sjoeberg and Montgomery (1999) who proposed that beliefs and values might be independently related to attitudes (Double denial).

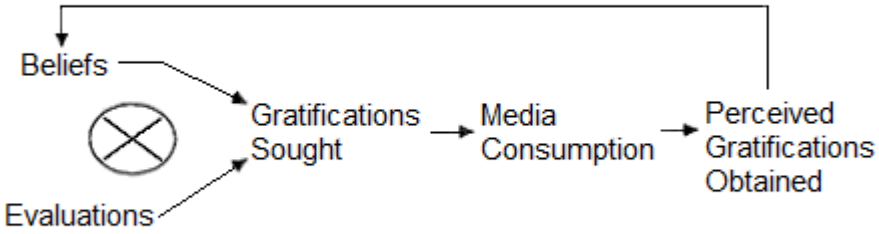


Figure 3.5 – The Expectancy Value Model (Palmgreen, 1984)

It has also been suggested in the 'affective primacy hypothesis' that affective processes control evaluations, and that affect presides over cognition (Zajonc, 1980). This model proposes that the affective and cognitive systems are separate and are to some extent independent of each other even though both systems usually function together. The affective system, however, could start functioning without prior cognitive processing. For example, Winkielman, Zajonc and Schwarz (1997) found that affective priming was unaffected and independent of cognitive processes such as attributional judgements.

According to the multi-component view of attitudes, both cognition and affect contribute to attitude formation (Eagly & Chaiken, 1993; van der Pligt, Zeelenberg, van Dijk, de Vries, & Richard, 1998). Verplanken, Hofstee and Janssen (1998) reported that affect and cognition differ in accessibility and that affect is far more easily accessible in memory than cognition. For example, when participants were given affective and cognitive judgments, Verplanken et al. (1998) found that they responded quicker to affective judgments. Experience with attitude objects influences the importance of affect and cognition (Simons & Carey, 1998). With increased experience, the importance of affect as a predictor of attitudes becomes greater.

Individuals are thought to differ in their tendency to base attitudes on cognition or affect (Haddock & Zanna, 2000, 1998). People whose attitudes can be predicted by their beliefs are

classified as "*thinkers*", whereas those whose attitudes can be predicted from their feelings are known as "*feelers*" (Haddock & Zanna, 2000, 1998). It has been suggested, however, that some objects require attitudes to be formed by affect more than cognition whereas the opposite is true for other objects (Kempf, 1999).

Attitudes are related to personality and temperament, which are part of our genetic make-up. Studies have found that identical twins share more attitudes than fraternal twins even when they have been raised separately (Tesser, 1993). Therefore the evidence from such studies has led to the suggestion that attitudes could be genetic in origin. Worchel and Shebilske (1986) however disagree; they believe that there is plenty of evidence to show that humans are not born with attitudes, because people have attitudes for events and objects that they may never have encountered. Therefore, although some people view attitudes as being genetic, others believe that social influences and experience play a primary role in attitude formation.

Attitudes are based on cognitive, affective or behavioural experiences but some are based more on one experience than another (Aronson, Wilson & Akert, 1999). This therefore suggests that attitudes are not created equally. For example, sometimes people base their attitudes purely on facts (cognitively based attitudes), and evaluate the positive and negatives of attitude objects so as to arrive at a decision about what attitudes to hold. On other occasions, attitudes may be based more on emotions and values (affectively based attitudes), so that individuals can express and validate their own basic value systems. Attitudes may also be based primarily on behaviour (behaviourally based attitudes), forming attitudes by observing how individuals behave towards attitude objects.

Worchel and Shebilske (1986) suggest that attitudes come from four main sources: parents, peers, personal experience and the media. Parents have a profound influence on their children and it has been found that many individual's beliefs reflect those of their parents. Parents influence their children by rewarding and punishing them for good or bad behaviour (a form of operant conditioning), but they also control what information reaches their children (Kail & Cavanaugh, 2007; Worchel & Shebilske, 1986). Children often tend to believe that what their parents say is correct and accept this information without questioning it. This is why parents have a strong and lasting influence on their children. Attitudes formed during childhood and adolescence tend to persist throughout life as individuals will tend to only seek out new information that supports their original views and ignore conflicting information (Worchel & Shebilske, 1986). Peers are also influential when it comes to attitude formation. The threat of

being rejected by peers means that individuals will try to adopt attitudes and behave in ways that are consistent with their peers in order to gain group acceptance. Peers supply individuals with new information and ways of looking at things (Worchel & Shebilske, 1986).

Personal experience also affects how attitudes are formed. According to Olson and Zanna (1983), many of our strongly held attitudes, which are the most difficult to change result from having personal experience with attitude objects. For example, it is far easier to trust our own personal experiences and to over-generalise from them, than it is to get reliable information second or third-hand from other people that can be trusted.

The media are also very influential in forming and strengthening attitudes because frequently, they are the only source of information about events (Matzopoulos, Myers & Jobanputra, 2008; Shope, 2006). They are powerful mainly because of their ability to reach and influence a large number of people (Curran, 2002). Consequently, as with parental influence, people may believe that what the media says is the truth and accept the information and form attitudes without questioning it. Both advertising and entertainment media promote fast driving and performance driving rather than safe driving (Shope, 2006). For example, a large number of young people spend a considerable amount of time playing car racing games that encourage aggressive driving behaviour with the resultant effect that they practices these behaviours when they drive (Shope, 2006). Matzoupoulos et al. (2008) suggested that advertising policies should be introduced restraining harmful advertising encouraging behaviours such as speeding, environmental damage and macho driving behaviour. Shope (2006) suggested that enlisting help from the media to provide positive images of safe driving practices may be a successful method of preventing risky driving practices among young drivers but getting their cooperation would be a challenge.

Psychological researchers tend to categorise participant results according to age and gender in order to look at patterns in data sets. With regard to driver attitude research, such categorisation has consistently thrown up significant differences between participants. The main differences being, that males more than females report engaging in unsafe driving behaviours such as drink driving and speeding (Harré, Field & Kirkwood, 1996; Yagil, 1998). Also, young males are frequently selected as the most deviant driver subgroup because they perceive traffic laws to be of less importance compared to other laws and show lower levels of normative motivation to comply with them (Brown & Copeman, 1975; Yagil, 1998).

According to Lancaster and Ward (2002), it is drivers with inappropriate attitudes, rather than poor skills, who are more likely to crash. Consequently research has shown that people who have the wrong (less safe) attitudes towards driving violations such as speeding (e.g., finding speeding acceptable and/or are less considerate of other road users) are more likely to commit violating behaviour on the roads and/or have higher accident rates than drivers who are considered to have the right attitudes (Assum, 1997; Isler, Starkey, Charlton & Shepperd, 2008). West and Hall (1997) also found evidence to support this when they looked at drivers aged between 17 and 83 years showing that those who reported having more positive (high-risk) attitudes to driving violations, and higher levels of social deviance, drove faster and reported more accidents.

In 1975, Brown and Copeman looked at the attitudes of British motorists, aged between 18 and 55 years, towards 31 different forms of offensive driving behaviours. Their results showed that younger drivers and males viewed driving offences less seriously. Studies by Parker, Manstead, Stradling, Reason and Baxter (1992[a]) and Yagil (1998), found that these two driver sub-groups (younger drivers and males) expect less negative outcomes from committing traffic violations and perceive a gain in social approval from performing such actions. They also report having little control over their own driving behaviour (Parker et al., 1992[a]; Yagil, 1998). Women however, have been found to evaluate the content of traffic laws far more positively and seriously than males and express a stronger sense of obligation to comply with them (Yagil, 1998; Moyano-Diaz, 1997). Generally, compared to men, a larger percentage of women have the right attitude to road safety (Assum, 1997).

Research has shown that attitudes are related to risky driving behaviour. This pattern occurs in drivers of all ages, where undesirable attitudes predict involvement in risky behaviours on the roads. Among a randomly selected group of Norwegian drivers (with an average age of 45 years) their attitudes towards traffic safety issues predicted their involvement in risky behaviour (violation of traffic rules and speeding, reckless driving or fun-riding, not using seat belts, drinking and driving and attentiveness towards children in traffic) and accidents 12 months later (Iversen, 2004). Iversen's (2004) results showed that individuals who showed positive (high-risk) attitudes towards rule violations and speeding in the first survey, reported engaging in riskier driving behaviours and greater accident involvement in the second survey.

3.9 Attitudes and Driving

Studies have also shown that adolescents who report positive (low-risk) attitudes towards traffic safety are less likely to report risky driving behaviour (Iversen, 2004; Ulleberg & Rundmo, 2003). Developing and maintaining positive attitudes to all aspects of traffic safety in both adolescents and pre-adolescents should therefore become a priority. This is particularly so as research has shown that when young drivers perceive the risks related to traffic accidents as being high they are less likely to take risks (Ulleberg & Rundmo, 2003).

Since young people are developing a strong interest in driving and formulating attitudes about appropriate driving behaviour at ever decreasing ages, it is important for measures to be taken prior to adolescence to help aid the development and maintenance of positive traffic safety attitudes (Harré, Brandt & Dawe, 2000). In adolescents as young as eleven years old, significant differences have been found between males and females and what they expect from driving (Stradling, 1991). Waylen and McKenna (2008, 2002[abc]) carried out a study on pre-drivers aged 11-16 years and found that from 14 years old upwards, boys report that learning to drive will be significantly easier than girls. In their study there was a tendency for boys to report perceiving a greater increase in popularity as a result of driving than girls. This gender difference in perception has been found to increase significantly with age, with the perception that driving increases popularity becoming less plausible the older the girls. The study also reported that boys seemed to accept violations to a significantly greater extent than girls.

Drivers who regularly commit traffic violations tend to endorse the associated driving behaviour (Lancaster & Ward, 2002). In a study by Stradling and Meadows (2001) young drivers (aged 17-20 years old) reported driving faster than other driver age groups (aged 21 years to 70+ years) and wanted to drive even faster. They also rated telematic speed control as less acceptable, committed more violations, sought more thrill from driving, reported themselves as less safe but not less skilled and had more crashes than other drivers. Interestingly, whilst females in this study reported driving as fast as young males, they tended to grow out of it quicker. This study therefore provides further evidence to suggest that more effort needs to be put into targeting young males attitudes.

As so many casualties on British roads are attributable to speeding, it is not surprising to learn that the British Government invests a vast amount of money into researching the reasons why people choose to speed and ways of preventing them from doing so.

Drivers view speeding as the least serious of all traffic offences (Brown & Copeman, 1975; Rothengatter, 1991). It is commonly believed that if only attitudes could be changed, appropriate behaviour would follow (Lonero & Clinton, 1997[b]). Therefore the first approach directed towards speed reduction used by road safety professionals should be through targeted education, aimed at changing driver's attitudes to speeding behaviour. For example, one method of changing attitudes could be to highlight the inherent risks involved in engaging in speeding behaviour.

Attempting to influence changes in drivers' attitudes and behaviour towards fast driving is a potentially mammoth task. Researchers have thus tried to identify those drivers who are at high-risk and targeted interventions directly at them. There are two main theories or methodologies used to explain such driver behaviour, which are described within this thesis. One is to explain the commission of driving violations in terms of rational cognitive processes, for instance the Theory of Planned Behaviour, whilst another is used in respect of personality traits, such as sensation seeking theory, and individual needs (Yagil, 2001).

3.10 Adolescent Road Behaviour

Risky road behaviour among adolescents increases with age; with boys reporting more aberrant behaviour than girls (West et al., 1998). In a UK survey of 4,000 11-14 year olds from the inner city, 25% reported that they had been pushed into the road by a friend; 49% admitted using their mobile phones for texting whilst crossing the road; 13% said they wore reflectors; and only 15% admitted that they wore helmets whilst cycling (BRAKE, 2004). These figures can be considered quite high and draw attention to the problems of risky adolescent behaviours on the road.

In a survey of 1027 accident-involved children aged 7-15 years old West et al. (1998) found that self-reported risky road behaviour was closely linked to traffic accident involvement as pedestrians or cyclists. They asked children two questions "*Do you cross the road without looking?*" and "*Do you run into the road without looking?*". Their results showed that engagement in these risky behaviours increased with age and that boys reported engaging in more risky behaviour on the roads than females. They also found that adolescents who frequently reported engaging in unsafe behaviours on the road failed to report engaging in safe behaviours as often as they should.

Elliott and Baughan (2004) developed the Adolescent Road User Behaviour Questionnaire (ARBQ) in an attempt to classify adolescent aberrant road behaviours. The ARBQ consists of aberrant behaviour items that measure behaviour on three levels ('Unsafe Road Crossing Behaviour', 'Dangerous Playing in the Road' and 'Planned Protective Behaviour on the Road') and were developed from information on a database containing qualitative descriptions of road accidents involving children, as well as focus groups. Elliott and Baughan (2004) surveyed 2,433 11-16 year olds and found that 13-14 year olds and 15-16 year olds engaged in unsafe road crossing behaviours and less planned protective behaviours compared to the 11-12 year olds. The 13-14 year olds also reported carrying out more dangerous play in the road behaviours than 15-16 year olds.

Simpson and Beirness (1993) addressed the possibility of a link between personality, adolescent attitudes and future driver behaviour (in particular accident involvement). They questioned 1,273 Grade 9 and 10 Canadian high-school students to determine whether or not information collected could predict future traffic accident involvement. Approximately 14% of the students had a driver's licence at the start of the study, but at the time of the follow up study three years later, 96% were licensed drivers. Several personal characteristics were found to be predictors of future accident involvement. Those with greater accident likelihood showed fewer adherences to traditional social values regarding school and religious worship and had greater tolerance for deviance. Those who were accident-involved showed more liberal attitudes towards alcohol use, and drank regularly in large quantities. They also reported engaging in more risky driving behaviour practices such as drink-driving, drug-driving and/or failure to use seat belts.

There is, therefore, a need to understand why adolescent road users are at particularly high-risk of road traffic accidents and whether or not their behaviour carries over into future driving behaviour. Although a few studies have been conducted to look at the attitudes of pre-drivers towards driving, the studies that currently exist in the driving domain have failed to take into account the direct effects of past road behaviour on future driving behaviour. In health psychology, however, evidence has been presented to show links between past behaviour and future behaviour (Triandis, 1977; Bagozzi, 1981). Several studies have also found a link between past behaviour and attitudes as well as between past behaviour and intentions (Bagozzi, 1981; Bagozzi, Baumgartner & Yi, 1992; Bentler & Speckart, 1979, 1981; Conner & Armitage, 1998; Ouellette & Wood, 1998).

Bentler and Speckart (1979, 1981) believed that the attitude-behaviour relationship explained by the Theory of Reasoned Action (TRA) could be further improved by incorporating the influence of past behaviour on subsequent behaviour (Figure 3.6). Their premise was that as well as attitudes and subjective norms, previous behaviour has a direct influence on intentions and subsequent behaviour. In three studies Bentler and Speckart found that past behaviour and attitudes both had direct positive influences on subsequent behaviour: *"for this sample it is apparent that attitudes and past behaviour, or some other factor(s) linearly related to these antecedents, are contributing strongly to the occurrence of behaviour without the regulation of intentions"* (Bentler & Speckart, 1979, 1981). The addition of prior behaviour according to their model would thus facilitate the prediction of future behaviour.

Several researchers have supported Bentler and Speckart's model and found it to be capable of accounting for the effects of extraneous variables on intentions (Budd et al., 1984; Fredricks & Dossett, 1983). Budd et al. (1984) found that by adding a past behaviour component to the Theory of Planned Behaviour (TRA's successor) the model's ability to predict subsequent behaviour (in this instance intention to wear seat belts) was improved by a further 7-9%. This effect size was shown to vary from behaviour to behaviour. In a review of the literature on past behaviour-behaviour relationships, Sutton (1994) suggested that past behaviour may be a good predictor of future behaviour.

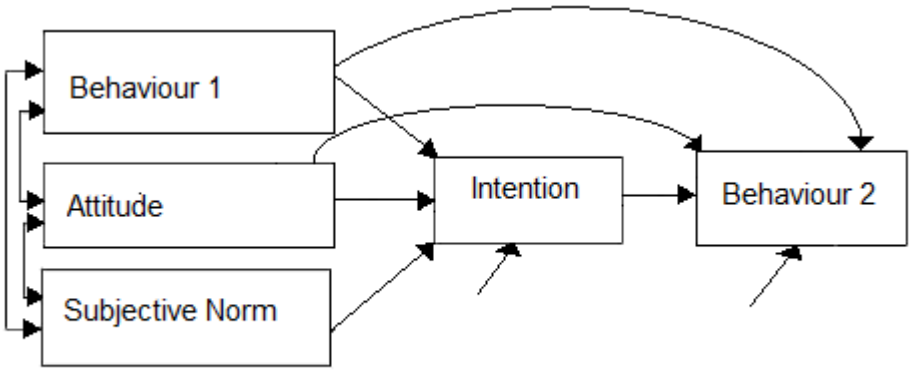


Figure 3.6 – A Model of the Attitude-Behaviour Relationship Incorporating Previous Behaviour (Bentler & Speckart, 1979).

In the TPB and TRA models, attitudes influence behaviour indirectly through intentions. However, Bagozzi (1981) found that the attitude-intention relationship is attenuated when past behaviour is incorporated into the model. The inclusion of past behaviour into both of these models therefore lessens the impact of intentions on behaviour. As Bagozzi (1981)

stated, *"..as habit increases, the performance of the behaviour becomes less one of a rational evaluation of the consequences of the act and more one of a learned response*". In light of this pre-driving behaviour should, in theory, reflect future driving behaviour over and above intentions.

Waylen and McKenna (2002[abc], 2008) conducted a number of studies on pre-driving adolescents to determine whether or not associations found between risky road behaviour and individual characteristics such as sensation seeking and deviance are the result of driver behaviour or intrinsic to the individuals. Their results showed that risk-taking characteristics typically found in drivers (such as affinity for speed, driving violations, anti-social behaviour and sensation seeking) are also present in pre-drivers. For example, adolescents who reported engaging in anti-social behaviour (such as leaving a shop without paying for goods or riding on public transport without a ticket) were more likely to condone violations (such as crossing a junction when the traffic lights have turned red or ignoring speed limits late at night or early in the morning) and enjoy speed. Adolescents who reported a desire for novel/thrilling experiences reported that they enjoyed fast speeds and/or found driving violations to be acceptable. These findings support the existence of associations between risky road behaviour and individual characteristics that are intrinsic. Waylen and McKenna's findings also showed that gender differences typically observed in drivers could also be seen in pre-drivers; pre-driving males reported more frequent displays of sensation seeking, anti-social and competitive behaviours. They concluded that gender differences among drivers can be explained by pre-existing differences in individual characteristics.

Harré et al. (2000) examined the effects of age, gender and experience on adolescent attitudes towards high-risk driving behaviour. As there were no significant differences between the attitudes held by drivers and non-drivers, they concluded that experience does not affect attitudes towards driving behaviour. They also reported gender differences in attitudes, with males displaying riskier attitudes towards driving.

Unlike Waylen and McKenna (2002[abc], 2008) who looked at reflections of risky driving characteristics in a group of pre-drivers, the research presented in this thesis explores direct links between a large group of individuals' past pre-driving road behaviour and their future behaviour as drivers. The main hypothesis being tested is that pre-drivers who report displaying dangerous road behaviour and positive (high-risk) attitudes towards driving violations are more likely to report engagement in dangerous driving behaviour in the future.

Should the null hypothesis be rejected it would provide road safety professionals with useful information about how to tackle the young driver problem and when to start (such as before driver training and licensure).

Ajzen who devised the Theory of Planned Behaviour has stated on numerous occasions that it serves no useful purpose to include past behaviour in causal models of behaviour change (Ajzen, 1987; Beck & Ajzen, 1991). Should this be reflected in the results from this thesis, Ajzen's views regarding its lack of purpose in the TPB would be confirmed, and road safety professionals would be provided with useful information about driver education. For example, it would inform them that road safety education and efforts to encourage safer attitudes on the roads among pre-driving adolescents may not have a very big effect on their future driving behaviour. Further it would confirm that driver behaviour interventions would be better targeted at those who are already driving.

Understanding the factors that contribute to adolescents' high crash rates is important in developing interventions to reduce their risk. In view of the fact that performance becomes more learnt than rational as habits increase, past behaviour could therefore reduce the impact of interventions on behaviour (Bagozzi, 1981; Triandis, 1977). In terms of applying this to driving behaviour and to reducing the prevalence of risky behaviour, if young people are encouraged to want to be safe on the roads and ultimately behave in a safe manner then they will be less likely to engage in risky driving behaviour in the future.

3.11 Chapter Conclusions

This chapter has highlighted the extent of the global young driver problem and the association between risk-taking and accident-involvement. The number of factors that influence risk-taking are vast and range from adolescents' unrealistic optimism about encountering hazardous events, over-confidence in driving skills, lack of driving experience, an inability to anticipate risky situations, through to the influence of hormones. Social factors also influence driving behaviour to a large extent, for example factors such as peer-pressure, media influence, lack of organisational and institutional ties (such as membership to a church or football club). Past behaviour also plays a role, with young people continuing to engage in high-risk behaviours out of habit but also because they engage in other high-risk behaviour (such as drinking or smoking, as described in the Problem Behaviour Theory). Aspects of an individual's personality also have an impact on their manifestation of risk-taking tendencies,

with some individuals' deliberately choosing to engage in risk-taking in order to satisfy their sensation seeking tendencies.

The next chapter is the final section of the Literature Review and looks at external influences on drivers such as parents and passengers and the effects of driving whilst under the influence of drugs and alcohol.

CHAPTER 4 - INFLUENCES ON YOUNG DRIVERS

4.1 Chapter Summary

In this chapter external influences on young driver behaviour will be introduced. Over the years road safety professionals and researchers have examined young novice driver collisions in order to establish their causes and to develop interventions and campaigns that ultimately aim to reduce their high collision rates. Other than inexperience and undeveloped driving skills, some of the main factors that are considered to be involved in young driver crashes are speeding, driving under the influence of alcohol or drugs, failure to use seat belts, distraction from passengers, parental influence, gender (both the gender of the driver and the gender of passengers) and personality traits such as sensation seeking (discussed in the next section). One other new and relatively unexplored influence on young drivers is their past behaviour.

These factors will be discussed and evaluated further throughout this thesis.

4.2 Parental Influence on Young Drivers

Risk taking among adolescent drivers rarely occurs under adult supervision (Hirsch, 2003). If they have gained experience under supervision and in safe circumstances, their accident involvement after gaining their license is greatly reduced compared to those who gain experience alone or with peers (Engstrom et al., 2003). Appropriate parental management practices with regards to managing their offspring's driving have been shown to be related to lower levels of risky driving behaviour, fewer traffic tickets, and less crashes among newly licensed teenage drivers (Simons-Morton, 2002). Consequently, more frequent parental supervision and restricted adolescent driving are associated with safer driving behaviours among young drivers (Beck, Shattuck & Raleigh, 200l). As previously mentioned, parental control has been linked to reduced sensation seeking behaviour, and sensation seeking has been linked to risky driving behaviour. Therefore, these studies suggest that increased parental involvement in offspring's driving would be a positive step towards reducing their risk level on the road.

Parents are in two minds when it comes to their children's driving. They are concerned about the risks that their offspring may face but they are also interested in reducing the amount of time that they spend transporting them around (Simpson, 1995). Simons-Morton and Hartos (2003) reported that parents appeared to perceive that the most dangerous driving conditions for novice drivers were of only moderate risk. Whilst they recognised that practices such as

drink-driving were extremely risky and prevalent among young drivers, they were found not to appreciate the risks that are associated with everyday situations such as driving with fellow teenage passengers or driving in bad weather (Simons-Morton & Hartos, 2003). Earlier licensing of new drivers occurs when parents consider their children to be well-trained and therefore safer than other young drivers (Waller, 1983).

Some road safety professionals believe that parents may have contributed to the past failure of driver education to reach its safety goals. This is because many parents perceive their teenage children to be responsible (Simons-Morton & Hartos, 2003) and consequently they give them more freedom to drive and less supervision than is necessary (Lonero, 1998). This therefore increases their exposure to risky situations and increases their involvement in crashes (Lonero, 1998). Parents have the potential to reduce driving risks by carefully managing their teens' early driving experience (NHTSA, 1994; Stutts & Thomas, 2002). Parents, guardians, or other adults must play a greater role in the education and licensing of young novice drivers. In an American report to Congress, the National Highway Traffic Safety Administration (NHTSA, 1994) stated that *"..there will never be enough time or money to fully train a novice driver through public institutions…[and that] there will always be the need for additional supervised oversight during initial training."*

Risky driving practices among young drivers have been linked to parental restrictions. Those drivers who have had fewer restrictions imposed on them by their parents engage in more dangerous and risky driving behaviour (Hartos, Eitel & Simons-Morton, 2002). Parents have a substantial opportunity to affect their offspring's driving. This is because they can be involved in their driving from the very beginning, perhaps teaching them to drive but ultimately governing their access to vehicles (Leaf & Beck, 2002; Simons-Morton, Hartos). Parents have the potential to help reduce their offspring's accident-risk because they determine when their children are ready to get a licence and the conditions under which they can drive once they are licensed. For example, they decide what type of vehicle they have access to and when they are able to use it (Simons-Morton, 2002).

Bingham and Shope (2004) reported that parental permissiveness and behavioural monitoring both contributed indirectly to the prediction of three problem driving behaviours: drink-driving, drug-driving and risky driving. Parent orientedness, school performance, and tolerance of deviance each indirectly predicted drinking- and drug-driving. Parent orientedness was also indirectly associated with risky driving. Finally, cigarette use indirectly

predicted all three outcomes, and alcohol misuse indirectly predicted drug-driving. Bingham and Shope concluded that adolescents who were raised with less permissive parenting, greater parental monitoring, stronger social bonds, and less substance-use were less likely to engage in problem driving.

Research has shown that low parental monitoring and control are related to young drivers' engagement in risky driving behaviours, traffic violations, and collisions (Hartos, Eitel & Simons-Morton, 2001; Hartos, Eitel, Haynie & Simons-Morton, 2000). Lenient passenger restrictions imposed by parents have been shown to increase the likelihood of their offspring committing violations on the road by up to four times and increase their chances of crashing by up to seven times when they are carrying passengers (Simons-Morton et al., 2002). Frequent parental supervision and restricted teen access to a car, on the other hand, have been associated with less likelihood of adolescent drivers engaging in speeding behaviour and a higher probability of their using a seat belt when driving (Beck et al., 2001; Simons-Morton et al., 2002). Shope, Waller, Raghunathan & Patil (2001) found that higher levels of parental monitoring, nurturance and family connectedness, reported in 10^{th} grade school pupils were associated with lower rates of serious offences and crashes.

In their Brazilian study, Bianchi and Summala (2004) found that parent's driving records were predictive of their children's records. The more errors and violations that were reported by parents on the Driver Behaviour Questionnaire, the more their children also reported similar behaviour. Bianchi and Summala concluded that parents' crashes and violations predicted those of their offspring; parents with poor driving records were more likely to have children with poor driving records. Parents' self-reported collision involvement is more predictive of their children's collision involvement, than self-reported driving violations (Ferguson et al., 2001; Wilson et al., 2006). This relationship between parents and children's driving styles may be partly explained by a social learning process known as modelling (Bandura, 1977, 1986). This is a process whereby children learn to model another person's behaviour through observation. By symbolically encoding information about the skill that is being demonstrated, children can use this encoded information as a guide for their future action (Bandura, 1977, 1986). With regards to driving, children learn to model their parents' driving styles by observing their driving practices (Shope, 2006). Children may also drive like their parents if they were taught to drive by them.

Some researchers believe that parents and significant others do not affect driver's behaviour to such a great extent. Haglund and Åberg (2000) reported that when it comes to making decisions about driving speed, other road users are far more influential than family members. For example, if a driver perceives other drivers to be driving at excessive speeds they are far more likely to drive fast compared to when they perceive other drivers to be complying with the limits. Åberg, Larsen, Glad and Beilinson (1997) also reported similar findings. Haglund and Åberg (2000) concluded that driving behaviour, such as speed choice, is largely influenced by people who are present either in the vehicle or other drivers. The behaviour of drivers is relatively unaffected by people who are not present, such as parents, who might ordinarily be prominent in other areas of the driver's life. Although there may be an element of truth in these results, they do not take into consideration the affect of attitudes on behaviour and the influence that other people, such as parents, have in shaping attitudes towards behaviours such as speeding. It is entirely conceivable to think that even when a driver is driving alone or with passengers, the influence of attitudes that have been shaped by parents and other significant figures may be monitoring their behaviour.

Parents have been under utilized as a source of influence in the traffic safety area (Beck, Hartos, & Simons-Morton, 2002). They need to have more access to useful information regarding children's accident involvement and ways of teaching their children to be safe in a road environment that are effective (Waylen & McKenna, 2002[c]). Bingham and Shope (2005) found that crash risk may be reduced by encouraging parents to supervise their children and to increase their awareness of their offspring's activities. They suggest that interventions should encourage parents to restrict, monitor and supervise their children's driving. This has also been suggested in various other studies (Simons-Morton & Hartos, 2003; Hartos, Eitel Haynie & Simons-Morton, 2000). Driver education needs to be linked with parental and community influences (Lonero, 1998). Parents need to be provided with more detailed information about the everyday risks their offspring could face on the road in order to highlight the importance of maintaining control over their children's driving during the early stages.

In a Scottish study, parents perceived themselves as having the main responsibility to develop road safety awareness and skills in their children (Graham, Fyfe & Murray, 2004). Parents also demonstrated a lack of awareness of road safety activity at school. Graham et al. (2004) therefore concluded that there is a need for better linkages to be created between parents and schools. The skills and knowledge of parents on key road safety issues, including driving

safety and behaviour, need to be increased and initiatives need to be developed that bring parents in as partners to complement programmes being delivered at school. The main problem is that parents of younger children are more likely to reinforce road safety messages than the parents of older, teenage children. There is particular scope to involve the parents of teenage children in pre-driver education in conjunction with the schools their children attend and local Road Safety Units (Graham, Fyfe & Murray, 2004).

4.3 Passenger Influence on Young Drivers

Drivers are also affected by the presence of passengers (Keating, 2007). The combination of passengers' ages, gender and their relationships to the driver all affect the driver's behaviour (Regan & Mistopoulos, 2001). The number of passengers present in the vehicle also influences drivers' behaviour on the roads.

Passengers are considered as distractions because they interact verbally and physically either among themselves or with the driver (Williams, 2000). Distractions increase the load that is placed on the driver's cognitive functioning and decreases the speed with which they process information. A drivers' ability to detect changes in the environment is therefore impaired by distractions and thus increases their potential for being crash involved (Lamble, Kauranen, Laakso & Summala, 1999).

When drivers carry passengers their behaviour is modified according to what they perceive their passengers social expectations to be (Baxter et al., 1990). The inexperience of the driver, coupled with the presence of passengers, has been found to increase the number of driver errors made (Ulleberg, 2004). Young drivers are particularly at-risk of being crash involved when passengers are present (Williams, 2000). It has been reported that passengers are more likely to talk to younger rather older drivers (Regan & Mitsopoulos, 2001). Thus young drivers appear to be faced with more in-vehicle distractions compared to older drivers.

Young drivers are very susceptible to peer-pressure (Arnett et al., 2002; Gardner & Steinberg, 2005; Gregersen & Berg, 1994; Keating, 2007; Moller, 2002; Shope, Raghunathan & Patil, 2003; Simons-Morton, Lerner, & Singer, 2005; Steinberg & Cauffman, 1996; Twisk, 1994). Steinberg and Cauffman (1996) found that they have limited abilities in psychosocial functioning that are likely to interfere with their ability to act independently of others. The fact that adolescents associate with similarly risk-prone peers is one explanation for why

young drivers may engage in more risky behaviour than adults (Arnett et al., 2002; Gardner & Steinberg, 2005).

In the presence of peers, drivers evaluate risky behaviour more positively, take more risks and make riskier decisions (Gardner & Steinberg, 2005). The difference in the amount of group risk-taking between adolescents and adults is not just due to the fact that adolescents spend more time with their peers than adults do. The difference in age affects an individuals' orientation towards risky behaviour when passengers are present (Gardner & Steinberg, 2005).

Young drivers perceive high-risk driving to be a demonstration of their superior control skills (Fuller, 1995). Their driving behaviour is reinforced directly via peer influence and indirectly via media influence (e.g., television, films, and magazines). Parker, Manstead, Stradling and Reason (1992[b]) showed that young drivers experience greater peer pressure to engage in violating behaviour on the roads such as speeding, drink-driving and dangerous over-taking. They have also been observed driving faster and with shorter following distances behind cars when their peers have been present (Baxter et al., 1990; Chen, Baker, Braver & Li, 2000; Doherty et al., 1998; McKenna & Crick, 1994).

4.4 Alcohol and Drugs

Alcohol is a major causal factor in young driver crashes (Cameron, 1982; Klitzner, Vegega, & Gruenewald, 1988; Macdonald, 1994; Mao, Zhang, Robbins, Clarke, Lam & Pickett, 1997). Even at low blood alcohol levels young drivers have been found to have an elevated crash risk (Horwood & Fergusson, 2000; Mayhew, Donelson, Beirness & Simpson, 1986). However, it is not just alcohol that influences young drivers; drugs also influence their crash rate. Chliaoutakis et al. (1999) found that young drivers who have a lifestyle related to drinking and drug taking have the highest accident risks on the road.

Vehicles provide adolescents and young drivers with a social space away from the supervision of adults where behaviours such as drinking and drug-taking can go successfully un-detected (Klitzner, Vegega, & Gruenewald, 1988). Influences such as peer pressure and drivers' over-confidence in their driving ability put them at increased risk of engaging in these behaviours.

Stimulants affect driving ability by blurring the lines between sources of risk-taking. Consequently drivers who are under the influence of drugs or alcohol are often more inclined

to take greater risks on the roads compared to when they drive in a sober state (Hirsch, 2003). Studies looking at young driver attitudes have found that they have positive (high-risk) attitudes, norms and intentions towards drink-driving. They also evaluate the consequences of engaging in drink-driving less negatively (Marcil, Bergeron & Audet, 2001; Parker et al., 1992[a]).

Kulick and Rosenberg (2000) believe that young drivers are at a greater risk of being involved in alcohol-related accidents compared to other driver groups because of their inexperience as both drinkers and drivers. They also get themselves into difficult situations. For example, if a young driver perceives him or herself to be more sober than their friends; they will be more likely to opt to drive (Kulick & Rosenberg, 2000).

Research from both New Zealand and Sweden has highlighted the extent of the drink and drug-driving problem among young drivers. Begg and Langley (1999) found that among a group of 21-year-old New Zealand drivers 49% of males and 32% of females reported that they had driven within two hours of drinking. They also admitted to driving after having drunk too much (19% of males and 8% of females) and to driving after taking drugs such as marijuana (25% of males and 6 % of females). The results of Begg and Langley's study emphasise that drink-driving and drug-driving among young drivers is more prevalent among males. Males were found to have been just as likely to have reported being passengers in cars driven by drink/drug-drivers as they were to have reported engaging in the behaviour themselves. According to Engstrom et al. (2003), the drink-driving problem is increasing in Sweden. From 2001-2003, statistics from the Swedish National Road Administration showed that alcohol related accidents among young drivers in Southern Sweden had increased by 30% and fatal alcohol related accidents increased by 20% (Engstrom et al., 2003).

4.5 Chapter Conclusions

This chapter has presented factors that influence young drivers. By identifying factors that have the greatest influence on driving, actions can be taken to reduce or increase the impact of these factors on young drivers and thus help towards reducing their accident risk.

Age and experience seem to have an equal part to play in young driver accident risk, with evidence showing that risk levels decrease as both of these factors increase. This suggests that increased age leads to increased driving experience and thus to a lower crash risk. This is more evidence to suggest that graduated driving licence programs which gradually introduce

new drivers to risky situations would be beneficial for both drawing out the licensing process and increasing driving exposure time. This additional driving time would also help to increase novice drivers' skills such as hazard perception.

Graduated licence programs such as those in place in countries like America and New Zealand limit the number of passengers novices can carry until they have gained their full licence. The effect of passengers on drivers has been discussed in detail with the outcome being that passengers are far more likely to be distracting for young drivers than older drivers. Thus introducing a graduated licence program in the UK could limit the effects of passenger influence on accident involvement.

Community schemes to reduce young driver accident involvement may also help towards reducing their high accident figures. Evidence reviewed in this chapter has suggested that parents are powerful influences that are currently under utilized. Encouraging parents to be more actively involved in their offspring's driving could be as beneficial as community schemes and in-school interventions at creating safety-conscious drivers if not more so. They are role models for their children but as yet they have not been incorporated into the delivery of road safety interventions. There is a lack of information available to parents regarding the risks that young drivers face daily and what they can do to help reduce their offspring's risk on the road. Successful interventions should therefore try and encourage parental involvement.

Differences between the genders on risk-taking and sensation seeking indicate that high sensation seekers and males take particularly greater risks both on and off the road. However, changing personality traits is far more difficult than changing attitudes. Attitudes have been shown to have links with behavioural intentions and actual behaviour. Therefore interventions aimed at changing attitudes rather than sensation seeking behaviour would be more successful. Regular interventions, and interventions that direct high sensation seekers towards engaging in more socially acceptable forms of risk-taking behaviour such as sport, would also be more effective at encouraging long-term behavioural changes.

4.6 Research Aims

Adolescents are the primary focus for this thesis. The literature review presented in this section (Chapters Two-Four) has provided evidence from previous research conducted on young drivers. The findings that have been reported highlight important facts about young novice drivers. Firstly, compared to other driver sub-groups, novice drivers are over-represented in crash statistics. Secondly, as younger novices (teenage drivers) are more highly represented in collisions than older novices it appears logical to assume that there must be something more than simply inexperience influencing their driving behaviour. Understanding teenagers' attitudes and road user practices may help to explain why they are more liable to be involved in road traffic crashes as drivers. Exploring adolescents' pre-driving attitudes and behaviours could help to identify potential early warning signs regarding their future as high-risk drivers. Finding these antecedent factors could thus highlight the need for pre-driver interventions.

The research presented in this thesis has five aims in order to bridge gaps in current knowledge:

1. To examine pre-drivers' attitudes and intentions towards driving

According to the TPB, attitudes and intentions lead to behaviours (Ajzen, 1985, 1987, 1991). The research presented in the literature review highlighted that many drivers who are crash-involved have inappropriate attitudes towards driving (Assum, 1997; Lancaster & Ward, 2002; West & Hall, 1997). According to Harré et al. (2000), adolescents are forming inappropriate attitudes towards driving at ever decreasing ages. Research has shown that attitudes formed during childhood and adolescence persist throughout life (Worchel & Shebilske, 1986). Therefore the aim of the first study presented in this thesis (Chapter Five) is to explore associations between pre-drivers' driving attitudes and intentions. A significant predictive relationship between these two factors would indicate that interventions that are designed to reduce positive (high risk) attitudes towards driving could also lower speeding intentions.

2. To explore associations between pre-drivers' road behaviour, driving attitudes and intentions, and their future self-reported driving behaviour

Past behaviour has been found to have a direct influence on intentions and subsequent behaviour (Bentler & Speckart, 1979). According to the PBT (Jessor, 1977), past behaviour can affect current and future behaviour through behavioural association. Research has shown

that adolescents who engage in one form of high-risk behaviour are significantly more likely to engage in another form of high-risk behaviour (Jessor & Jessor, 1977). Findings from several studies have shown that engagement in risky driving is associated with engagement in other forms of problem behaviours (Beirness & Simpson, 1988; Bingham & Shope, 2005; Jessor, 1987[ab]). The aim of the second study presented in this thesis (Chapter Six) is to explore associations between pre-drivers' road behaviour, driving attitudes and intentions, and their future self-reported driving behaviour. Finding significant predictive relationships between past behaviour, attitudes, intentions and future behaviour, may provide support for the implementation of pre-driving interventions to increase safety.

3. To look at the stability of adolescents' attitudes and intentions towards driving violations

It is commonly believed that by changing inappropriate attitudes towards driving, people would engage in appropriate behaviour (Lonero & Clinton, 1997[b]). Research has shown that attitudes that are formed during childhood and adolescence are durable and persist throughout life (Worchel & Shebilske, 1986). Therefore, if changing inappropriate attitudes is an effective method for reducing inappropriate behaviour, it is important to influence children and adolescents' attitudes before their attitudes become stabilised and thus more resistant to change. The aim of the third study (Chapter Seven) presented in this thesis is to look at the stability of adolescents' attitudes and intentions towards driving violations. If adolescents' attitudes are found to be fluid then pre-driving interventions could be successful at reducing high-risk attitudes and intentions.

4. To associate sensation seeking with risky pre-driver driving attitudes, intentions, road behaviour and driving behaviour

In a meta-analysis of 38 studies that explored the relationship between sensation seeking and risky driving behaviours, only four studies failed to find a positive correlation between the two factors (Jonah, 1997[b]). According to Zuckerman (1979), the defining feature of sensation seeking is a willingness to take risks. Research has shown that intentional risk-taking is related to high accident involvement; several prospective studies found that drivers' collision likelihood could be predicted up to three years previously from measurements of their intentions and beliefs (Maycock, 1995; Rutter & Quine, 1996; West, Elander & French, 1993; West & Hall, 1997).

A disregard for legal driving rules and regulations among adolescents is often related to a driver's intentional risk taking behaviour (Hirsch, 2003). Studies have shown that high sensation seeking drivers hold more positive attitudes towards committing violations on the road than low sensation seekers (Yagil, 2001). Several studies have shown that there is an association between engagement in high-risk driving behaviour and other forms of problem behaviour (Beirness & Simpson, 1988; Bingham & Shope, 2005; Jessor 1987[ab]). West et al. (1998) have also identified a positive relationship between engagement in problem behaviour, risky road behaviour and involvement in traffic and non-traffic accident rates among pre-driving adolescents. A further aim of the second and third studies (Chapters Six-Seven) was to test for an association between sensation seeking with risky pre-driver driving attitudes, intentions, road behaviour and driving behaviour. Finding significant associations between sensation seeking and both driving and road behaviour would highlight the need for interventions to specially target high sensation seekers.

5. To propose an extension to the Theory of Planned Behaviour, which incorporates past behaviour as a predictor of future behaviour

As mentioned in the second aim, prior research has shown that past behaviour has a direct influence on intentions and subsequent behaviour (Bentler & Speckart, 1979). West et al. (1998) identified a positive relationship between engagement in problem behaviour, risky road behaviour and involvement in accidents among pre-driving adolescents. These accidents were traffic related (adolescents were either pedestrians or cyclists) and non-traffic related (e.g., the result of playing with matches, falling from a height).

Engagement in risky driving has been found to be significantly associated with engagement in other forms of problem behaviours (Beirness & Simpson, 1988; Bingham & Shope, 2005; Jessor, 1987[ab]). Since problem behaviours share the same set of personality, perceived environment and behavioural variables (Jessor, 1987[ab]; Jessor, Donovan & Costa, 1991[ab]) it is believed that risky pre-driving road behaviour will be associated with risky driving behaviour. Therefore, another aim for the second study (Chapter Six) is to propose an extension to the Theory of Planned Behaviour, which incorporates past behaviour as a predictor of future behaviour. Pre-driving road behaviour (past behaviour) will be measured alongside other questions that are based on the components of the TPB. Significant associations between pre-driving behaviour and driving behaviour will support the need for pre-driving interventions to be implemented.

SECTION A - CONCLUSIONS

In this section various driver behaviour models have been presented which were designed to explain the processes involved in learning to drive. The literature that was presented emphasised the various influences on driving (such as personality and attitudes), the differences in driving experience between experienced and novice drivers' and age-related differences between younger and older novices.

Two types of driver behaviour models were presented which theorists have used to explain driving behaviour. The performance models assist with understanding the various different processes involved in driving and can identify problems in skill development, however, the motivational models are considered to be more helpful for understanding deviations in individual's driving practices. For example, they can help explain why some drivers chose to engage in safe behaviour whilst others do not.

Research has shown that some aspects of personality may influence people's risk-taking behaviour. For example, high sensation seeking tendency in adolescence (particularly among males) has been associated with positive attitudes towards traffic violations and engagement in reckless driving. Individuals who are drawn towards socially deviant behaviour have also been found to have higher-risk attitudes towards driving violations, drive faster and are more accident-involved. These aspects of personality could be identified and targeted through interventions. In this thesis it is believed that a tendency towards high sensation seeking may be responsible for engagement in high-risk road behaviour (namely 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road') and high-risk driving behaviour (namely 'Errors', 'Lapses' and 'Highway Code Violations').

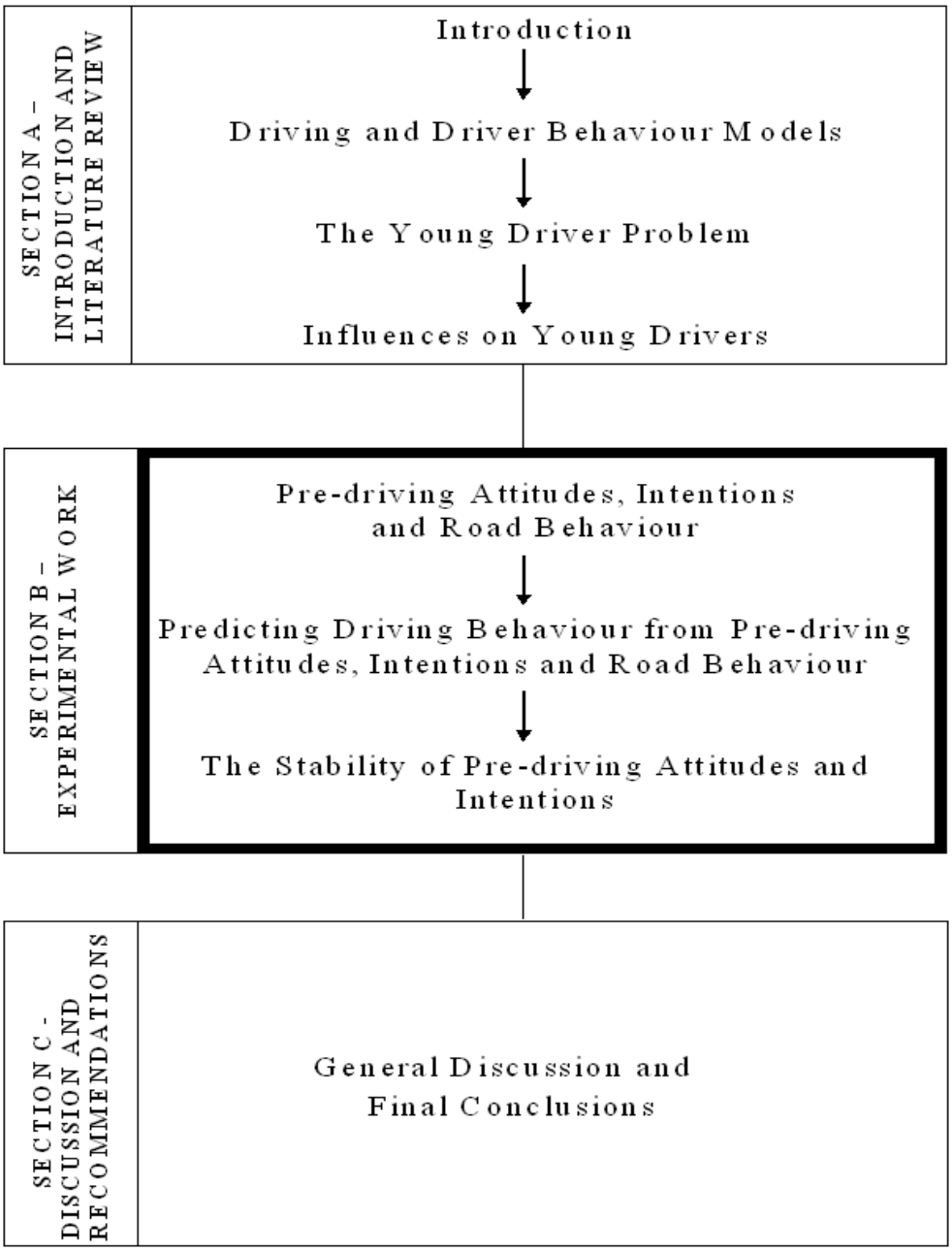
According to the Theory of Planned Behaviour, the attitudes that individuals hold towards specific behaviours are predictive of their engagement in them. Consequently, whilst interventions could be targeted at groups who share specific personality traits (i.e., high sensation seekers) it would be easier to change their attitudes and encourage them towards engaging in more socially acceptable forms of risk-taking behaviour than it would be to change their personality. This does not imply that it would be an easy task to change people's attitudes. However, if research could establish when certain attitudes are formed then interventions could be implemented on or around this time that aim to create desirable low-risk attitudes.

Attitudes come from four main sources (parents, peers, personal experience and the media); those formed during childhood and adolescence have a propensity to persist throughout life. It is therefore important to utilise these sources when designing interventions aimed at changing or creating attitudes. Peer pressure is particularly influential on young people who tend to adopt the attitudes and behaviours of their peers. In this thesis it is believed that by changing the attitudes of a whole peer group, pressure among peers to engage in safe (low risk) activities could be increased. Personal experiences create strong change-resistant attitudes. It is therefore believed that by introducing adolescents to safe driving interventions before they have gained personal driving experience their driving attitudes and potentially their future driving practices could be affected.

Young drivers are considered to have a poor conception about what good driving is. Research has shown that drivers are less likely to take risks when they perceive the risks related to traffic accidents as being high. In this thesis it is believed that more has to be done to convince pre-drivers about the consequences of not engaging in safe driving practices. Adolescents may be less likely to take risks when they drive if they are more informed about which driving behaviours are associated with greater accident-involvement.

The studies presented in the experimental section of this thesis (Section B, Chapters Five-Seven) explore whether pre-drivers' inappropriate attitudes towards driving violations (such as speeding, drink-driving and not wearing seat belts), intentions towards engaging in speeding behaviour and self-reported engagement in risky road behaviours (such as 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviours on the Road') are associated with their future engagement in risky driving behaviours (such as 'Lapses', 'Errors' and 'Highway Code Violations'). The research aims reveal that there is currently a lack of research linking pre-driver behaviour with driver behaviour. It is hoped that the findings from the research conducted in Section B will provide important information for road safety professionals about the importance of pre-driver interventions. It is hoped that these findings will facilitate the expansion of current road safety education initiatives to include the importance of safe driving.

SECTION B EXPERIMENTAL WORK



SECTION B - SUMMARY

Over the next three chapters, studies will be presented that were conducted in Scotland and New Zealand in response to the gaps in current young driver and pre-driver research, identified in the Literature Review (Chapters Two-Four). These studies explore links between pre-drivers' road behaviour and attitudes towards driving. They also explore links between pre-drivers' road behaviour, attitudes towards driving and their self-reported behaviour as drivers. The results highlight the need for pre-driver education to be incorporated into the school curriculum when adolescents' attitudes and intentions are still fluid.

SECTION B - INTRODUCTION

In Chapters Three and Four, literature detailing some of the problems associated with young drivers was presented. The three main problem areas that were associated with young drivers were identified as:

1) their attitudes towards driving,
2) their tendency towards sensation seeking
3) the influence of past behaviour.

Attitudes towards rule violations and speeding are strong predictors of engagement in risk-taking behaviour whilst driving (Iversen, 2004). In a 12-month longitudinal survey of a random sample of Norwegian drivers, who ranged from junior high school students to over 45 year olds, Iversen (2004) found that those who reported the most positive (high-risk) attitudes towards rule violations and speeding in the first survey (for example, agreeing that *"if you are a good driver it is acceptable to drive a little faster"*) reported practising more risky driving behaviour such as reckless driving, drink-driving and non-use of seat belts in the second survey. Positive (high-risk) attitudes towards the careless driving of others (for example, disagreeing that *"I don't want to risk my life and health by riding with an irresponsible driver"*) and towards drink-driving (for example, disagreeing that *"I would never drive after drinking alcohol"*), as measured in the first survey, were also significantly associated with self-reported risky driving behaviour in the second survey.

Iversen (2004) also found that participants who had reported being accident-involved during the 12-month period between surveys had reported practising significantly more risky driving behaviour in the first survey. These findings supported Assum's (1997) findings, that drivers with risky attitudes towards violations have higher accident rates. As expected, adolescents with positive (low-risk) attitudes towards safety are reported to be least likely to engage in risky driving behaviour (Ulleberg & Rundmo, 2003; Iversen, 2004). Therefore it is generally believed that inappropriate attitudes rather than skills are to blame for crashes (Stradling & Meadows, 2006; Ward & Lancaster, 2003). As previously mentioned (Chapter Three) attitudes that are formed in childhood and adolescence persist throughout life (Worchel & Shebilske, 1986). However, it is thought that if attitudes can be modified then appropriate behaviours would be more likely to follow (Lonero & Clinton, 1997[b]).

Significant differences between males and females in their road behaviour and attitudes towards driving have been found in children as young as 11 years old (Elliott, 2004; Elliott &

Baughan, 2003[ab], 2004; Waylen & McKenna 2002[abc], 2008). Pre-driving males reported having significantly more negative attitudes towards road safety than females (Waylen & McKenna, 2002[abc], 2008; Elliott, 2004; Elliott & Baughan, 2003[ab], 2004). In particular they had significantly more negative intentions and attitudes towards engaging in safe road behaviours such as wearing cycle helmets and crossing roads safely (Elliott, 2004; Elliott & Baughan, 2003[ab], 2004). Consequently, it was the males and older adolescents who reported feeling more social pressure to engage in less safe practices on the road than females and younger adolescents (Elliott, 2004; Elliott & Baughan, 2003[ab], 2004).

Waylen and McKenna (2002[abc], 2008) found that pre-driving males as young as 11 years old reported a greater affinity for speeding. They were also more condoning of drivers engaging in driving violations, and reported being more confident in their current knowledge of driving than females. Consequently, compared to girls, the boys in Waylen and McKenna's (2002[abc], 2008) studies reported that learning to drive would be easy and perceived that their popularity would increase once they became a driver. These studies show that it is important to address the attitudes that pre-drivers hold. Road safety professionals need to explore whether it is possible to create desirable attitudes towards driving in adolescents' before they form their own undesirable (high-risk) attitudes. Equally, they also need to see whether it is possible for undesirable attitudes towards driving to be changed whilst they are still forming. The influence of pre-driver attitudes on rule violations and speeding will be explored in this section in order to see whether risky pre-driving attitudes are related to engagement in risky driving practices in the future.

Several studies have found a link between past behaviour and attitudes as well as between past behaviour and intention (Bentler & Speckart, 1981; Bagozzi et al., 1992; Conner & Armitage, 1998; Ouellette & Wood, 1998). It has been suggested that past behaviour may be a good predictor of future behaviour and that its influence is so great that it can ruin the impact of interventions (Bagozzi, 1981; Sutton, 1994; Triandis, 1977). The problems associated with unsafe road behaviour are addressed in the following three chapters (Chapters Five-Seven). Chinn, Elliott, Santinella and Williams (2004) found that among a sample of 153 accident-involved children aged 6-16 years old, approximately ninety percent of accidents occur due to road crossing. In a study of pre-drivers aged 11-16 years old, Elliott (2004) found that males and older adolescents reported engaging in more undesirable road behaviour (such as not wearing cycle helmets, crossing between parked cars, challenging traffic and not using crossings) than females and younger adolescents. It has thus been

suggested that gains in safety could arise from bringing about desirable changes in risky road behaviour (Elliott & Baughan, 2003[ab], 2004). The studies documented in this section (Chapters Five-Seven) identify links between unsafe (risky) pre-driver road behaviour and risky driving behaviour so as to highlight the benefits that could arise from targeting both behaviours simultaneously.

As mentioned in the introduction (Chapter One), Yagil (2001) stated that there are two main approaches used to explain the commissioning of driving violations. One is to use the Theory of Planned Behaviour (to explore rational cognitive processes) and the other is to use measures of personality traits and individual needs (such as the need to engage in sensation seeking behaviour). Both of these approaches were adopted in the studies documented in this section (Chapters Five-Seven).

The Theory of Planned Behaviour or TPB (Ajzen, 1985, 1991; Chapter Two) is a useful framework for examining links between problem behaviours. This is because the TPB examines socio-cognitive variables, social influence, social norms and other elements from the four systems that comprise the Problem Behaviour Theory or PBT (Jessor & Jessor, 1977; Jessor, 1987[ab]; Chapter Three). The PBT was created to explain relationships between psychosocial characteristics and problem behaviours, its major premise being that all behaviour is the result of person-environment interactions (Jessor & Jessor, 1977; Jessor, 1987[ab]). The TPB is a social model that has been consistently used in the area of driving behaviour to measure person-environment interactions (Elliott et al., 2002, 2003; Forward, 1997; Parker et al., 1992[ab], 1995; Parker, Stradling, & Manstead, 1996; Stead, Tagg, MacKintosh & Eadie, 2004; Yagil, 2001), and for this reason it was used as a framework for the studies documented in this section (Chapters Five-Seven).

Personality traits, such as sensation seeking tendency, form the second approach for explaining why drivers commit driving violations. A large amount of evidence exists to support links between sensation seeking and the under-taking of risky driving and non-driving related behaviour (Arnett, 1994; Gullone, Moore, Moss & Boyd, 2000; Jonah, 1997[ab]; Jonah et al., 2001). Gullone et al. (2000) found that boys and older adolescents perceived risk-taking behaviours such as smoking, getting drunk, drink-driving and speeding to be less risky than females and younger adolescents and consequently they reported engaging in them more frequently. Studies have shown that high sensation seekers engage in significantly more high-risk driving behaviours than low sensation seekers (Jonah et al., 2001; Jonah, 1997[ab]). High

sensation seekers reported engaging in significantly more risky driving practices such as speeding, drink-driving and deliberately not wearing seat belts than low sensation seekers (Jonah et al., 2001). In a meta-analysis of studies that examined relationships between sensation seeking behaviour and driving, Jonah (1997[ab]) concluded that the majority of studies supported the existence of a positive relationship between sensation seeking and driving.

Studies have also reported links between sensation seeking and attitudes towards driving violations (Waylen & McKenna, 2002[abc], 2008; Yagil, 2001). Yagil (2001) found that high sensation seekers reported significantly more positive (high-risk) attitudes to risky driving practices such as speeding, close following, dangerous over-taking and failing to comply with a stop sign compared to low sensation seekers (Yagil, 2001). Waylen and McKenna (2002[abc], 2008) found that high sensation seeking pre-drivers were more pro-speeding and condoned (accepted) violations to a greater extent than low sensation seekers.

Arnett (1994) reported that high scores on the Arnett Inventory of Sensation Seeking (AISS) were predictive of engagement in a variety of risk taking behaviours among adolescents. Adolescents' sensation seeking scores were significantly correlated with engagement in risky driving behaviours such as driving whilst intoxicated, driving at high speeds (driving above 80mph and driving 20mph over the speed limit), racing cars, passing cars in no-passing zones. They were also significantly correlated with non-driving problem behaviours such as practising illicit sex, engaging in vandalism, using drugs and smoking (Arnett, 1994). The PBT (Chapter Three) was originally put forward by Jessor and Jessor (1977; Jessor, 1987[ab]) in order to explain why adolescents' engage in several different risk-taking behaviours. It states that adolescence is characterised by a syndrome of problem behaviours. Arnett's (1994) study thus supports the PBT. Jessor and Jessor (1977; Jessor, 1987[ab]) believed that the reason problem behaviours co-occur is that they all share the same social, psychological and behavioural variables. Jessor concluded that because problem behaviours are united by three variables, interventions designed to change one form of problem behaviour might also reduce other forms of problem behaviours. Thus, according to Jessor's conclusions, it is possible that by changing pre-drivers' road behaviour and attitudes their engagement in risky driving behaviour and other problem behaviours may be reduced.

The first experimental study, documented in Chapter Five, explores links between pre-driver attitudes, self-reported behaviours and intentions to engage in speeding in the future. This

study aims to see whether high-risk behaviours and attitudes are significantly associated with intentions to engage in future risky driving behaviour (i.e., whether self-reported engagement in one form of problem road behaviour is associated with intentions to engage in another form of problematic road behaviour).

The second experimental study, documented in Chapter Six, is a longitudinal study which explores pre-driver attitudes, self-reported road behaviour, intentions to engage in speeding behaviour and their self-reported driving behaviour a year later (self-reported engagement in 'Highway Code Violations', 'Errors' and 'Lapses'). This study aims to see whether adolescents' pre-driving road behaviour and attitudes towards driving are significantly associated with their intentions to engage in risky driving behaviour in the future and also with self-reported driving behaviour. It also aims to examine possible links between sensation seeking, adolescent pre-driving road behaviour and future driving behaviour.

The third experimental study, documented in Chapter Seven, looks at the stability of adolescent attitudes and beliefs over a six-month period in order to assess whether pre-driver interventions could potentially change attitudes and intentions via targeted interventions (thus if pre-driver attitudes and intentions have not stabilised and are fluid it may be possible for interventions to change them, even if only temporarily, thus reducing problem behaviour on the roads).

CHAPTER 5 - THE ATTITUDES, INTENTIONS AND BEHAVIOURS OF PRE-DRIVERS

5.1 Summary

Several studies have been conducted that have looked at pre-driver attitudes and behaviours (Chinn et al, 2004; Elliott and Baughan, 2004[ab]; Pinsky, Labouvie, Pandina & Laranjeira, 2001; Waylen & McKenna, 2002[abc], 2008). Findings from these studies have shown that exposure, knowledge and social influence are factors that affect adolescents' attitudes and behaviours. For example, Pinsky et al. (2001) found that drinking and driving expectations among pre-drivers were predicted by their current use of alcohol, whether they considered higher amounts of alcohol intake as being safe to drive, and the social influences on them (such as having experience of travelling with drunk drivers, having friends that drive under the influence, having more friends that approve than disapprove of driving under the influence).

The study presented in this chapter looks at pre-driving adolescents in both Scotland and New Zealand. It explores links between their road behaviour, attitudes towards driving violations and their intentions to speed in the future as drivers. It makes cross-national comparisons between adolescents from New Zealand and Scotland based upon their responses to questionnaire items. Participants' responses from both countries were also combined in order to see whether the proposed links between pre-driving road behaviour, driving attitudes and intentions were significant for all adolescents regardless of their country of residence.

Self-reported risky road behaviour is linked to traffic accident involvement (West et al., 1998). Studies have consistently shown that males are riskier pedestrians on the roads compared to females (Elliott & Baughan, 2004; West et al., 1998). Elliott and Baughan (2004) found that males engaged in significantly more unsafe road crossing behaviours and dangerous play and social activities on the road than females. Elliott and Baughan (2004) also reported a significant difference in adolescents' road behaviour according to their locality. Adolescents from schools in urban areas engaged in more unsafe road crossing behaviours than adolescents from rural schools. Adolescents from schools in rural areas engaged in more play and social activities on the roads and planned protective behaviours on the roads than adolescents from schools in urban areas. Elliott and Baughan (2004) explained these differences in road behaviours according to environmental differences, with adolescents from urban areas being exposed to a higher density of traffic and having more opportunities to

engage in unsafe road crossing behaviour compared to adolescents from rural areas. Conversely, adolescents from rural areas are exposed to a lower density of traffic and they may socialise on the roads to a greater extent because they perceive the danger from engaging in such activity as being lower than adolescents from urban areas. Adolescents from rural areas may also choose to engage in more protective behaviours on the roads (such as wearing fluorescent clothing) than adolescents from urban areas due to poor lighting. Elliott and Baughan (2003[ab], 2004) concluded that gains in safety could arise from a reduction in unsafe road crossing and dangerous play and social activities on the roads, and an increase in planned protective behaviours.

West et al. (1998) identified a significant relationship between problem behaviour, risky road behaviour and traffic and non-traffic accident rates in pre-driving adolescents. Adolescents who were involved in significantly more traffic and non-traffic related accidents reported engaging in problem behaviours (such as truancy from school, stealing, burglary, smoking, drugs, violence, graffiti, mugging, knife crime) and risky road behaviour (such as crossing the road without looking and running into the road without looking). West et al. (1998) proposed that risky road behaviour and problem behaviour are associated with the same personality measures of danger seeking, impulsiveness and frustration induced aggressiveness. It is therefore entirely plausible that risky road behaviour is a form of problem behaviour, as not all problem behaviours need to be illegal.

This study looks at risky road behaviour and its association with pre-driver attitudes towards driving violations and intentions to engage in speeding behaviour in the future as drivers. According to Harré et al. (2000), the age at which young people are developing a strong interest in driving and formulating attitudes about appropriate driving behaviour continues to decrease. It is therefore important for measures to be taken prior to adolescence to help aid the development and maintenance of positive (low-risk) traffic safety attitudes (Harré et al., 2000). In adolescents as young as 11 years old, significant differences have been found between males and females and what they expect from driving (Stradling, 1991). Waylen and McKenna (2002[abc], 2008) carried out a study on pre-drivers aged 11–16 years and found that from 14 years old upwards, boys perceived that learning to drive would be significantly easier than girls perceived it to be. There was also a tendency for boys to report perceiving a greater increase in popularity as a result of driving than girls. This gender difference in perception was found to increase significantly with age, with the perception that driving increases popularity becoming less plausible the older the girls. The study also reported that boys were

more accepting of driving violations than girls. Ulleberg and Rundmo (2003) and Iversen (2004) have shown that adolescents who report negative (high-risk) attitudes towards traffic safety are more likely to report risky driving behaviour. Therefore, it is important to create positive (low-risk) attitudes towards traffic safety if risky driving behaviour is to be reduced.

In this study questionnaires were used to assess pre-driving adolescents' road behaviour, driving attitudes and intentions.

5.2 Hypotheses

This study has five main hypotheses regarding pre-driving adolescents' general attitudes and behaviour:

1) Risky road behaviour is significantly associated with high-risk (positive) attitudes towards driving violations. High scorers on road behaviour (measured using the Adolescent Road-user Behaviour Questionnaire; Elliott & Baughan, 2004) are also high scorers on attitudes towards driving violations (measured using an adapted version of the Driver Attitude Questionnaire; Parker, Manstead, Stradling & Senior, 1998).

2) Risky road behaviour will be significantly associated with high-risk (positive) perceptions about the morality of speeding, a lack of anticipated regret and approval of significant others (for example, friends and family) towards speeding. High scorers on road behaviour (measured using the Adolescent Road-user Behaviour Questionnaire) are also high scorers on moral norm, anticipated regret and subjective norm (measured using the extended Theory of Planned Behaviour scale, Parker, Manstead & Stradling, 1995).

3) Risky road behaviour will be significantly associated with high-risk (positive) intentions to speed. High scorers on road behaviour (measured using the Adolescent Road User Behaviour Questionnaire) are also high scorers on intentions to speed (measured using the extended TPB scale).

4) Positive (high-risk) attitudes towards driving violations are significantly associated with positive (high-risk) intentions to speed. High scorers on attitudes towards driving violations (measured using the DAQ) are also high scorers on intentions to speed (measured using the extended TPB scale).

5) Positive (high-risk) perceptions about the morality of speeding, lack of anticipated regret and approval of significant others (for example, friends and family) towards speeding are significantly associated with positive (high-risk) intentions to speed. High scorers on moral norm, anticipated regret, subjective norm are also high scorers on intentions to speed (measured using the extended TPB scale).

This study has three further cross-national hypotheses regarding pre-driving adolescents' attitudes and behaviour according to the country they inhabit:

i) Scottish adolescents will have significantly different attitudes towards driving violations than New Zealand adolescents.

ii) Scottish adolescents will have significantly different road behaviour than New Zealand adolescents.

iii) Scottish adolescents will have significantly different intentions to speed than New Zealand adolescents.

5.3 Methodology

5.3.1 Research Design

A survey of pre-driving adolescents' attitudes, road behaviour and intentions towards speeding formed the baseline survey for two longitudinal studies conducted in New Zealand and Scotland.

5.3.2 Participants

1336 pre-drivers (719 females, 617 males) aged between 12-18 years old (M = 14.2yrs, SD = 0.96) from small towns (42.8%), cities (34.6%), villages and the countryside (21%) in New Zealand and Scotland participated in the study.

The New Zealand AA Driver Education Foundation (AADEF) recruited 36 schools from across the North and South Islands to take part in the study. In total 814 participants (361 males, 453 females) aged 13-18 years (M = 14 years, SD = 0.59) completed questionnaires. 570 participants came from 23 schools on the North Island and 243 participants came from 13 schools on the South Island and reported living in cities (41.6%), small towns (37.5%), villages and the countryside (19%).

Road Safety Scotland (RSS) recruited 24 schools from across Scotland to take part in the study. In total 522 participants (256 males, 266 females) aged 12-18 years (M = 14.6 years, SD = 1.27) completed questionnaires. They reported living in small towns (51.1%), villages and the countryside (23.9%) and cities (23.6%).

5.3.3 Procedure

RSS and the AADEF sent letters to schools in their respective countries inviting them to take part in the study.

Once schools had agreed to participate in the study they were sent questionnaires, parental/guardian consent forms and a set of instructions regarding the recruitment of participants and the procedure for completing questionnaires. The teachers at the schools were given the responsibility of recruiting student participants and the instructions provided them with information about participant demographics for the study (i.e., students aged between 13-18 years). The instructions also provided information about the procedure for completing questionnaires (i.e., that students needed to complete all three sections of the first

questionnaire which would take approximately ten minutes). The schools' were instructed to send out the consent forms to the parents or guardians of students to inform them about the research being undertaken and to give them the opportunity to withdraw their child from the study should they wish to do so. They were then asked to collect students' consent forms and to return only those questionnaires that had received parental or guardian consent.

5.3.4 Measures

5.3.4.1 Questionnaire

The questionnaire (Appendix G and I) consisted of three sections:

i) Adolescent road behaviour (questions taken from the Adolescent Road User Behaviour Questionnaire - ARBQ, Elliott and Baughan, 2004; Appendix A);

ii) Attitudes and intentions to engage in speeding behaviour (questions were extracted from the extended TPB scale and included measures of moral norm; Parker, Manstead & Stradling, 1995; Appendix B);

iii) Attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts'(questions adapted from Parker, Manstead, Stradling and Senior's (1998) DAQ; Appendix C).

Some of the Likert scales for items in the questionnaire were reversed at random to encourage participants to think about each question. When answers to reversed questions were reversed back to the correct direction, high risk-takers and people with positive (high-risk) attitudes towards risky driving practices scored high on all three scales (the ARBQ scale, the TPB speeding scale and the DAQ scale).

Section 1: Adolescent Road Behaviour

In the first section Elliott and Baughan's (2004) ARBQ was used to measure road behaviour (Appendix A). These items were divided into three subscales that measured 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Planned Protective Behaviour on the Road'. Elliott and Baughan (2004) reduced their scale from 43 items to 23 items because they felt that when the full scale was used in conjunction with other self-report measures the questionnaires would be too long for self-completion. They arrived at 23 items after conducting a principal axis factor analysis on the original 43 item scale and selecting the eight items that loaded most strongly on 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' and the seven items that loaded most strongly on 'Planned Protective Behaviour on the Road'. After a second principal axis factor analysis using the

shortened 23 items scale Elliott and Baughan (2004) reduced the ARBQ scale further to 21 items. The 21-item ARBQ scale was used in this study as recommended by Elliott and Baughan (2004).

For the purposes of directionality, the Likert scale for items measuring 'Planned Protective Behaviour on the Road' (for example, *"wear bright or reflective clothing when riding a bike in the dark"*, *"use lights on your bike when it is dark"*) was reversed and the sub-scale was re-labelled 'Non-engagement in Planned Protective Behaviour on the Road'. Consequently dangerous road users were those participants who scored high on each of the three sections of the ARBQ. The reduced 21-item ARBQ scale therefore consisted of eight 'Unsafe Road Crossing Behaviour' items, eight 'Play and Social Activity on the Road' items and five 'Non-engagement in Planned Protective Behaviour on the Road' items. All items were measured using a five point Likert scale (1 = never, 2 = hardly ever, 3 = sometimes, 4 = fairly often, 5 = very often).

Although in the New Zealand questionnaire the full 43-item ARBQ was printed, only the 21 items from the reduced 21-item scale were used in statistical analysis. The reason the full scale was printed was that a second study unrelated to this thesis was running simultaneously validating the use of the 43-item ARBQ in NZ (Sullman & Mann, 2009).

Section 2: Attitudes and Intentions to Speed

In the second section the 'Extended TPB scale' (Parker, Manstead et al., 1995) was used to measure pre-drivers' attitudes and intentions to speed (referred to as the TPB speeding scale). It included measures of personal norm (moral norm and anticipated regret; Appendix B). As Parker, Manstead et al. (1995) designed the extended TPB scale for their study on drivers, only those questions which were deemed to be relevant to pre-drivers were included in this study. There were 13 items in total (one moral norm, two anticipated regrets, four attitude items, two subjective norms, three perceived behavioural control and one measure of intention) taken from Parker, Manstead et al.'s (1995) original questionnaire and the wording slightly modified so that pre-drivers could reasonably answer the questions.

Some of the TPB components were measured using more than one item (for example, attitudes to speeding were measured using four items, Appendix B), responses to each of these facets were added together and averaged. Of the three perceived behavioural control items (PBC) only one was used in the statistical analysis in this study *("My refraining from*

speeding would be easy/difficult") because of the low Cronbach's Alpha produced when the three items were combined (Table 5.1). Parker, Manstead et al. (1995) produced low Cronbach's Alphas for PBC in their study and consequently they chose to use the one PBC item that had correlated most highly with the belief-based measure of PBC. Parker, Manstead et al. (1995) calculated the belief-based measure of PBC by multiplying ratings for a set of salient control beliefs by the perceived power of each control factor to inhibit or facilitate performance and then summing the products). The calculations and correlations conducted by Parker, Manstead et al. (1995) could not be performed in this study because participants were pre-drivers and could not rate internal or external factors that affect driving (i.e., their control beliefs) nor the frequency they encountered them (which would have produced an indication of the power of these control factors). A decision was made to use only one PBC item in the statistical analysis in this study. This decision was made based partly upon Parker, Manstead et al.'s (1995) suggestion but also on the results of Cronbach's Alphas conducted on the complete TPB scale. When the two PBC items were removed from the complete TPB scale the Cronbach's Alpha value increased (Table 5.2).

After removing two PBC items, 11 items were used to measure the components of the 'Extended TPB scale' in this study. The items were measured using a seven point Likert scale with the end points being appropriate to the question (for example: 1 = Strongly agree, 7 = Strongly disagree; 1 = Very likely, 7 = Very unlikely; 1 = Very easy, 7 = Very difficult).

Section 3: Attitudes to Driving Violations

In the third section the DAQ was used to assess attitudes towards driving violations such as 'speeding', 'drink-driving' and 'not wearing seat belts'. There were 22 questions (nine 'speeding' items, eight 'drink-driving' items and five attitudes to 'not wearing seat belts' items). 16 items were taken from Parker, Manstead, et al.'s (1998) 40-item DAQ (Appendix C). The DAQ consisted of four sub-sections (10 items in each section) measuring attitudes towards: 'drink-driving', 'speeding', 'over-taking' and 'close following'.

The 16 items from the original 40-item DAQ used in this study only addressed attitudes to 'speeding' and 'drink-driving' as it was felt that some pre-drivers might not have any knowledge about over-taking and close following. A new subscale, attitudes towards 'not wearing seat belts', was created to measure adolescent attitudes towards wearing seat belts in cars.

From the original DAQ scale, seven items from the 'drink-driving' subscale were chosen to be used in this study. Three 'drink-driving' items from the original subscale measuring attitudes towards breath-testing and knowledge of the legal blood alcohol limit were removed because as participants were below the legal drinking age it was assumed that they may not know about legal limits or breath-testing. A new item ("*it's ok to drink and drive*") was added to the 'drink-driving' subscale in this study.

From the original DAQ scale only nine items on 'speeding' were used in this study. One item, namely "*I know exactly how fast I can drive and still drive safely*", was omitted because it was felt that it would not have been applicable to the pre-drivers answering the questionnaire.

A third subscale on 'attitudes to not wearing seat belts' consisting of five questions was created for the purposes of this study. Some of the questions used in the other two sections on 'speeding' and 'drink-driving' were re-worded so that they could be applied to attitudes towards non-use of seat belts.

All items were measured using a five point Likert scale (1 = Strongly agree, 5 = Strongly disagree).

5.4 Results

The data collected from this study was looked at in three different ways:

1) Data collected in Scotland
2) Data collected in New Zealand
3) Data from both countries combined.

Looking at the data in three ways allowed for close analysis of what was going on in each country, for comparisons to be made between countries and also for adolescents' attitudes and behaviour to be looked at in general irrespective of culture.

5.4.1 Cronbach's Alpha

Cronbach's Alphas were run on the scales and subscales used in the questionnaire for Scotland, New Zealand and both countries combined (Table 5.1 and Table 5.2).

Cronbach's Alphas run on the Extended TPB scale for each data group showed that the three speeding perceived behavioural control items had very low Alpha values (Table 5.1). In Parker, Manstead et al.'s (1995) study they only used one perceived behavioural control (PBC) item ("*How easy or difficult is it to refrain (stop yourself) from speeding when driving?*") because it correlated well with the belief-based measures that they took. Therefore, two PBC items were removed and the Extended TPB scale was reduced from 13 items to 11 (Table 5.2).

Table 5.1 – Cronbach's Alpha (α) Values for the Extended TPB Scale

	Number of items	Scotland α	New Zealand α	Combined Countries α
TPB scale	13	0.76	0.72	0.74
Moral Norm	1	-	-	-
Anticipated Regret	2	0.53	0.54	0.52
Attitude	4	0.64	0.66	0.65
Subjective norms	2	0.70	0.73	0.72
PBC	3	0.12	0.25	0.18
Intention	1	-	-	-

The Cronbach Alpha values for all three scales and their respective subscales were very high. Each scale was considered to have fairly high levels of internal consistency reliability (Table 5.2).

Table 5.2 – Cronbach's Alpha (α) Values for Scale Items

Scales	Number of items	Scotland α	New Zealand α	Combined Countries α
ARBQ scale	21	0.82	0.84	0.83
Unsafe Road Crossing Behaviour	8	0.76	0.78	0.77
Play and Social Activity on the Road	8	0.79	0.85	0.83
Non-engagement in Planned Protective Behaviour	5	0.74	0.75	0.74
DAQ scale	22	0.85	0.82	0.83
Attitudes to speeding	9	0.80	0.73	0.76
Attitudes to drink-driving	8	0.68	0.68	0.67
Attitudes to not wearing seat belts	5	0.81	0.76	0.79
TPB scale	11	0.78	0.76	0.77
Moral Norm	1	-	-	-
Anticipated Regret	2	0.53	0.54	0.52
Attitude	4	0.64	0.66	0.65
Subjective norms	2	0.70	0.73	0.72
PBC	1	-	-	-
Intention	1	-	-	-

5.4.2 Factor Analysis

A principal axis factor analysis (PAF) with varimax rotation was run on the ARBQ data to find out whether the items loaded on the appropriate factors ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road', and 'Non-engagement in Planned Protective Behaviour on the Road'). The three factors explained 45.9% of the r^2 variance in the Scotland group, 48.2% in the New Zealand group and 47.6% in the combined countries group.

A principle components analysis (PCA) with varimax rotation was run on the DAQ data from all three data groups to find out whether the items loaded on the appropriate factors. The three factors (attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts') explained 43.6% of the r^2 variance in the Scotland group, 39.1% New Zealand group and 40.3% for the combined countries group.

5.4.3 Questionnaire Analysis

Mean scores for the three scales were calculated for the three data groups (Scotland, New Zealand and combined countries groups; Table 5.3).

Table 5.3 – Mean Response to Questionnaire Items

Questionnaire items	*Scale Range*	Scotland mean scores (n = 522)	NZ mean scores (n = 814)	Combined countries mean scores (n = 1336)
ARBQ Unsafe Road Crossing Behaviour	*1-5*	2.73	2.57	2.63
ARBQ Play and Social Activity on the Roads	*1-5*	1.33	1.45	1.40
ARBQ Non-engagement in Planned Protective Behaviour on the Road	*1-5*	**4.26**	**3.69**	**3.91**
TPB Speeding moral norm	*1-7*	2.61	2.56	2.58
TPB Speeding mean anticipated regret	*1-7*	3.64	3.50	3.55
TPB Speeding mean attitude	*1-7*	2.98	2.95	2.96
TPB Speeding mean subjective norm	*1-7*	2.25	2.28	2.26
TPB Speeding perceived behavioural control	*1-7*	**4.04**	**4.16**	**4.11**
TPB Speeding intention	*1-7*	**4.40**	**4.04**	**4.18**
DAQ Attitude to speeding	*1-5*	2.91	2.87	2.88
DAQ Attitude to drink-driving	*1-5*	2.67	2.68	2.68
DAQ Attitude to not wearing seat belts	*1-5*	2.12	1.92	2.00

= scores above the mid-point of the scale that indicate high-risk responses

The scores tended to be below the mid-points of the scales (Table 5.3). This suggested that the majority of the attitudes expressed and the road behaviours reported were fairly desirable and relatively low risk (for example, adolescents did not often cross from between parked cars when safer places to cross were nearby). Three items were responded to above the mid-point

for all three participant sampling groups. These items were 'Non-engagement in Planned Protective Behaviour on the Road', speeding perceived behavioural control, and speeding intention. Scoring above the mid-point for perceived behavioural control (PBC) was desirable because it meant that participants considered themselves to have the ability to control their speeding behaviour (having low PBC is associated with increased accident involvement).

These results suggest that regardless of the country they were from, adolescents engaged in little protective behaviour on the road. With regard to driving, participants perceived that when they become drivers they would be able to control their speeding (i.e., that it would be easy to refrain from speeding) and they reported intending to speed in the future.

5.4.4 Adolescent Road Behaviour

Total scores were calculated for the three ARBQ subscales: 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road' for all three data groups (Table 5.3). The mean scores on 'Unsafe Road Crossing Behaviour' were just below the mid-point of the scale suggesting that although the majority of participants in this study engaged in frequent unsafe road crossing practices they could still be classified as being relatively safe road users. They were also below the mid-point for 'Play and Social Activity on the Road', which suggests that they did not engage in many play and social activities on the road. There was one subscale, namely 'Non-engagement in Planned Protective Behaviour on the Road', with a mean score above the mid-point, suggesting that the majority of participants do not engage in many protective behaviour practices on the road (For example, "*Wear bright or reflective clothing when near the road")*.

The means for the 21 ARBQ items reported by the adolescents from Scotland, New Zealand and both countries combined were ranked in descending order so that the most frequently committed behaviours appeared at the top of the list and the least committed behaviours appeared at the bottom of the list (Table 5.4). Failing to wear bright or reflective clothing near the roads, or on the road as pedestrians/cyclists at night, were the top three behaviours performed on the roads in all three sampling groups. The most frequent unsafe road crossing behaviour performed by youths was "*Forget to look properly (both ways as you cross roads) because you are talking to friends who are with you*" in Scotland, and "*Get part way across the road and then have to run the rest of the way to avoid traffic*" for both adolescents from New Zealand and the combined countries group. "*Running on to the road to get a ball*

without checking for traffic" was the most frequent play and social activity engaged in by youths from all three sampling groups.

Table 5.4 – Cultural Differences on Individual ARBQ Questionnaire Items (1-5 scale)

		Combined Countries (n = 1336)			Scotland (n = 522)			New Zealand (n = 814)		
Scale	**Item (How often do you…)**	Rank	M	SD	Rank	M	SD	Rank	M	SD
N	Wear bright or reflective clothing when near the road	1	4.50	0.83	1	4.63	0.71	1	4.42	0.89
N	Wear bright or reflective clothing when out walking in the dark	2	4.40	0.96	2	4.55	0.77	2	4.30	1.05
N	Wear bright or reflective clothing when riding a bike in the dark	3	4.19	1.17	3	4.39	0.99	3	4.05	1.25
N	Use lights on your bike when it is dark	4	3.46	1.49	5	3.59	1.44	4	3.37	1.51
U	Get part way across the road and then have to run the rest of the way to avoid traffic	5	3.00	1.02	8	2.96	0.98	5	3.03	1.04
N	Wear a cycle helmet when riding a bike	6	3.00	1.60	4	4.11	1.23	11	2.29	1.38
U	Cross from between parked cars when there is a safer place to cross nearby	7	2.94	1.03	7	3.03	1.03	6	2.88	1.03
U	Forget to look properly (both ways as you cross roads) because you are talking to friends who are with you	8	2.93	1.05	6	3.10	1.04	7	2.82	1.05
U	See a small gap in the traffic and "go for it"	9	2.77	1.15	10	2.72	1.15	8	2.80	1.16
U	Forget to look properly (both ways as you cross roads) because you are thinking about something else	10	2.58	0.98	9	2.73	0.96	9	2.48	0.98
U	Think it is OK to cross the road safely, but a car is coming faster than you thought	11	2.47	0.92	11	2.60	0.91	10	2.38	0.92
U	Cross the road Whether traffic is coming or not, thinking the traffic should stop for you	12	2.26	1.12	12	2.45	1.13	12	2.15	1.10
U	Run across the road without looking, because you are in a hurry	13	2.10	1.06	13	2.23	1.07	13	2.03	1.05
P	Run on to the road to get a ball without checking for traffic	14	1.85	0.96	14	1.84	0.95	14	1.85	0.97
P	Ride a skateboard (or roller-skates/roller-blades) on the road	15	1.63	1.03	15	1.54	0.99	15	1.68	1.05
P	Ride out on to the road on a skateboard (or roller-skates/roller-blades) without thinking to check for traffic	16	1.32	0.69	16	1.26	0.64	16	1.36	0.72
P	Deliberately run across the road without looking, for a dare	17	1.30	0.75	18	1.22	0.62	18	1.35	0.82
P	Play "chicken" by deliberately running out in front of traffic	18	1.29	0.74	17	1.23	0.66	21	1.33	0.79
P	Play "chicken" by lying down on the road and wait for cars to come along	19	1.29	0.77	19	1.17	0.59	17	1.36	0.86
P	Hold on to a moving vehicle when riding a bike	20	1.27	0.72	21	1.17	0.55	19	1.34	0.80
P	Hold on to a moving vehicle when riding a skateboard, roller-skates or roller-blades	21	1.27	0.70	20	1.17	0.55	20	1.34	0.77

N = Non-engagement in Planned Protective Behaviour; U = Unsafe Road Crossing; P = Play and Social Activity

= shared rank order of ARBQ items for Scotland/New Zealand and both countries combined

Independent t-tests were run on the three data groups in order to see if there were any significant gender differences on the ARBQ subscales. The results (Table 5.5) showed that young males scored significantly higher than young females on 'Play and Social Activity on the Road' (e.g., hanging around the roads with friends and playing games on the road) in Scotland ($t(382) = 5.85$, $p < 0.001$, $d = 0.51$), New Zealand ($t(704) = 2.11$, $p < 0.05$, $d = 0.15$) and in the combined countries groups ($t(1159) = 4.56$, $p < 0.001$, $d = 0.25$). These results suggest that young males expose themselves to higher risks as they engaged in more play and social activities on the road.

Table 5.5 – Gender Differences on ARBQ Subscales (1-5 scale)

	Scotland (n = 522)			New Zealand (n = 814)			Combined Countries (n = 1336)		
	Males (n=256)	**Females (n=266)**	**Diff.**	**Males (n=361)**	**Females (n=453)**	**Diff.**	**Males (n=617)**	**Females (n=719)**	**Diff.**
ARBQ									
Unsafe road crossing Behaviour	2.77	2.68	0.09	2.55	2.59	-0.03	2.64	2.62	0.02
Play and Social Activity on the Roads	1.44	1.21	**0.23****	1.50	1.41	**0.09***	1.48	1.34	**0.14****
Non-engagement in Planned Protective Behaviour	4.31	4.20	0.11	3.68	3.69	0.00	3.94	3.88	0.07

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
□ = males significantly higher means than females

A one-way between groups ANOVA was run on the three data groups in order to find out if there were any significant differences in ARBQ response according to where participants lived (City/small town/villages and countryside). Results from the Scotland data showed that participants who lived in the city scored significantly lower than participants who lived in villages and the countryside on 'Play and Social Activity on the Road' ($F(2) = 7.17$, $p < 0.001$) but significantly higher on 'Non-engagement in Planned Protective Behaviour on the Road' ($F(2) = 3.34$, $p < 0.05$). These results suggest that in Scotland young people from the city engage in less risky 'Play and Social Activity on the Road' and engage in significantly less protective behaviour on the road compared to adolescents from villages and the countryside.

Results from New Zealand ($F(2) = 3.26$, $p < 0.05$) and the combined countries group ($F(2) = 5.33$, $p < 0.05$) showed that participants who lived in small towns scored significantly higher on 'Unsafe Road Crossing Behaviour' than participants from villages and the

countryside. These results suggest that people from small towns engage in riskier behaviour on the roads than people from villages and the countryside.

An independent samples t-test was conducted to see if there any significant cultural differences on the ARBQ subscales between New Zealand and Scottish youths (Table 5.6).

Table 5.6 – Cultural Differences on ARBQ Subscales (1-5 scale)

	Country		
ARBQ	**Scotland (n = 522)**	**New Zealand (n = 814)**	**Diff.**
ARBQ Unsafe Road Crossing Behaviour	2.73	2.57	**0.15****
ARBQ Play and Social Activity on the Road	1.33	1.45	**-0.13****
ARBQ Non-engagement in Planned Protective Behaviour	4.26	3.69	**0.57****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
= Scotland significantly higher means than New Zealand

The results showed that there were significant differences between New Zealand and Scotland on 'Unsafe Road Crossing Behaviour' ($t(1334) = 4.27$, $p < 0.001$, $d = 0.24$), 'Play and Social Activity on the Road' ($t(1292) = -4.45$, $p < 0.001$, $d = 0.24$) and 'Non-engagement in Planned Protective Behaviour on the Road' ($t(1231) = 12.7$, $p < 0.001$, $d = 0.70$). Scottish participants scored significantly higher on 'Unsafe Road Crossing Behaviour' and 'Non-engagement in Planned Protective Behaviour on the Road'. New Zealand participants, however, scored significantly higher on 'Play and Social Activity on the Road'.

5.4.5 Attitudes and Intentions to Speed

Some of the TPB components were measured using more than one item (for example, attitudes to speeding were measured using four items), responses to each of these facets were added together and then divided to find the mean scores ('TPB Speeding mean attitude').

Participants from all three sampling groups (Scotland, New Zealand and both countries combined) scored under the mid-point for speeding moral norms, anticipated regret, attitudes and subjective norms (Table 5.3). This suggests that the majority of participants knew that it was morally wrong to speed and were aware that most people they know would not approve of their engaging in such behaviour on the roads. They also anticipated that they would feel sorry after engaging in speeding behaviour. Participants scored above the mid-point for intentions to speed and perceived behavioural control over speeding. These results suggest that adolescents think that refraining from speeding will be easy and they intend to engage in speeding behaviour in the future.

Independent t-tests were run on the three data groups in order to see if there were any significant gender differences on the TPB items (Table 5.7).

Table 5.7 – Gender Differences on TPB Subscales (1-7 scale)

	Scotland			New Zealand			Combined Countries		
	Males (n=256)	Females (n=266)	Diff.	Males (n=361)	Females (n=453)	Diff.	Males (n=617)	Females (n=719)	Diff.
TPB									
Moral Norm	2.94	2.29	**0.65****	2.77	2.40	**0.37****	2.84	2.36	**0.48****
Anticipated Regret	4.09	3.20	**0.89****	3.78	3.27	**0.51****	3.91	3.24	**0.67****
Attitude	3.30	2.68	**0.62****	3.18	2.76	**0.43****	3.23	2.73	**0.50****
Subjective norms	2.56	1.94	**0.62****	2.56	2.05	**0.51****	2.56	2.01	**0.55****
PBC	4.09	4.00	0.09	4.13	4.18	-0.04	4.11	4.11	0.00
Intentions to speed	4.59	4.22	**0.37***	4.19	3.92	**0.27***	4.35	4.03	**0.32****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)

= males significantly higher means than females

Males scored significantly higher than females on moral norm in Scotland ($t(490) = 4.78$, $p < 0.001$, $d = 0.42$), New Zealand ($t(734) = 3.50$, $p < 0.001$, $d = 0.25$) and the combined countries group ($t(1225) = 5.75$, $p < 0.001$, $d = 0.32$; Table 5.7). They also scored higher on anticipated regret in Scotland ($t(520) = 7.27$, $p < 0.001$, $d = 0.64$), New Zealand ($t(812) = 5.35$, $p < 0.001$, $d = 0.38$) and the combined countries group ($t(1334) = 8.81$, $p < 0.001$, $d = 0.48$). Males also scored significantly higher on mean attitude in Scotland ($t(520) = 6.30$, $p < 0.001$, $d = 0.55$), New Zealand ($t(812) = 5.55$, $p < 0.001$, $d = 0.39$) and the combined countries group ($t(1334) = 8.30$, $p < 0.001$, $d = 0.45$).

Females scored significantly lower than males on mean subjective norm in Scotland ($t(472) = 5.76$, $p < 0.001$, $d = 0.51$), New Zealand ($t(699) = 5.50$, $p < 0.001$, $d = 0.39$) and the combined countries group ($t(1179) = 7.82$, $p < 0.001$, $d = 0.43$; Table 5.7). Males reported a significantly greater intention to speed than females in Scotland ($t(520) = 2.58$, $p < 0.05$, $d = 0.23$), New Zealand ($t(812) = 2.40$, $p < 0.05$, $d = 0.17$) and the combined countries group ($t(1334) = 3.66$, $p < 0.001$, $d = 0.20$).

These results suggest that pre-driving males have significantly riskier attitudes and intentions regarding speeding than females. They consider speeding to be not as morally wrong as females do and do not anticipate feeling as much regret from engaging in it. Males also perceive that their significant others (people who they consider to be important when

responding to the question *"Most people who are important to me, for example my family and friends, would think that I should speed when I drive"*) would not be as disapproving of their engaging in speeding as females' significant others would, and they ultimately report a greater intention to speed in the future.

A one-way between groups ANOVA was run on the three data groups in order to find out if there were any significant differences in TPB response according to where participants lived. In Scotland participants who lived in the city scored significantly lower (more negative) than participants who lived in small towns and participants who lived in villages and the countryside on moral norm ($F(2) = 3.65$, $p < 0.05$) and mean anticipated regret ($F(2) = 6.17$, $p < 0.05$). They also scored significantly lower than participants from small towns on speeding intention ($F(2) = 3.22$, $p < 0.05$). These results suggest that in Scotland, adolescents from the city believe it is more morally wrong to speed and anticipate that they will feel regret from engaging in speeding behaviour compared those who live in small towns, villages and the countryside. Further, they report that they do not intend to engage in speeding in the future as much as adolescents from small towns.

In New Zealand adolescents who lived in the city scored significantly lower than participants who lived in small towns on moral norm ($F(2) = 4.06$, $p < 0.05$) and anticipated regret ($F(2) = 5.35$, $p < 0.05$). They also scored significantly lower on speeding intention than participants from villages and the countryside ($F(2) = 3.40$, $p < 0.05$). These results suggest that New Zealand adolescents from the city believe that it is more morally wrong to speed and anticipate feeling more regret from engaging in speeding behaviour compared to those who live in small towns. Further, they report a lower intention to speed than youths from villages and the countryside.

For the combined countries group, adolescents who lived in the city reported significantly lower scores on moral norm ($F(2) = 7.05$, $p < 0.001$), anticipated regret ($F(2)$ 12.5, $p < 0.001$) and speeding intention ($F(2) = 7.36$, $p < 0.001$) than participants who lived in small towns, villages and the countryside. These results imply that adolescents from the city believe it is more morally wrong to speed, anticipate that they will feel regret from engaging in speeding behaviour and report a lower intention to speed than those from small towns, villages and the countryside. Results from all three data groups show that regardless of the country they are from, adolescents from the city report less risky attitudes and intentions

towards speeding than adolescents from other areas (such as small towns, villages and countryside).

An independent samples t-test was conducted to see if there any significant cultural differences in response to TPB speeding items from New Zealand and Scottish youths (Table 5.8).

Table 5.8 – Cultural Differences on TPB Subscales (1-7 scale)

	Country		
TPB	**Scotland (n = 522)**	**New Zealand (n = 814)**	**Diff.**
TPB Moral Norm	2.61	2.56	0.04
TPB Anticipated Regret	3.64	3.50	0.14
TPB Attitude	2.98	2.95	0.04
TPB Subjective norms	2.25	2.28	-0.03
TPB PBC	4.04	4.16	-0.12
TPB Intention to speed	4.40	4.04	**0.36****

* = Significant Difference (p < 0.05); **= Significant Difference (p < 0.001)
= Scotland significantly higher means than New Zealand

The results found only one significant difference between the two countries on TPB speeding items (Table 5.8). Scottish adolescents reported a significantly greater intention to speed in the future compared to New Zealand adolescents ($t(1073) = 3.93$, $p < 0.001$, $d = 0.22$).

5.4.6 Attitudes to Driving Violations

Mean scores were calculated for the three DAQ subscales: attitude to speeding; attitude to drink-driving; and attitude to not wearing seat belts for the three sampling groups (Table 5.3). The mean scores showed that respondents scored under the mid-point for all three DAQ subscales. The results suggest that the majority of participants did not have dangerous attitudes regarding driving violations, particularly with regards to 'not wearing seat belts' and 'drink-driving'. They knew that it was wrong to commit driving violations such as 'drink-driving' and 'not wearing seat belts'. Participants only just scored under the mid-point for 'attitudes towards speeding', which suggests that compared to their 'attitudes towards drink-driving' and 'not wearing seat belts' they have more dangerous and permissive 'attitudes towards speeding'.

Independent t-tests were run on the three data groups to see if there were any significant gender differences on the DAQ (Table 5.9).

Table 5.9 – Gender Differences on DAQ Subscales (1-5 scale)

	Scotland (n = 522)			New Zealand (n = 814)			Combined Countries (n = 1336)		
	Males (n=256)	Females (n=266)	Diff.	Males (n=361)	Females (n=453)	Diff.	Males (n=617)	Females (n=719)	Diff.
DAQ									
Speeding	3.08	2.74	**0.34****	2.98	2.77	**0.21****	3.02	2.76	**0.26****
Drink-driving	2.77	2.57	**0.20****	2.76	2.62	**0.14***	2.76	2.60	**0.16****
Not wearing seat belts	2.25	2.00	**0.25****	1.99	1.87	**0.12***	2.10	1.92	**0.18****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
= males significantly higher means than females

Males scored significantly higher than females on 'attitudes to speeding' in Scotland ($t(501) = 5.83$, $p < 0.001$, $d = 0.51$), New Zealand ($t(812) = 4.82$, $p < 0.001$, $d = 0.34$) and the combined countries group ($t(1334) = 7.52$, $p < 0.001$, $d = 0.41$; Table 5.9). They also scored significantly higher than females on 'attitudes to drink-driving' in Scotland ($t(520) = 3.42$, $p < 0.001$, $d = 0.30$), New Zealand ($t(726) = 3.17$, $p < 0.05$, $d = 0.22$) and the combined countries group ($t(1253) = 4.60$, $p < 0.001$, $d = 0.25$). Females scored significantly lower than males on 'attitudes to not wearing seat belts' in Scotland ($t(487) = 3.71$, $p < 0.001$, $d = 0.33$), New Zealand ($t(812) = 2.42$, $p < 0.05$, $d = 0.17$) and the combined countries group ($t(1214) = 4.41$, $p < 0.001$, $d = 0.24$).

These results suggest that pre-driving males possess significantly more dangerous attitudes towards driving than their female counterparts. They had riskier attitudes than females towards speeding, drink-driving and not wearing seat belts.

A one-way between groups ANOVA was run on the three data groups in order to find out if there were any significant differences in DAQ response according to where participants lived. In Scotland, adolescents who lived in the city scored significantly lower than those who lived in small towns, villages and the countryside on 'attitude to speeding' ($F(2) = 4.99$, $p < 0.05$). Adolescents from the city also scored significantly lower on 'attitude to not wearing seat belts' than participants from villages and the countryside ($F(2) = 4.48$, $p < 0.05$). These results suggest that young people in Scotland who are from cities have less risky attitudes to speeding compared to people from small towns, villages and the countryside. They also scored lower on attitudes to not wearing seat belts compared to adolescents from villages and the countryside.

In New Zealand, young people who lived in the city scored significantly lower than participants who lived in small towns on 'attitude to speeding' ($F(2) = 4.13$, $p < 0.05$). They also scored significantly lower on 'attitude to drink-driving' than participants from villages and the countryside ($F(2) = 7.06$, $p < 0.001$). These results suggest that New Zealand adolescents who are from cities have less risky attitudes to speeding, compared to those from small towns. They also score lower on attitudes to drink-driving than people from villages and the countryside.

For the combined countries group, adolescents who lived in the city reported significantly lower scores than participants who lived in small towns, villages and the countryside. They scored lower on 'attitude to speeding' ($F(2) = 9.28$, $p < 0.001$), 'drink-driving' ($F(2) = 6.74$, $p < 0.001$) and 'not wearing seat belts' ($F(2) = 7.28$, $p < 0.001$). These results suggest that regardless of the country they are from, adolescents from the city have less risky attitudes to speeding, drink-driving and not wearing seat belts compared to people from small towns, villages and the countryside.

An independent samples t-test was conducted to see if there any significant cultural differences in responses to the DAQ from New Zealand and Scottish youths (Table 5.10).

Table 5.10 – Cultural Differences on DAQ Subscales (1-5 scale)

	Country		
DAQ	**Scotland (n = 522)**	**New Zealand (n = 814)**	**Diff.**
DAQ attitudes to speeding	2.91	2.87	0.04
DAQ attitudes to drink-driving	2.67	2.68	-0.02
DAQ attitudes to not wearing seat belts	2.12	1.92	**0.20****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
□ = Scotland significantly higher means than New Zealand

The results showed that there was only one significant difference between the two countries on the DAQ items; Scottish adolescents scored significantly higher than New Zealand adolescents on 'attitude to not wearing seat belts' ($t(1334) = 4.81$, $p < 0.001$, $d = 0.27$; Table 5.10).

5.4.7 Association between Road Behaviour and Attitudes to Driving Violations

Correlations conducted on items from the ARBQ and DAQ for all three sampling groups revealed significant associations ($p < 0.001$; Table 5.11).

Table 5.11 – Correlations Between ARBQ and DAQ subscales

		DAQ		
ARBQ	**Country**	**Speeding r**	**Drink-driving r**	**Not wearing seat belts r**
Unsafe Road Crossing Behaviour	Scotland (n = 522)	**0.29****	**0.25****	**0.23****
	New Zealand (n = 814)	**0.30****	**0.29****	**0.19****
	Combined countries (n = 1336)	**0.29****	**0.27****	**0.22****
Play and Social Activity on the Road	Scotland (n = 522)	**0.29****	**0.24****	**0.24****
	New Zealand (n = 814)	**0.29****	**0.26****	**0.26****
	Combined countries (n = 1336)	**0.28****	**0.25****	**0.23****
Non-engagement in Protective Behaviour on the Road	Scotland (n = 522)	**0.26****	**0.17****	**0.20****
	New Zealand (n = 814)	**0.19****	**0.21****	**0.17****
	Combined countries (n = 1336)	**0.21****	**0.18****	**0.21****

* = $p < 0.05$; **= $p < 0.001$

All three subscales from the ARBQ (namely 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road') positively correlated with all three subscales from the DAQ (namely attitudes to speeding, drink-driving and not wearing seat belts; Table 5.11).

These correlations show that as scores on DAQ subscales increased, scores on ARBQ subscales also increased. These results suggest that regardless of country, high scores (frequent engagement in risky road behaviour) on 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road' are associated with high scores (risky attitudes) on attitudes towards driving violations such as speeding, drink-driving and not wearing seat belts.

A forwards regression was conducted to find significant predictors of engagement in 'Unsafe Road Crossing Behaviour' (Table 5.12). The results showed that individuals from all three groups (Scotland, New Zealand and the combined group) who self-reported frequently engaging in this behaviour also reported significantly riskier attitudes towards drink-driving and speeding. They also reported significantly greater intentions to speed in the future. In the combined group, high risk attitudes towards not wearing seat belts was also a significant predictor of high risk road crossing behaviour.

Table 5.12 – Hierarchical Regressions Predicting 'Unsafe Road Crossing Behaviour' from TPB and DAQ Subscales

a) Scotland						Model 4	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding Intention	0.099			57.4	0.000	0.20 **
2	TPB Speeding mean Attitude	0.134	0.035	3.5	40.2	0.011	0.12 *
3	DAQ attitude to drink-driving	0.151	0.017	1.7	30.8	0.004	0.13 *
4	TPB Speeding moral norm	0.161	0.010	1.0	24.8	0.015	0.11 *
b) New Zealand						**Model 7**	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean Attitude	0.124			114.7	0.000	0.17 **
2	DAQ attitude to drink-driving	0.151	0.028	2.8	72.4	0.000	0.14 **
3	TPB Speeding perceived behavioural control	0.173	0.022	2.2	56.5	0.000	-0.12 **
4	TPB Speeding moral norm	0.188	0.014	1.4	46.7	0.006	0.10 *
5	Gender	0.199	0.011	1.1	40.0	0.000	0.12 **
6	TPB Speeding mean anticipated regret	0.208	0.009	0.9	35.3	0.007	0.11 *
7	TPB Speeding Intention	0.214	0.006	0.6	31.3	0.015	0.08 *
c) Combined						**Model 9**	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean Attitude	0.109			162.7	0.000	0.13 **
2	TPB Speeding Intention	0.140	0.031	3.1	108.1	0.000	0.13 **
3	DAQ attitude to drink-driving	0.160	0.021	2.1	84.7	0.000	0.12 **
4	TPB Speeding moral norm	0.172	0.012	1.2	69.2	0.003	0.09 *
5	TPB Speeding perceived behavioural control	0.180	0.008	0.8	58.3	0.002	-0.08 *
6	TPB Speeding mean anticipated regret	0.185	0.006	0.6	50.4	0.001	0.11 **
7	Gender	0.192	0.007	0.7	45.1	0.000	0.09 **
8	DAQ attitude to not wearing seat belts	0.196	0.004	0.4	40.3	0.017	0.07 *
9	Age	0.198	0.003	0.3	36.5	0.030	0.05 *

** = $p < 0.05$, ** = $p < 0.001$*

A second regression was conducted to find significant predictors of engagement in 'Play and Social Activity on the Road' (Table 5.13). The findings suggest that individuals from New Zealand and the combined group who self-reported frequently engaging in this behaviour also reported significantly riskier attitudes towards drink-driving and not wearing seat belts. Individuals from all three groups (Scotland, New Zealand and the combined group) reported significantly riskier attitudes towards speeding.

Table 5.13 – Hierarchical Regressions Predicting 'Play and Social Activity on the Road' from TPB and DAQ Subscales

a) Scotland						Model 5	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean Attitude	0.114			66.6	0.001	0.16 **
2	Age	0.165	0.052	5.2	51.4	0.000	-0.26 **
3	Gender	0.203	0.038	3.8	44.1	0.000	-0.19 **
4	TPB Speeding moral norm	0.220	0.017	1.7	36.5	0.002	0.14 *
5	TPB Speeding Intention	0.227	0.007	0.7	30.4	0.026	0.10 *
b) New Zealand						Model 6	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean Attitude	0.111			101.3	0.001	0.14 **
2	DAQ attitude to not wearing seat belts	0.137	0.026	2.6	64.1	0.000	0.13 **
3	TPB Speeding perceived behavioural control	0.159	0.023	2.3	51.2	0.000	-0.13 **
4	TPB Speeding mean anticipated regret	0.177	0.017	1.7	43.4	0.010	0.11 *
5	TPB Speeding moral norm	0.185	0.008	0.8	36.7	0.006	0.10 *
6	DAQ attitude to drink-driving	0.189	0.004	0.4	31.4	0.040	0.08 *
c) Combined						Model 8	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean Attitude	0.107			159.5	0.000	0.13 **
2	TPB Speeding moral norm	0.128	0.021	2.1	98.1	0.001	0.10 **
3	DAQ attitude to drink-driving	0.143	0.015	1.5	74.3	0.004	0.08 *
4	Age	0.153	0.010	1.0	60.2	0.000	-0.10 **
5	TPB Speeding perceived behavioural control	0.163	0.010	1.0	51.8	0.000	-0.09 **
6	TPB Speeding mean subjective norm	0.170	0.006	0.6	45.2	0.008	0.08 *
7	DAQ attitude to not wearing seat belts	0.174	0.004	0.4	40.0	0.007	0.08 *
8	TPB Speeding mean anticipated regret	0.177	0.003	0.3	35.7	0.029	0.07 *

** = $p < 0.05$, ** = $p < 0.001$*

A third regression was conducted to find significant predictors of engagement in 'Play and Social Activity on the Road' (Table 5.14). The results revealed that individuals from New Zealand and the combined group who self-reported frequently engaging in this behaviour also reported significantly riskier attitudes towards drink-driving and not wearing seat belts. Individuals from Scotland and the combined group reported significantly riskier attitudes towards speeding.

These results show that attitudes towards driving violations are associated with engagement in high-risk road behaviour by pre-driving adolescents. The regressions showed that attitudes towards speeding are particularly associated with engagement in 'Unsafe Road Crossing' and 'Play and Social Activity on the Road'. High-risk attitudes towards not wearing seat belts and drink-driving are associated with all three high risk road behaviours.

Table 5.14 – Hierarchical Regressions Predicting 'Non-engagement in Protective Behaviour on the Road' from TPB and DAQ Subscales

a) Scotland						Model 4	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	DAQ attitude to speeding	0.070			39.1	0.002	0.17 *
2	TPB Speeding mean Attitude	0.086	0.017	1.7	24.5	0.002	0.16 *
3	Age	0.102	0.016	1.6	19.7	0.003	0.12 *
4	TPB Speeding perceived behavioural control	0.111	0.009	0.9	16.2	0.021	-0.10 *
b) New Zealand						**Model 5**	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.074			64.5	0.000	0.20 **
2	DAQ attitude to not wearing seat belts	0.089	0.015	1.5	39.4	0.009	0.09 *
3	DAQ attitude to drink-driving	0.095	0.007	0.7	28.4	0.018	0.09 *
4	Age	0.101	0.006	0.6	22.7	0.021	0.08 *
5	TPB Speeding Intention	0.107	0.006	0.6	19.3	0.024	0.08 *
c) Combined						**Model 7**	
Model	**Forward Regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.070			100.7	0.000	0.15 **
2	Age	0.095	0.025	2.5	70.3	0.000	0.17 **
3	DAQ attitude to not wearing seat belts	0.117	0.022	2.2	59.0	0.000	0.12 **
4	TPB Speeding Intention	0.128	0.010	1.0	48.7	0.001	0.09 **
5	TPB Speeding mean Attitude	0.132	0.004	0.4	40.3	0.015	0.08 *
6	Gender	0.134	0.003	0.3	34.4	0.037	0.06 *
7	DAQ attitude to drink-driving	0.137	0.003	0.3	30.1	0.046	0.06 *

** = $p < 0.05$, ** = $p < 0.001$*

5.4.8 Predicting Speeding Intention

a) Theory of Planned Behaviour (TPB) items as Predictors of Speeding Intention

For all three data groups (Scotland, New Zealand, and combined countries group) regressions were run on the components of the TPB speeding subscale to identify the best predictors of speeding intention in pre-drivers (Table 5.15).

First, an enter regression was run on all of the TPB components followed by a forward regression so that only those components that made significant contributions were selected. Anticipated regret emerged as the most important predictor of speeding intention in all three data groups. The three main components of the TPB namely, attitude, perceived behavioural control and subjective norm emerged as significant predictors of speeding intention in the forward regression (Table 5.15).

Table 5.15 – Hierarchical Regressions Predicting Speeding Intention from TPB Subscales

a) Scotland						**Model 7**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.162			100.4	0.000	**0.21****
2	TPB Speeding mean subjective norm	0.190	0.028	2.8	60.7	0.005	**0.13***
3	TPB Speeding perceived behavioural control	0.200	0.010	1.0	43.3	0.054	-0.08
4	TPB Speeding moral norm	0.205	0.005	0.5	33.3	0.687	0.02
5	TPB Speeding mean anticipated regret	0.241	0.036	3.6	32.8	0.000	**0.26****
6	Age	0.247	0.006	0.6	28.1	0.040	**0.08***
7	Gender	0.250	0.003	0.3	24.4	0.141	0.06
						Model 4	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.183			116.8	0.000	**0.25****
2	TPB Speeding mean attitude	0.224	0.041	4.1	74.7	0.000	**0.20****
3	TPB Speeding mean subjective norm	0.235	0.011	1.1	52.9	0.008	**0.12***
4	TPB Speeding perceived control	0.241	0.006	0.6	41.1	0.036	**-0.08***
b) New Zealand						**Model 7**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.099			89.2	0.002	**0.13***
2	TPB Speeding mean subjective norm	0.118	0.019	1.9	54.2	0.006	**0.10***
3	TPB Speeding perceived behavioural control	0.142	0.024	2.4	44.6	0.000	**-0.14****
4	TPB Speeding moral norm	0.150	0.008	0.8	35.8	0.099	0.06
5	TPB Speeding mean anticipated regret	0.167	0.017	1.7	32.4	0.000	**0.16****
6	Age	0.168	0.001	0.1	27.2	0.269	-0.04
7	Gender	0.168	0.000	0.0	23.3	0.993	0.00
						Model 4	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.108			98.7	0.000	**0.18****
2	TPB Speeding mean attitude	0.134	0.026	2.6	62.7	0.001	**0.14****
3	TPB Speeding perceived control	0.155	0.021	2.1	49.6	0.000	**-0.14****
4	TPB Speeding mean subjective norm	0.164	0.009	0.9	39.8	0.003	**0.11***
c) Combined countries						**Model 7**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.123			186.6	0.000	**0.16****
2	TPB Speeding mean subjective norm	0.144	0.021	2.1	111.9	0.000	**0.11****
3	TPB Speeding perceived behavioural control	0.162	0.018	1.8	86.0	0.000	**-0.12****
4	TPB Speeding moral norm	0.169	0.007	0.7	67.9	0.145	0.04
5	TPB Speeding mean anticipated regret	0.195	0.026	2.6	64.3	0.000	**0.21****
6	Age	0.197	0.002	0.2	54.4	0.042	**0.05***
7	Gender	0.197	0.000	0.0	46.6	0.528	0.02
						Model 5	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.139			215.7	0.000	**0.22****
2	TPB Speeding mean attitude	0.169	0.030	3.0	135.9	0.000	**0.16****
3	TPB Speeding perceived control	0.184	0.015	1.5	100.3	0.000	**-0.12****
4	TPB Speeding mean subjective norm	0.193	0.009	0.9	79.7	0.000	**0.11****
5	Age	0.196	0.003	0.3	64.8	0.044	**0.05***

** = p < 0.05, ** = p < 0.001*

The forward regression run on the Scotland data (Table 5.15a) revealed the following order of importance for independent variables that significantly predicted speeding intention: anticipated regret, attitude, subjective norm and perceived behavioural control. The Beta values (Table 5.15a) suggest that adolescents who score high on anticipated regret (i.e., they do not anticipate feeling regret from speeding), speeding attitude (i.e., they think speeding is safe), subjective norm (i.e., they think that people would approve of their engaging in speeding) and low on perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) are those more likely to report intending to speed in the future.

The ranked importance of the predictors of speeding intention in the New Zealand group (Table 5.15b) and the combined countries group (Table 5.15c) were similar. The order of the significant predictors in these two data groups differed from the order in the Scotland group, because perceived behavioural control was a stronger predictor than subjective norm and thus came higher up in importance than in the Scotland group. The ranked order for the predictors of intention in both data groups (New Zealand and combined countries) were as follows: anticipated regret, attitude, perceived behavioural control, subjective norm. In the combined countries group, age was also a significant predictor after subjective norm. The Beta values (Table 5.15b and Table 5.15c) suggest that adolescents who score high on anticipated regret (i.e., they do not anticipate feeling regret from speeding), attitude (i.e., they think speeding is safe), subjective norm (i.e., they think that people would approve of their engaging in speeding) and low on perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) were those most likely to report intending to speed in the future. In the combined countries group those who were older in age reported a significantly greater intention to speed.

b) Adolescent Road Behaviour Questionnaire (ARBQ) items as Predictors of Speeding Intention

For all three data groups (Scotland, New Zealand, and combined countries groups), in order to see what effect including ARBQ items in the questionnaire had on predicting participants' speeding intention a third forward regression was run on the data including TPB and ARBQ items (Table 5.16).

Table 5.16 – Hierarchical Regressions Predicting Speeding Intention from TPB and ARBQ Subscales

a) Scotland						**Model 9**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.162			100.4	0.000	**0.18****
2	TPB Speeding mean subjective norm	0.190	0.028	2.8	60.7	0.012	**0.12***
3	TPB Speeding perceived behavioural control	0.200	0.011	1.1	43.3	0.090	-0.07
4	TPB Speeding moral norm	0.205	0.004	0.4	33.3	0.996	0.00
5	TPB Speeding mean anticipated regret	0.241	0.036	3.6	32.8	0.000	**0.23****
6	Age					0.045	**0.08***
	Gender	0.250	0.008	0.8	24.4	0.192	0.05
7	ARBQ Unsafe Road Crossing Behaviour	0.272	0.022	2.2	23.9	0.001	**0.15****
8	ARBQ Play and Social Activity on the Road	0.272	0.000	0.0	21.2	0.758	0.01
9	ARBQ Non-engagement in Planned Protective Behaviour	0.273	0.001	0.1	19.2	0.426	0.03
						Model 5	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.183			116.8	0.000	**0.23****
2	TPB Speeding mean attitude	0.224	0.040	4.0	74.7	0.000	**0.18****
3	ARBQ Unsafe Road Crossing Behaviour	0.250	0.027	2.7	57.7	0.000	**0.17****
4	TPB Speeding mean subjective norm	0.259	0.008	0.8	45.1	0.015	**0.11***
5	Age	0.264	0.006	0.6	37.0	0.048	**0.08***
b) New Zealand						**Model 9**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.099			89.2	0.009	**0.11***
2	TPB Speeding mean subjective norm	0.118	0.019	1.9	54.2	0.002	**0.11***
3	TPB Speeding perceived behavioural control	0.142	0.024	2.4	44.6	0.000	**-0.14****
4	TPB Speeding moral norm	0.150	0.009	0.9	35.8	0.143	0.06
5	TPB Speeding mean anticipated regret	0.167	0.017	1.7	32.4	0.001	**0.14****
6	Age					0.212	-0.04
	Gender	0.168	0.001	0.1	23.3	0.581	-0.02
7	ARBQ Unsafe Road Crossing Behaviour	0.176	0.008	0.8	21.5	0.000	**0.15****
8	ARBQ Play and Social Activity on the Road	0.185	0.009	0.9	20.3	0.003	**-0.12***
9	ARBQ Non-engagement in Planned Protective Behaviour	0.187	0.002	0.2	18.5	0.140	0.05
						Model 6	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.108			98.7	0.000	**0.17****
2	TPB Speeding mean attitude	0.134	0.026	2.6	62.7	0.002	**0.13***
3	TPB Speeding perceived behavioural control	0.155	0.021	2.1	49.6	0.000	**-0.14****
4	TPB Speeding mean subjective norm	0.164	0.009	0.9	39.8	0.001	**0.12****
5	ARBQ Unsafe Road Crossing Behaviour	0.172	0.008	0.8	33.6	0.000	**0.15****
6	ARBQ Play and Social Activity on the Road	0.181	0.009	0.9	29.8	0.003	**-0.12***

The results on the Scotland data (Table 5.16a) revealed that the most significant factors that predicted speeding intention were as follows: mean scores on anticipated regret, speeding attitude, 'Unsafe Road Crossing Behaviour', subjective norm and age. The Beta values (Table 5.16a) revealed that those with greater intentions to speed scored higher on these items.

Table 5.16 – Hierarchical Regressions Predicting Speeding Intention from TPB and ARBQ Subscales

c) Combined countries						Model 9	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude	0.123			186.6	0.000	**0.13****
2	TPB Speeding mean subjective norm	0.144	0.021	2.1	111.9	0.000	**0.12****
3	TPB Speeding perceived behavioural control	0.162	0.018	1.8	86.0	0.000	**-0.11****
4	TPB Speeding moral norm	0.169	0.007	0.7	67.9	0.255	0.03
5	TPB Speeding mean anticipated regret	0.195	0.025	2.5	64.3	0.000	**0.18****
6	Age					0.359	0.02
	Gender	0.197	0.003	0.3	46.6	0.875	0.00
7	ARBQ Unsafe Road Crossing Behaviour	0.211	0.013	1.3	44.3	0.000	**0.15****
8	ARBQ Play and Social Activity on the Road	0.217	0.007	0.7	40.9	0.001	**-0.09****
9	ARBQ Non-engagement in Planned Protective Behaviour	0.220	0.003	0.3	37.4	0.032	0.06
						Model 7	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.139			215.7	0.000	**0.19****
2	TPB Speeding mean attitude	0.169	0.030	3.0	135.9	0.000	**0.14****
3	ARBQ Unsafe Road Crossing Behaviour	0.188	0.019	1.9	103.0	0.000	**0.16****
4	TPB Speeding perceived behavioural control	0.200	0.011	1.1	83.1	0.000	**-0.11****
5	TPB Speeding mean subjective norm	0.208	0.008	0.8	70.0	0.000	**0.12****
6	ARBQ Play and Social Activity on the Road	0.215	0.007	0.7	60.8	0.001	**-0.09****
7	ARBQ Non-engagement in Planned Protective Behaviour	0.219	0.003	0.3	53.1	0.018	**0.06***

** = p < 0.05, ** = p < 0.001*

The results for the New Zealand group (Table 5.16b) revealed a different order of importance for predicting speeding intention, as follows: anticipated regret, attitude, perceived behavioural control, subjective norm, 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road'. The Beta values (Table 5.16b) reveal that those youths reporting greater intentions to speed scored higher on anticipated regret (i.e., they do not anticipate feeling regret from speeding), speeding attitude (i.e., they think speeding is safe), subjective norm (i.e., they think that people would approve of their engaging in speeding) and 'Unsafe Road Crossing Behaviour' (i.e., they cross the road dangerously). Low scores on 'Play and Social Activity on the Road' (i.e., they do not engage in frequent 'Play and Social Activity on the Road') and perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) were also predictors.

The combined countries group results (Table 5.16c) revealed a different order of importance for predictors of speeding intention compared to the Scotland and New Zealand groups. The ranked order of predictors for the combined countries group were as follows (Table 5.16): anticipated regret, attitude, 'Unsafe Road Crossing Behaviour', perceived behavioural control, subjective norm, 'Play and Social Activity on the Road', and 'Non-engagement in Planned

Protective Behaviour on the Road'. The Beta values (Table 5.16c) imply that youths that reported greater speeding intentions also scored higher on anticipated regret (i.e., they do not anticipate feeling regret from speeding), mean attitude (i.e., they think speeding is safe), 'Unsafe Road Crossing Behaviour' (i.e., they cross the road dangerously), mean subjective norm (i.e., they think that people would approve of their engaging in speeding) and 'Non-engagement in Planned Protective Behaviour on the Road' (i.e., they do not wear helmets when cycling or florescent materials when out on the roads at night). Low scores on 'Play and Social Activity on the Road' (i.e., they do not engage in frequent 'Play and Social Activity on the Road') and perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) were also predictors.

The results from all three data groups confirm the importance of the two main components of the TPB, namely attitudes and subjective norms. However, perceived behavioural control was a significant predictor in two of the data groups but not in the Scotland group. Anticipated regret and 'Unsafe Road Crossing Behaviour' were present as predictors in all three data groups thus emphasising their value as additional predictors in the TPB model. Another facet of the ARBQ, namely 'Play and Social Activity on the Road' appeared as a significant addition to the TPB model in the New Zealand and the combined countries groups. In the combined group only, 'Non-engagement in Planned Protective Behaviour on the Road' appeared as a predictor of speeding intention.

c) Driver Attitude Questionnaire (DAQ) items as Predictors of Speeding Intention

In order to see what effect the inclusion of DAQ items into the questionnaire had on predicting participants' speeding intention, another forward regression was run on the data for all three data groups (Scotland, New Zealand, and combined countries groups) including measures of TPB, ARBQ and DAQ items (Table 5.17).

In the Scotland group (Table 5.17a), only one of the DAQ items, namely attitude to speeding, appeared as a predictor of speeding intention. The ranked order of importance for the speeding intention predictors were as follows: speeding anticipated regret, attitude, 'Unsafe Road Crossing Behaviour', mean DAQ attitude to speeding, age and subjective norm. The Beta values (Table 5.17a) revealed that high scores on these items predicted speeding intention.

Table 5.17 – Hierarchical Regressions Predicting Speeding Intention from TPB, ARBQ and DAQ Subscales

a) Scotland						Model 10	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude					0.007	**0.14***
2	TPB Speeding mean subjective norm	0.190			60.7	0.049	**0.09***
3	TPB Speeding perceived behavioural control	0.200	0.011	1.1	43.3	0.196	-0.05
4	TPB Speeding moral norm	0.205	0.004	0.4	33.3	0.752	-0.01
5	TPB Speeding mean anticipated regret	0.241	0.036	3.6	32.8	0.000	**0.20****
6	Age					0.013	**0.10***
	Gender	0.250	0.008	0.8	24.4	0.133	0.06
7	ARBQ Unsafe Road Crossing Behaviour					0.002	**0.14***
	ARBQ Play and Social Activity on the Road					0.696	0.02
	ARBQ Non-engagement in Planned Protective Behaviour	0.273	0.023	2.3	19.2	0.574	0.02
8	DAQ attitude to speeding	0.281	0.008	0.8	18.1	0.018	**0.14***
9	DAQ attitude to drink-driving	0.284	0.003	0.3	16.8	0.113	0.07
10	DAQ attitude to seat belts	0.286	0.002	0.2	15.6	0.214	-0.06
						Model 6	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.183	0.183	18.3	116.8	0.000	**0.20****
2	TPB Speeding mean attitude	0.224	0.040	4.0	74.7	0.011	**0.13***
3	ARBQ Unsafe Road Crossing Behaviour	0.250	0.027	2.7	57.7	0.000	**0.16****
4	DAQ attitude to speeding	0.260	0.010	1.0	45.4	0.011	**0.13***
5	Age	0.268	0.008	0.8	37.7	0.019	**0.09***
6	TPB Speeding mean subjective norm	0.273	0.006	0.6	32.3	0.046	**0.09***
b) New Zealand						**Model 10**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude					0.055	0.08
2	TPB Speeding mean subjective norm	0.118			54.2	0.002	**0.11***
3	TPB Speeding perceived behavioural control	0.142	0.024	2.4	44.6	0.000	**-0.13****
4	TPB Speeding moral norm	0.150	0.009	0.9	35.8	0.295	**0.04***
5	TPB Speeding mean anticipated regret	0.167	0.017	1.7	32.4	0.008	**0.11***
6	Age					0.367	-0.03
	Gender	0.168	0.001	0.1	23.3	0.672	-0.01
7	ARBQ Unsafe Road Crossing Behaviour					0.001	**0.14****
	ARBQ Play and Social Activity on the Road					0.005	**-0.11***
	ARBQ Non-engagement in Planned Protective Behaviour	0.187	0.019	1.9	18.5	0.107	0.05
8	DAQ attitude to speeding	0.195	0.008	0.8	17.6	0.003	**0.13***
9	DAQ attitude to drink-driving	0.195	0.000	0.0	16.1	0.477	0.03
10	DAQ attitude to seat belts	0.202	0.007	0.7	15.6	0.008	**-0.10***
						Model 8	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.108			98.7	0.001	**0.14****
2	DAQ attitude to speeding	0.141	0.033	3.3	66.7	0.000	**0.14****
3	TPB Speeding perceived behavioural control	0.159	0.018	1.8	51.1	0.000	**-0.13****
4	TPB Speeding mean subjective norm	0.170	0.011	1.1	41.3	0.001	**0.12****
5	ARBQ Unsafe Road Crossing Behaviour	0.178	0.008	0.8	35.0	0.000	**0.15****
6	ARBQ Play and Social Activity on the Roads	0.187	0.009	0.9	30.9	0.006	**-0.11***
7	DAQ attitude to not wearing seat belts	0.192	0.005	0.5	27.3	0.015	**-0.09***
8	TPB Speeding mean attitude	0.197	0.005	0.5	24.6	0.030	**0.09***

Table 5.17 – Hierarchical Regressions Predicting Speeding Intention from TPB, ARBQ and DAQ Subscales

c) Combined countries						**Model 10**	
Model	**Enter regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean attitude					0.003	**0.10***
2	TPB Speeding mean subjective norm	0.144			111.9	0.000	**0.11****
3	TPB Speeding perceived behavioural control	0.162	0.018	1.8	86.0	0.000	**-0.10****
4	TPB Speeding moral norm	0.169	0.007	0.7	67.9	0.530	0.02
5	TPB Speeding mean anticipated regret	0.195	0.025	2.5	64.3	0.000	**0.15****
6	Age					0.138	0.04
	Gender	0.197	0.003	0.3	46.6	0.962	0.00
7	ARBQ Unsafe Road Crossing Behaviour					0.000	**0.15****
	ARBQ Play and Social Activity on the Road					0.002	**-0.09***
	ARBQ Non-engagement in Planned Protective Behaviour	0.220	0.023	2.3	37.4	0.031	**0.06***
8	DAQ attitude to speeding	0.228	0.008	0.8	35.5	0.000	**0.13****
9	DAQ attitude to drink-driving	0.228	0.000	0.0	32.6	0.193	0.04
10	DAQ attitude to seat belts	0.232	0.004	0.4	30.7	0.012	**-0.07***
						Model 9	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	TPB Speeding mean anticipated regret	0.139			215.7	0.000	**0.16****
2	DAQ attitude to speeding	0.174	0.034	3.4	140.0	0.000	**0.14****
3	ARBQ Unsafe Road Crossing Behaviour	0.193	0.020	2.0	106.5	0.000	**0.15****
4	TPB Speeding mean subjective norm	0.203	0.010	1.0	84.9	0.000	**0.11****
5	TPB Speeding perceived behavioural control	0.211	0.008	0.8	71.3	0.000	**-0.10****
6	ARBQ Play and Social Activity on the Road	0.218	0.007	0.7	61.7	0.001	**-0.09****
7	TPB Speeding mean attitude	0.224	0.006	0.6	54.7	0.002	**0.10***
8	ARBQ Non-engagement in Planned Protective Behaviour	0.227	0.003	0.3	48.6	0.013	**0.06***
9	DAQ attitude to not wearing seat belts	0.230	0.003	0.3	43.9	0.022	**-0.06***

** = p < 0.05, ** = p < 0.001*

For the New Zealand data (Table 5.17b), two of the DAQ items, namely attitude to speeding and attitude to not wearing seat belts, were predictors of speeding intention. The ranked order of importance for the predictors of speeding intention were: anticipated regret, DAQ attitude to speeding, perceived behavioural control, subjective norm, 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road', DAQ attitude to not wearing seat belts and attitude. The Beta values (Table 5.17b) suggest that speeding intention is predicted by high scores on speeding anticipated regret, DAQ speeding attitude, 'Unsafe Road Crossing Behaviour', subjective norm and attitude. Low scores on 'Play and Social Activity on the Road' (i.e., they do not engage in frequent 'Play and Social Activity on the Road') and perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) and DAQ attitudes to not wearing seat belts (i.e., that it is not ok to travel in cars without wearing seat belts) were also significant predictors.

Like the New Zealand group, two DAQ items, namely attitude to speeding and attitude to not wearing seat belts were predictors of speeding intention in the combined countries group (Table 5.17c). The predictors of speeding intention were ranked in the following order of importance: anticipated regret, DAQ speeding attitude, 'Unsafe Road Crossing Behaviour', subjective norm, perceived behavioural control, 'Play and Social Activity on the Road', attitude, 'Non-engagement in Planned Protective Behaviour on the Road' and DAQ attitude to not wearing seat belts. The Beta values (Table 5.17c) revealed that speeding intention was predicted by high scores on speeding anticipated regret, DAQ speeding attitude, 'Unsafe Road Crossing Behaviour', subjective norm, attitude and 'Non-engagement in Planned Protective Behaviour on the Road'. Low scores on 'Play and Social Activity on the Road' (i.e., they do not engage in frequent 'Play and Social Activity on the Road') and perceived behavioural control (i.e., they perceive that it is difficult to refrain from speeding) and DAQ attitudes to not wearing seat belts (i.e., that it is not ok to travel in cars without wearing seat belts) were also predictors of speeding intention.

5.5 Discussion

In this study correlations showed that adolescents from Scotland and New Zealand who self-reported frequently engaging in high-risk behaviour on the roads had significantly more accepting (high-risk) attitudes towards driving violations. Hierarchical regressions showed that frequent engagement in 'Unsafe Road Crossing Behaviour' was a significant predictor of self-reported intentions to speed in the future among pre-drivers. Infrequent engagement in 'Play and Social Activities on the Road' was also a significant predictor of intentions to speed. This result was surprising as it was anticipated that adolescents who engaged in frequent social activity on the road would report significantly greater intentions to speed. One possible explanation for these findings is that adolescents who play and socialise on the roads, and who are therefore exposed to the road environment to a greater extent than those who do not engage in such behaviour, may have more realistic ideas about driving. The strongest predictor of adolescents' intention to speed was lack of anticipated regret; the more adolescents felt that they would not feel sorry after engaging in speeding behaviour the stronger their intention to speed. These results therefore show that more needs to be done to make pre-drivers realise the consequences of engaging in high-risk behaviours on the roads as both pedestrians and drivers in order to reduce their intentions and ultimately their high-risk behaviours on the roads. However, more research needs to be conducted to gain a greater understanding about adolescent behaviour on the roads.

Pre-driving males from Scotland and New Zealand self-reported engaging in significantly more 'Play and Social Activity on the Road' compared to females. They also had significantly riskier (more condoning) attitudes towards driving violations such as speeding, drink-driving and not wearing seat belts. Consequently males reported that speeding was not morally wrong, that they did not anticipate feeling sorry after engaging in speeding behaviour, that significant others would approve of their engaging in speeding behaviour and subsequently they reported a greater intention to speed in the future compared to females. These results show that more needs to be done to reduce the high-risk attitudes and intentions of males towards high-risk driving behaviours.

Cross-national comparisons showed that adolescents from New Zealand engaged in significantly more 'Play and Social Activity on the Road' than youths from Scotland who, in comparison, engaged in significantly more 'Unsafe Road Crossing Behaviour' and less protective behaviour on the road. One possible reason for these differences could be exposure to different volumes of traffic, New Zealand adolescents are exposed to less volumes of traffic compared to Scottish adolescents because New Zealand has a smaller population and has larger rural areas. 'Unsafe Road Crossing Behaviour' was a predictor of pre-drivers' intentions to speed in both countries suggesting that this is the most important behaviour to reduce among adolescents if intentions and ultimately high-risk driving behaviour is to be reduced. 'Play and Social Activity on the Road' was also a significant predictor of speeding intention for New Zealand and the combined countries group, with adolescents who infrequently engaged in the behaviour reporting greater intentions to speed. These results suggest that playing and socialising on the roads and thus increased exposure to traffic could potentially help adolescents to form realistic ideas about the dangers on the roads such as speeding. These results suggest that more needs to be done to reduce unsafe road crossing behaviour on the roads among adolescents.

With regards to where participants lived, adolescents from cities in both Scotland and New Zealand were safer on the roads, were less condoning of driving violations, reported a lower intention to speed in the future as drivers but engaged in less protective behaviour on the roads than adolescents from suburban and rural areas outside cities. Therefore, these results suggest that interventions need to target their efforts more on adolescents who live outside of cities in more rural and suburban areas.

The null was rejected for the following hypotheses in this study:

1) Risky road behaviour was significantly associated with positive (high-risk) attitudes towards driving violations. Correlations showed that high scorers on 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road' (i.e., they frequently reported engaging in these behaviours) were also high scorers on attitudes towards speeding, drink-driving and not wearing seat belts (i.e., they were more condoning of these behaviours). Regressions showed that adolescents from Scotland and New Zealand who were high scorers on attitudes towards 'drink-driving' and people 'not wearing seat belts' (i.e., they condoned these behaviours) were also high scorers on 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road' (i.e., they frequently reported engaging in these behaviours).

2) Risky road behaviour was significantly associated with high-risk (positive) perceptions about the morality of speeding, a lack of anticipated regret and approval of significant others (for example, friends and family) towards speeding. Regressions showed that high scores on moral norm were indicative of frequent engagement in both 'Unsafe road crossing' and 'Play and social activity on the road' for all three groups (combined group, New Zealand and Scotland). High scores on anticipated regret were predictive of frequent engagement in 'Unsafe road crossing', 'Play and social activity on the road' and 'Non-engagement in Planned Protective Behaviour on the Road' but only in the combined group and in New Zealand. High scores on subjective norm were only predictive of 'Play and social activity on the road' for the combined group.

3) Risky road behaviour was significantly associated with positive (high-risk) intentions to speed. Forward regressions to find significant predictors of speeding intentions revealed that high scorers on 'Unsafe Road Crossing Behaviour' (i.e., they frequently reported engaging in this behaviour) were also high scorers on intentions to speed (i.e., they reported a greater intentions to speed). In the combined group and New Zealand, 'Play and Social Activity on the Road' was significantly negatively associated with positive (high-risk) intentions to speed and adolescents who scored low on this factor (i.e., they infrequently engaged in 'Play and Social Activity on the Road') scored high on intentions to speed (i.e., they reported a greater intentions to speed). In the combined group, high scorers on 'Non-engagement in Planned Protective Behaviour on the Road' (i.e., they frequently reported not engaging protective

behaviours on the road) were also high scorers on speeding intention (i.e., they reported a greater intentions to speed). These results were also confirmed in regressions that were conducted to find predictors of road behaviour. The results showed that high scorers on speeding intentions also scored significantly high on 'Unsafe road crossing' (in Scotland, New Zealand and the combined group), 'Play and Social Activity on the Road' (in Scotland) and 'Non-engagement in Protective Behaviour on the Road' (in the combined group and New Zealand).

4) Positive (high-risk) attitudes towards driving violations are significantly associated with positive (high-risk) intentions to speed. Forward regressions showed that high scorers on attitudes towards speeding and not wearing seat belts (i.e., they were more condoning of these behaviours) were also high scorers on intentions to speed (i.e., they reported a greater intention to speed).

5) Positive (high-risk) perceptions about the morality of speeding, lack of anticipated regret and approval of significant others (for example, friends and family) towards speeding are significantly associated with positive (high-risk) intentions to speed. Regressions showed that high scores on anticipated regret and subjective norm were associated with greater speeding intentions. Moral norm was, however, not a significant predictor.

This study also had three further cross-national hypotheses regarding adolescents' attitudes and behaviour according to the country they inhabit:

i) Scottish adolescents had significantly different attitudes towards driving violations than New Zealand adolescents. Independent t-tests revealed that Scottish adolescents scored higher on attitudes to not wearing seat belts than New Zealand adolescents (i.e., they were more condoning of people not wearing seat belts in cars).

ii) Scottish adolescents had significantly different road behaviour than New Zealand adolescents. Independent t-tests found that Scottish adolescents engaged in less planned protective behaviours on the road and more 'Unsafe Road Crossing Behaviour' than New Zealand adolescents. New Zealand adolescents engaged in more 'Play and Social Activity on the Road' than Scottish adolescents.

iii) Scottish adolescents had significantly different intentions to speed than New Zealand adolescents. Independent t-tests showed that Scottish adolescents reported significantly greater intentions to speed in the future than New Zealand adolescents.

The results collected from this study lend support to the application of the ARBQ in both New Zealand and Scotland (as the ARBQ had only recently been published in England when this study was conducted, it is believed that the scale had not been used previously in either Scotland or New Zealand). The use of ARBQ subscales ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road') as predictors of intentions among pre-drivers to engage in speeding behaviour in the future has also been shown.

The three main components of the TPB (attitude, subjective norm and perceived behavioural control) were confirmed as important predictors of pre-drivers' speeding intention in this study. The link between pre-driver attitude, subjective norm and perceived control with speeding intention highlights some important points. Firstly it shows the importance of creating positive (low-risk) attitudes to safe driving practices in pre-drivers in order to lower their intentions to speed. Secondly it shows the powerful influence that other people have on adolescents' attitudes and intentions. Several researchers have reported the profound effect that others have on our actions. Bandura, Ross and Ross (1961, 1963) in their classic Social Learning Theory experiments found that when children were exposed to models (called 'Bobo Dolls') that exhibited either aggressive or non-aggressive behaviours, they replicated what they had seen. Although Social Learning Theory states that people learn through imitation (Bandura, 1977), the effects are more profound in children and young people who have little or no social conditioning. This theory can be applied to the formation and maintenance of adolescents' speeding attitudes and intentions. For example, by being exposed to speeding drivers who frequently engage in this behaviour and impart positive (high-risk) attitudes towards it, pre-drivers' may be influenced into thinking that such behaviour is acceptable and therefore weaken their inhibitions to speed.

Other people can thus have a very powerful influence over adolescents' driving attitudes, intentions and ultimately their future driving behaviour. This study has identified that the power of social influence in creating and maintaining positive (low-risk) attitudes towards safety has been under-utilized in the road safety domain. If pre-driving adolescents and the people that they see as being influential are encouraged to take part in safe driving campaigns,

then any changes in their role models' attitudes and behaviour may have a profound impact on shaping their attitudes and future driving behaviour. Finally, the link between low perceived behavioural control and speeding intention indicates that adolescents need to be made aware that when they drive they are in control of their own driving behaviour and should accept responsibility for the consequences of their actions.

As previous studies have shown, males engage in riskier driving behaviour on the roads and are over-involved in car accidents as drivers across all age groups (McKenna, Waylen & Burkes, 1998). They have also been found to have risky pre-driver attitudes to bad driving practices (Waylen & McKenna, 2002[abc], 2008). This gender difference in risk-taking behaviour and attitudes was seen in this study, with males reporting more 'Play and Social Activity on the Road' and riskier attitudes to speeding, drink-driving and not wearing seat belts. They also reported believing that significant others would approve of their engaging in speeding behaviour and they did not anticipate feeling much regret after speeding. More has to be done to change these attitudes as well as to create accurate perceptions of what others think and to make pre-drivers realise the consequences of engaging in such behaviour. This is particularly important as the components of the TPB were found to be important predictors of speeding intention.

Waylen and McKenna (2002[abc], 2008) asked whether or not gender differences in driving are the result of being able to drive or something general about being male or female. This study shows that it could indeed be something general about being male or female, due to the fact that gender differences in attitudes and road behaviours were already visible among the pre-drivers in this study. Like Waylen and McKenna's (2002[abc], 2008) studies, this study has shown the existence of attitudes towards driving in pre-drivers but also the relationship between their pre-driving road behaviour, their attitudes and their intentions.

The link between behaviour, attitudes, subjective norms, perceived behavioural control and anticipated regret was found in this study thus providing support for the extended TPB model (excluding moral norm). The results highlight the need for pre-driver education to take place in schools so as to curb the emergence of bad behaviour on the roads (this includes behaviour as non-drivers and drivers). It has been shown that adolescent pre-drivers' undesirable attitudes towards bad driving practices and their intentions to engage in speeding are already in place before they have acquired driving skills. Their high-risk performance on the roads as pre-drivers is also linked to their greater (high-risk) intentions to engage in speeding. Road

safety professionals in both New Zealand and Scotland should focus their efforts on adolescent males, as they reported riskier road behaviour and greater intentions to speed in the future as drivers.

The majority of the attitudes expressed in this study and the road behaviours adolescents' reported were fairly desirable and relatively low risk. Mean scores from both New Zealand and Scotland on the ARBQ, DAQ and TPB speeding scales tended to be below the mid-point of the scales. There were three areas where adolescents scored above the mid-point of the scale; speeding intention, 'Non-engagement in Planned Protective Behaviour on the Road' and perceived behavioural control. High mean scores were reported on speeding intention; this was alarming as it suggested that pre-driving adolescents' already have intentions to speed in the future when they become drivers. Since intention is a direct predictor of engagement in behaviour (according to the TPB), these results highlight the need for pre-driving interventions to be introduced that lower adolescents' intentions and perhaps reduce their engagment in speeding behaviour in the future.

Mean scores on 'Non-engagement in Planned Protective Behaviour on the Road' were above the mid-point of the scale. Choosing to not engage in protective behaviour on the road is dangerous; however the hierarchical regressions for New Zealand and for Scotland did not find this to be a significant predictor of intention to speed in the future. It was a predictor when both countries were combined. This suggests that although it did not have a great influence when both countries were tested separately it did have an effect when they were combined. More therefore needs to be done to encourage adolescents to engage in this behaviour, particularly among males and those who live in Scotland (Scottish adolescents scored significantly higher on 'Non-engagement in Planned Protective Behaviour on the Road' compared to New Zealand adolescents), as it could affect their future driving behaviour.

Adolescents reported mean scores above the mid-point of the scale for perceived behavioural control (in the direction that speeding is easy to refrain from). This was encouraging because studies have shown that drivers who are high violators on the road and frequently engage in speeding behaviour tend to report a lack of control (Parker et al., 1992[a]). Low scores on this item are therefore very undesirable. The hierarchical regressions for the combined countries group, the New Zealand group and the Scottish group (before ARBQ and DAQ items were added) showed that there was a negative correlation between perceived behavioural control

and intention, with low scores on perceived behavioural control (in the direction of speeding being difficult to refrain from) being linked to high scores on intentions to speed in the future. This highlights that if intentions to speed or engage in violating behaviour on the roads are to be reduced, both pre-drivers and drivers need to realise that they are in control of their behaviour and are responsible for the choices that they make.

It must be noted that mean scores on 'Unsafe Road Crossing Behaviour', speeding anticipated regret, attitude to speeding and attitude to drink-driving were only just below the mid-point of the scales. Three of these items came up as significant predictors of speeding intention in hierarchical regressions (attitude to drink-driving was not a predictor). In order to reduce adolescents' intentions to engage in speeding behaviour, interventions should therefore be designed which aim to reduce unsafe road crossing behaviour, create negative attitudes to speeding and present the consequences of speeding so that adolescents' anticipate feeling regret for engaging in such behaviour.

With regards to cultural differences in pre-driver attitudes and behaviour it was found that Scottish adolescents engage in less planned protective behaviour on the road and more 'Unsafe Road Crossing Behaviour' but New Zealand adolescents engage in more 'Play and Social Activity on the Road'. Both 'Play and Social Activity on the Road' and 'Unsafe Road Crossing Behaviour' were significant predictors of speeding intention. Hierarchical regressions revealed that 'Unsafe Road Crossing Behaviour' was positively related to intentions to speed, with those who frequently engaged in such behaviour reporting a significantly greater intention to speed. In contrast, 'Play and Social Activity on the Road' was negatively related to speeding intentions with adolescents who infrequently engaged in such behaviour reporting greater intentions to speed. Therefore, Scottish adolescents who reported frequent 'Unsafe Road Crossing Behaviour' and infrequent 'Play and Social Activity on the Road' are potentially at higher risk on the road than New Zealand adolescents. However, further research would need to be conducted to substantiate these claims.

Regarding attitudes to driving violations (DAQ), there were no significant differences between the two countries on attitudes to drink-driving or speeding. Scottish adolescents did however score higher on attitudes to not wearing seat belts. This was a surprising result as in both countries it is a legal requirement to wear seat belts and they both frequently run campaigns to reinforce the need to wear them. Thus Scottish adolescents have riskier attitudes, intentions and riskier road behaviour.

Results from this study have shown that, regardless of which country they inhabit, adolescents living in the city reported engaging in significantly less risky behaviour on the roads compared to youths living in villages and the countryside. They also reported engaging in significantly less protective behaviour on the road. They reported that it is more morally wrong to speed, anticipated that they would feel regret from engaging in speeding behaviour and reported a lower intention to speed than adolescents from small towns, villages and the countryside. With regard to driving violations, adolescents from the city scored significantly lower on attitudes to speeding, drink-driving and not wearing seat belts. What these results suggest is that people from the city are safer in their pre-driving road behaviour, attitudes and intentions than adolescents from small towns, villages and the countryside. One reason for this difference could be that as cities are more compact and the roads are busier, adolescents are exposed to higher risks on the roads. This may mean that city-based adolescents have had to learn to pay more attention on the road compared to youths from smaller towns and rural areas in order to navigate their way around safely. Adolescents in the city may have therefore developed more realistic ideas about dangers on the roads.

Another reason for the differences in attitudes and behaviour according to location could be that as there is more money in the city any campaigns that are developed to tackle road safety issues are implemented there where there is money available to pay for them. Interventions therefore need to target smaller towns and rural areas in order to reduce their attitude, behaviour and intentions. City-based Scottish adolescents reported significantly less protective behaviour on the road compared to youths living in villages and the countryside. The reason for this might be that there is significantly more street lighting in cities and lower speed limits than in more rural areas and therefore youths may feel less compelled to wear retroreflective clothing or wear helmets whilst cycling.

The results from this study have shown that items from both the ARBQ and DAQ have been valuable additions to the TPB speeding model for predicting speeding intention in the future. It has thus been shown that pre-driving road behaviour and attitudes are valuable predictors of speeding intention. The next study presented in Chapter Six explores links between pre-driver attitudes, behaviours and intentions to see if they are linked with driving behaviour.

This study was limited by several factors such as uneven age spread of participants, inadequacy of the ARBQ scale design, time limitations and restrictions imposed by organisations as to length of the questionnaire. Originally the questionnaire was designed for

14-15 year olds but, unintentionally, some of the participants who responded were outside this age bracket and were either 12-13 years old or between 16-18 years old; this was due to teachers selecting student participants without following the age guidelines they were provided with. This uneven spread of participant ages meant that age group comparisons were not possible. If there had been an even distribution of participants across the age groups, it would have been possible to make age group comparisons and cultural age group comparisons between New Zealand and Scotland. Although responses from participants who were outside the age bracket could have been removed from the analysis it was decided to include them because they were still classed as pre-drivers.

The ARBQ was inadequately designed as it makes no allowances for people who do not have bicycles, skateboards, roller-skates, cycle helmets or reflective clothing. The use of *"never"* on the 5-point scale was ambiguous because responses could mean either of two things; that adolescents do not engage in protective behaviour because they do not possess the equipment mentioned or they do not engage in protective behaviour because they have the equipment but chose not to use it. The scale therefore needs to be more explicit. In future studies using this scale it may be better to make it a 6-point Likert scale ranging from 0 – 5, with the "0" representing "*Never because I do not have a* [insert the name of the equipment that the question refers to e.g., a bicycle]" and "1" representing "*Never but I do have a* [insert the name of the equipment that the question refers to e.g., a bicycle]" and scale points 2 – 5 remaining as they are in the original scale.

Due to time limitations and restrictions imposed by the length of the questionnaire, only TPB items measuring intention to engage in speeding behaviour were measured. As attitudes to other bad driving practices such as drink-driving and not wearing seat belts were measured, it would have been interesting to measure attitudes and intentions to engage in these behaviours using the TPB speeding questions as a framework. Although measuring these attitudes and intentions were considered during the early stages of the questionnaire's construction, it was decided that the questionnaire was already rather lengthy. More questions could have either discouraged students from fully completing the questionnaire or dissuaded schools from taking part because of the amount of lesson time required to complete them. Future research could measure intentions to engage in these actions to further support the link between attitudes and intentions as well as the importance of anticipated regret.

This research has shown that a large number of pre-drivers already possess positive (high-risk) attitudes towards bad driving practices and report intending to engage in speeding in the future (for both New Zealand and Scottish adolescents' mean speeding intention scores were above 4). Interventions to change driver behaviour should therefore start before people reach driving age. The positive relationship between dangerous road behaviour and attitudes towards bad driving habits that was found suggests that adolescents who engage in risky pedestrian practices are also those who have riskier attitudes to bad driving practices and intend to speed in the future. Therefore more needs to be done to make adolescents want to be safe and to encourage them to engage in safe practices on the road, especially in small towns and villages.

If the attitudes of our future drivers are to be changed, road safety professionals need to re-address approaches to educating youths about road safety awareness and need to encourage a desire to be safe on the roads. This is particularly important and imperative for young males prior to their beginning their driving career. Regarding novice drivers, incentive competency-based driver education programmes (such as the Alchemy programme run by the AA Driver Education Foundation in New Zealand and Pass Plus in the UK) should be made compulsory for all new drivers so as to increase their experience and increase their road awareness to lower their crash risk.

The second study presented in Chapter Six is a prospective study. It takes into consideration the findings from this study by examining whether there are links between pre-driver attitudes, road behaviour, intentions to speed in the future as drivers and self-reported driving behaviour. Should these links exist, the importance of the links postulated in this chapter will be supported. This would re-emphasise the need for an established curriculum of pre-driver education to be implemented in schools if the driving behaviour of future generations is to be changed.

5.6 Results Summary

1) Males from all three sampling groups reported engaging in more 'Play and Social Activity on the Road'. They also reported riskier attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts'. They believed speeding was not morally wrong, that significant others would approve if they engaged in speeding, they did not anticipate feeling much regret after speeding and subsequently reported a greater intention to speed in the future.

2) Adolescents living in the city report significantly less risky behaviour on the roads, less protective behaviour on the road, they believe that it is more morally wrong to speed, they anticipate that they will feel regret from engaging in speeding behaviour and report a lower intention to speed than those from small towns, villages and the countryside. They also scored significantly lower on attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts'.

3) The majority of the attitudes expressed in this study and the road behaviours that adolescents' reported were fairly desirable and relatively low risk.

Adolescent Road Behaviour and Driving Behaviour

4) The application of the ARBQ in both New Zealand and Scotland was supported in this study. Factor analysis of the ARBQ scale items confirmed the existence of three factors and supported the 3-factor structure of adolescent road behaviour as proposed by Elliott and Baughan (2004).

5) The ARBQ subscales 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' were significant predictors of intentions to engage in speeding behaviour among pre-drivers regardless of which country they were from. 'Unsafe Road Crossing Behaviour' was significantly positively associated with speeding intention (i.e., adolescents who frequently engaged in this behaviour reported greater intentions to speed) whereas 'Play and Social Activity on the Road' was negatively associated with speeding intention (i.e., adolescents who infrequently engaged in this behaviour reported greater intentions to speed).

6) For all three sampling groups, correlations revealed that high scores (frequent engagement) on 'Unsafe Road Crossing Behaviour' and 'Non-engagement in Planned Protective Behaviour on the Road' were positively associated with high scores (risky

attitudes) on attitudes towards driving violations (namely 'speeding', 'drink-driving' and 'not wearing seat belts'). Low scores on 'Play and Social Activity on the Road' were negatively associated with high scores on attitudes to driving violations.

7) Scottish adolescents engage in less protective behaviour on the road and more 'Unsafe Road Crossing Behaviour' but New Zealand adolescents engage in more 'Play and Social Activity on the Road'.

8) The positive relationship that was found between dangerous road behaviour and attitudes towards bad driving practices suggests that adolescents who engage in risky pedestrian practices are also those who have riskier attitudes to bad driving practices.

Intentions to Speed

9) Two of the main components of the TPB, attitude and subjective norm, were confirmed as important predictors of pre-drivers' intentions to speed for all three sampling groups. The third main component of the TPB, perceived behavioural control, was an important predictor of pre-drivers' speeding intentions for the New Zealand and combined countries groups.

10) The link between attitude, subjective norm and perceived control with speeding intention highlights the importance of creating positive (low-risk) attitudes to safe driving practices in pre-drivers in order to lower their intentions to speed. It also shows the powerful influence that other people have on our attitudes and intentions and the need to increase young drivers' perceived control over their ability to refrain from engaging in violating driving behaviours.

11) High mean scores were reported on speeding intention; this suggests that pre-driving adolescents' already have intentions to speed in the future when they become drivers.

12) There was a negative correlation between perceived behavioural control and speeding intention, with low scores on perceived behavioural control (i.e., that it is difficult to refrain from speeding) being linked to high scores on intentions to speed in the future.

13) Scottish adolescents reported greater intentions to speed in the future and also scored higher (riskier) on attitudes to not wearing seat belts.

14) Mean scores on DAQ attitude to 'speeding' was a significant predictor of speeding intention for all three sampling groups. Mean scores on DAQ attitude to 'not wearing seat belts' was a significant predictor of pre-drivers' speeding intentions for New Zealand and the combined countries group.

15) Anticipated regret (but not moral norm) was an important addition to the TPB model and was the top predictor in all of the regression models produced. It explained between 11-18% of the r^2 variance in speeding intention. Therefore, the inclusion of anticipated regret into the extended TPB model by Parker, Manstead and Stradling (1995) has been supported in this study. However, the inclusion of moral norm has not been support.

CHAPTER 6 - PREDICTING DRIVING BEHAVIOUR FROM PRE-DRIVING ATTITUDES, INTENTIONS AND ROAD BEHAVIOUR

6.1 Summary

The results from the previous study (Chapter Five) showed that attitudes and intentions towards driving exist before people are old enough to drive. Questionnaire responses from pre-driving adolescents as young as 12 years old showed that they were already developing attitudes towards driving violations and intentions towards engaging in speeding.

The majority of studies that have been conducted on adolescent road safety have focused on young drivers' attitudes and behaviours (Elliott, Armitage & Baughan, 2002; Iversen, 2004; Jonah, 1986; Stradling & Meadows, 2006; Trimpop & Kirkcaldy, 1997; Ulleberg & Rundmo, 2003; Vavrik, 1997) and pre-driver attitudes and behaviours (Chinn, Elliott, Sentinella & Williams, 2004; Elliott & Baughan, 2004[ab]; Pinsky et al., 2001; Waylen & McKenna, 2002[abc], 2008) but no prospective research has been found that links them together. In order to bridge this gap, the New Zealand findings from Chapter Five formed the start of a longitudinal study that was to be conducted over a 12-month period and followed adolescents from pre-driving through to driving (with the study presented in this chapter as the final part of this longitudinal study). Consequently the aim of the first and second studies presented in this report (Chapters Five and Six) was to link pre-driving research with research on young drivers.

In Chapter Five a positive association was found between pre-driver's 'Unsafe Road Crossing Behaviour', speeding attitudes and intentions to speed in the future. In this Chapter, the group of pre-driving teenagers from New Zealand who participated in the first study (Chapter Five) completed a second questionnaire 12 months later. Driving behaviours, attitudes and intentions were measured for those participants who had begun driver training. It was conducted in New Zealand because adolescents learn to drive at 15 years of age and could be followed up easily within the time constraints of the study.

6.2 Introduction

In New Zealand the minimum age to legally acquire a driving licence is 15 years old (LTNZ, 2009). Drivers must pass through a three-staged graduated driving licensing system before they can hold a full, unrestricted driving licence. Before an individual can start driving they must acquire a 'Learner licence' by passing an eyesight test and a theory test. Learner licence holders must drive with someone supervising them (the supervisor must have held a full New Zealand licence for at least two years) and display "L" plates on their car. They can only progress to the next stage of licensing and acquire a 'Restricted licence' if they have held their learner licence for more than six months. To upgrade their licence to a restricted licence they must pass a practical driving test and an eyesight test. Individuals in this stage of the graduated licensing process are able to drive unsupervised but only before 10pm and after 5am. They are not allowed to carry passengers unsupervised. During the restricted hours (10pm-5am) they can only drive if they are supervised by someone who has held a full New Zealand licence for at least two years.

Before an individual can upgrade their licence from a restricted licence to a 'Full licence', if they are under 25 years of age they have to have held their restricted licence for at least 18 months and at least six months if they are over 25 years. If they complete an approved course the minimum length of time they need to have had a restricted licence can be reduced to 12 months if they are less than 25 years of age and three months if they are over 25 years. Under 25's are only allowed to attend the approved course if they have held their restricted licence for more than six months. To qualify as a full licence holder (i.e., drive un-supervised and un-restricted), individuals have to pass an eyesight test and a practical driving test that assesses their driving and hazard perceptions skills.

Novice teenage drivers, particularly males, are more accident involved than any other driver group (Ferguson, Leaf, Williams, & Preusser, 1996; Williams, 1996). Studies have shown that the tendency to commit violations and engage in fast driving are associated with increased accident risk (Reason, Manstead, Stradling, Parker, & Baxter, 1991; West et al., 1993; Parker, Reason, Manstead, Stradling, 1995). Young drivers, males and high mileage drivers report engaging in more violations whilst driving than any other driver subgroups and consequently have higher accident rates (Parker et al., 1996; Ferguson et al., 2001).

The Driver Behaviour Questionnaire (DBQ), originally designed by Reason et al. (1990), has been used in many studies to obtain a measurement of drivers' self-reported engagement in risky driving behaviour. It has been found to correspond highly with observed driving behaviour (Rolls, Hall, Ingham & McDonald, 1991). It measures the frequency with which drivers engage in three types of driving behaviours: 'Highway Code Violations', 'Errors' and 'Lapses'. Driving 'Errors' refer to mistakes or omissions that are made whilst driving (for example, "*Brake too quickly on a slippery road, or steer the wrong way in a skid*"), 'Lapses' are harmless mistakes that are made whilst driving that are caused by lapses in attention (for example, "*Hit something when reversing that you had not previously seen*") and 'Highway Code Violations' are deliberate deviations from safe driving practice (for example, "*Race away from traffic lights with the intention of beating the driver next to you*").

High scores on DBQ violations have been associated with past and future involvement in active loss of control (where the driver fails to control the direction of their vehicle and is unable to keep it on the carriageway) and passive right-of-way accidents (where the collision occurs because another vehicle has pulled onto or across the carriageway without right-of-way; Lajunen et al., 2004; Parker, West, Stradling & Manstead, 1995; Sullman et al., 2002). Research has shown that males and young drivers engage in significantly more driving violations than females (Özkan, Lajunen & Summala, 2006). Females, however, engage in significantly more "silly" errors than males (Özkan et al., 2006). 'Errors' and 'Lapses' involve failures in cognitive competence (Reason et al., 1990). However, in studies that have used the DBQ there have been no significant associations found between 'Errors' or 'Lapses' and accident involvement (Lawton et al., 1997; Parker, West et al., 1995; Reason et al., 1991). It is therefore generally accepted that *"it is the propensity to violate, rather than engagement in errors whilst driving, which is associated with accident involvement"* (Parker, Reason et al., 1995; Parker, West et al., 1995).

The relationship between DBQ violations and accident risk has been shown to become less significant with increasing age and driving experience (Parker, West et al., 1995). Consequently, young inexperienced male drivers report higher DBQ violations and have the highest rate of involvement in passive right of way accidents than any other driver groups (West, 1993).

The commission of violations is considered to be intentional (Parker et al., 1996). As intentions arise from both attitudinal and motivational factors it is generally believed that an

individual's tendency to commit violations can be changed via attitudinal and behavioural interventions (Parker et al., 1996). Research has shown that males are less cautious in their approach to road use because they develop riskier driving attitudes than females (Harré et al., 2000; Zuckerman, 1994). It is therefore believed that earlier attitudinal and behavioural interventions among pre-drivers may be effective at encouraging young people, particularly males, to be more cautious on the roads, develop safer attitudes towards driving and ultimately reduce their tendency to commit violations in the future as drivers.

Bentler and Speckart (1979) believed that past behaviour predicted future behaviour (Chapter Three). Therefore, before people acquire their driving licence and undergo driver training, their behaviour on the roads as pedestrians and cyclists may be an indicator as to their susceptibility of becoming a driver that engages in frequent high-risk driving practices. This study incorporates a measure of past behaviour, in the form of adolescent road behaviour ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road'), into a Theory of Planned Behaviour (TPB) model that aims to predict engagement in high-risk driving behaviours ('Errors', 'Lapses' and 'Highway Code Violations').

Research by Ulleberg and Rundmo (2003) and Iversen (2004) reported that adolescents who report positive (low-risk) attitudes towards traffic safety are less likely to report risky driving behaviour. Therefore adolescents with negative (high-risk) attitudes towards traffic safety are more likely to report risky driving behaviour. Elliott and Baughan (2003[ab], 2004) who explored adolescent road behaviour concluded that gains in safety would arise from bringing about desirable changes in risky road behaviours. Waylen and McKenna (2002[abc]; 2008) explored the relationship between adolescent pre-driver attitudes and behaviours and reported that pre-drivers possess the same risk-taking characteristics as drivers (namely a tendency to engage in sensation seeking, deviant and competitive behaviours). They also showed the same gender differences frequently observed in drivers, with adolescent males reporting more sensation seeking, anti-social and competitive behaviours than females (Waylen & McKenna, 2002[abc]; 2008; Harré et al., 2000). These studies suggest that engagement in pre-driving risk taking behaviour predisposes engagement in future risk taking behaviour as drivers. This supports a social model of high-risk behaviour proposed by Jessor and Jessor (1977, Jessor, 1987[ab]) called the Problem Behaviour Theory (PBT). This theory suggests that young people who engage in one form of risky behaviour are at a higher probability of practicing another type of risky behaviour. Therefore this study will explore the relationship between

engagement in high-risk pre-driver road behaviour and future self-reported engagement in high-risk driving behaviours.

In this longitudinal study questionnaires were used to measure the same participants' pre-driver and driver attitudes, intentions and behaviours approximately 12 months apart. Significant links were found between pre-driver attitudes, intentions and road behaviours and future engagement in high-risk driving behaviour. Significant links were also found between sensation seeking and high-risk driving behaviour. Significant gender differences in attitude, driving behaviour and sensation seeking were also found.

6.3 Hypotheses

The main hypotheses for this New Zealand study were as follows:

1) Pre-drivers' high-risk attitudes towards driving are significantly associated with their reported engagement in high-risk driving behaviours. High scorers on pre-driving attitude items at 'Time 1' (measured using the extended TPB scale and Driver Attitude Questionnaire - DAQ) are high scorers on self-reported driving behaviour (measured using the DBQ) at 'Time 2'.

2) Pre-drivers' reported intentions to speed are significantly associated with their reported engagement in high-risk driving behaviours. High scorers on pre-driving intention to speed (measured using the extended TPB scale) at 'Time 1' are high scorers on self-reported driving behaviour (measured using the DBQ) at 'Time 2'.

3) Pre-drivers' reported engagement in high-risk road behaviour is significantly associated with their reported engagement in high-risk driving behaviours. High scorers on pre-driving road behaviour at 'Time 1' (measured using the Adolescent Road User Behaviour Questionnaire) are high scorers on self-reported driving behaviour (measured using the DBQ) at 'Time 2'.

4) Sensation seeking is significantly associated with reported engagement in high-risk driving behaviours. High scorers on sensation seeking (measured using the Arnett Inventory of Sensation Seeking scale - AISS) are high scorers on self-reported driving behaviour (measured using the DBQ) at 'Time 2'.

6.4 Methodology

6.4.1 Research Design

A longitudinal survey design was employed to monitor a single group of adolescents over a 12-month period.

6.4.2 Participants

Participants were recruited at two different time points; 'Time 1' when they completed 'Questionnaire 1' (at this point they were all pre-drivers) and 'Time 2' twelve months later when they completed 'Questionnaire 2' (at this point some of the respondents were still non-drivers whilst others held a learner or restricted driving licence). The same participants were approached at both time points to complete both questionnaires.

6.4.2.1 Participants: 'Questionnaire 1' ('Time 1')

The New Zealand AA Driver Education Foundation (AADEF) recruited 36 schools from across the North and South Islands to take part in the study. In total 814 pre-drivers (361 males, 453 females) aged 13-18 years (M = 14 years, SD = 0.59) completed 'Questionnaire 1'. 570 participants came from 23 schools on the North Island and 243 participants came from 13 schools on the South Island and reported living in cities (41.6%), small towns (37.5%), villages and the countryside (19%).

6.4.2.2 Participants: 'Questionnaire 2' ('Time 2')

From the 814 participants that responded to the 1st questionnaire, 471 students (196 males, 275 females) also completed 'Questionnaire 2'. They were aged between 14-16 years old (M = 15 years, SD = 0.38). At 'Time 1' all participants were non-drivers, but at 'Time 2' 263 participants were non-drivers (92 males, 171 females; M = 13.84, SD = 0.45) and 208 were drivers (182 learner licence holders, 26 restricted licence holders and no full licence holders).

Of the 208 drivers, 195 (97 males, 98 females; M = 15.1yrs, SD = 0.24) had fully completed the DBQ, which was the main source of information regarding their self-reported driving behaviour. Subsequently, statistical analysis that was conducted to look specifically at drivers' responses used only the responses of the 195 drivers who had completed the DBQ. However, statistical comparisons between drivers' and non-drivers' attitudes and intentions incorporated the responses of all 208 drivers. These participants were from 29 schools across New Zealand (10 South Island schools, 19 North Island schools).

6.4.3 Measures

This longitudinal study looks at individuals' responses to two questionnaires completed approximately 12 months apart, using several different scales of measurement. The questionnaires were designed to measure adolescent attitudes towards driving.

6.4.3.1 Questionnaire 1 ('Time 1')

Part one of the questionnaire ('Time 1') was divided into three sections (Chapter Five):

i) Adolescent road behaviour (questions taken from the Adolescent Road User Behaviour Questionnaire - ARBQ, Elliott and Baughan, 2004; Appendix A)
ii) Attitudes and intentions to engage in speeding behaviour (questions were extracted from the 'Extended TPB scale' and included measures of moral norm; Parker, Manstead & Stradling, 1995; Appendix B)
iii) Attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts' (questions adapted from Parker, Manstead, Stradling and Senior's (1998) DAQ; Appendix C).

Some of the Likert scales for items in the questionnaire were randomly reversed to encourage participants to think about each question. When answers to reversed questions were reversed back to the correct direction, high-risk drivers and people with positive (high-risk) attitudes towards high-risk driving practices scored high on all three scales (the ARBQ scale, the TPB speeding scale and the DAQ scale).

Section 1: Adolescent Road Behaviour

In the first section, Elliott and Baughan's (2004) Adolescent Road User Behaviour Questionnaire (ARBQ) was used to measure road behaviour (Appendix A). These items were divided into three subscales that measured 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Planned Protective Behaviour on the Road'. Elliott and Baughan (2004) reduced their scale from 43 items to 23 items because they felt that when the full scale was used in conjunction with other self-report measures the questionnaires would be too long for self-completion. They arrived at 23 items after conducting a principal axis factor analysis on the original 43 item scale and selecting the eight items that loaded most strongly on 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' and the seven items that loaded most strongly on 'Planned Protective Behaviour on the Road'. After a second principal axis factor analysis using the shortened 23 items scale Elliott and Baughan (2004) reduced the ARBQ scale further to 21 items. The 21-item ARBQ scale was used in this study as recommended by Elliott and Baughan (2004).

For the purposes of directionality, the Likert scale for items measuring 'Planned Protective Behaviour on the Road' (for example, *"wear bright or reflective clothing when riding a bike in the dark"*, *"use lights on your bike when it is dark"*) were reversed and the sub-scale was re-labelled 'Non-engagement in Planned Protective Behaviour on the Road'. Consequently dangerous road users were those participants who scored high on each of the three sections of the ARBQ. The reduced 21-item ARBQ scale therefore consisted of eight 'Unsafe Road Crossing Behaviour' items (**α** = 0.78), eight 'Play and Social Activity on the Road' items (**α** = 0.85) and five 'Non-engagement in Planned Protective Behaviour on the Road' items (**α** = 0.75). All items were measured using a five point Likert scale (1 = never, 2 = hardly ever, 3 = sometimes, 4 = fairly often, 5 = very often). A derived Cronbach's alpha value of 0.84 was calculated for all 21 items (Chapter Five, Table 5.2, page 108).

Although the full 43-item Adolescent Road User Behaviour Questionnaire was printed, only the 21 items from the reduced 21-item scale were used in statistical analysis. The reason the full scale was printed was that a second study unrelated to this thesis was running simultaneously validating the use of the 43-item ARBQ in NZ (Sullman & Mann, 2009).

Section 2: Attitudes and Intentions to Speed

The 'Extended TPB scale' (Parker, Manstead and Stradling, 1995) was used to measure pre-drivers' attitudes and intentions to speed (referred to as the TPB speeding scale in this study), which included measures of personal norm (moral norm and anticipated regret, Appendix B). As Parker, Manstead et al. (1995) designed the extended TPB for their study on drivers, only those questions which were deemed to be relevant to pre-drivers were included in this study. There were 13 items in total (one moral norm, two anticipated regret, four attitude items, two subjective norm, three perceived behavioural control and one measure of intention) taken from Parker, Manstead et al.'s (1995) original questionnaire and the wording slightly modified so that pre-drivers could reasonably answer the questions.

Some of the TPB components were measured using more than one item (for example, attitudes to speeding were measured using four items), responses to each of these facets were added together and averaged. Of the three perceived behavioural control items (PBC) only one was used in the statistical analysis in this study *("My refraining from speeding would be easy/difficult"*) because of the low Cronbach's Alpha produced when the three items were combined (**α** = 0.25; Chapter Five, Table 5.1, page 108). Parker, Manstead et. al (1995)

produced low Cronbach's Alphas for PBC in their study and consequently they chose to use the one PBC item that had correlated most highly with the belief-based measure of PBC. Parker, Manstead et. al (1995) calculated the belief-based measure of PBC by multiplying ratings for a set of salient control beliefs by the perceived power of each control factor to inhibit or facilitate performance and then summing the products).

The calculations and correlations conducted by Parker, Manstead et al. (1995) could not be performed in this study because participants were pre-drivers and could not rate internal or external factors that affect driving (i.e., their control beliefs) nor the frequency they encountered them (which would have produced an indication of the power of these control factors). A decision was made to use only one PBC item in the statistical analysis in this study. This decision was based partly upon Parker, Manstead et al.'s (1995) suggestion but also on the results of Cronbach's Alphas conducted on the complete TPB scale. When the two PBC items were removed from the complete TPB scale the Cronbach's Alpha value increased from 0.72 to 0.76 (Chapter Five, Tables 5.1 and Table 5.2, page 108).

After removing two PBC items, 11 items were used to measure the components of the 'Extended TPB scale' in this study. The items were measured using a seven point Likert scale with the end points being appropriate to the question (for example: 1= Strongly agree, 7= Strongly disagree; 1= Very likely, 7= Very unlikely; 1= Very easy, 7= Very difficult), the Cronbach's Alpha for all items was 0.76 (Chapter Five, Table 5.2, page 108).

Section 3: Attitudes to Driving Violations

The DAQ was used to assess attitudes towards driving violations such as 'speeding', 'drink-driving' and 'not wearing seat belts'. There were 22 questions (nine 'speeding' items, eight 'drink-driving' items and five attitudes to 'not wearing seat belts' items). 16 items were taken from Parker et al.'s (1998) 40-item DAQ scale (see Appendix C). The DAQ consisted of four sub-sections (10 items in each section) measuring attitudes towards: 'drink-driving', 'speeding', 'over-taking' and 'close following'.

The 16 items from the original 40-item DAQ used in this study only addressed attitudes to 'speeding' and 'drink-driving' as it was felt that some pre-drivers might not have any knowledge about over-taking and close following. A new subscale, attitudes towards 'not wearing seat belts', was created to measure adolescent attitudes towards wearing seat belts in cars.

From the original DAQ scale, seven items from the 10-item 'drink-driving' subscale were chosen to be used in this study. Three 'drink-driving' items from the original subscale measuring attitudes towards breath-testing and knowledge of the legal blood alcohol limit were removed because as participants were below the legal drinking age it was assumed that they may not know about legal limits or breath-testing. A new item ("*it's ok to drink and drive*") was added to the 'drink-driving' subscale in this study. The Cronbach's Alpha for the eight items in the attitudes to 'drink-driving' subscale was 0.68 (Chapter Five, Table 5.2, page 108).

From the original DAQ scale only nine items on 'speeding' were used in this study. One item, namely "*I know exactly how fast I can drive and still drive safely*", was omitted because it was felt that it would not have been applicable to the pre-drivers answering the questionnaire. The Cronbach's Alpha for the nine items in the attitudes to 'speeding' subscale was 0.73 (Chapter Five, Table 5.2, page 108).

A third subscale on 'attitudes to not wearing seat belts' (i.e., what they felt about people travelling in cars without wearing seat belts) consisting of five questions was created for the purposes of this study. Some of the questions used in the other two sections on 'speeding' and 'drink-driving' were re-worded so that they could be applied to attitudes towards non-use of seat belts. The Cronbach's Alpha for the five items in the attitudes to 'not wearing seat belts' subscale was 0.76 (Chapter Five, Table 5.2, page 108).

All items were measured using a five point Likert scale (1 = Strongly agree, 5 = Strongly disagree). The Cronbach's Alpha for the 22-item DAQ scale was 0.82 (Chapter Five, Table 5.2, page 108).

6.4.3.2 Questionnaire 2 ('Time 2')

The second questionnaire (see Appendix H) consisted of three sections:

i) Re-assessment of driving attitudes and intentions to speed (eight items from the first questionnaire; Appendix F)
ii) Sensation seeking behaviour (AISS, Arnett, 1994; Appendix D)
iii) Self-reported engagement in 'Errors', 'Lapses' and 'Violations' whilst driving (DBQ, Parker, West et al., 1995; Appendix E).

Section 1: Re-assessing Driving Attitudes and Intentions to Speed

The first section was designed to establish whether attitudes and intentions had changed during the intervening 12-month period as adolescents went from being pre-drivers to drivers. Eight items from the first questionnaire were replicated in this section. Four of the items that measured attitudes to speeding were included (responses to the four items were added together and averaged), along with one item on speeding intention. Three items from the DAQ measuring attitude towards 'speeding', 'drink-driving' and 'not wearing seat belts' were also included (Appendix F).

Section 2: Sensation Seeking Behaviour

In the second section the AISS (Arnett, 1994) was used to measure sensation seeking tendencies. The scale consisted of 20 items that formed two sub-scales: 'Novelty' and 'Intensity' (Appendix D). Each subscale had ten items. The 'Intensity' scale assessed the need for stimulation and experiences that provide intense sensory input (e.g., ''*When I listen to music, I like it to be very loud*'', ''*It would be interesting to see a car accident*'', ''*I like a movie with a lot of explosions and car chases*''), whereas the items in the 'Novelty' scale referred to the openness to experience (e.g., ''*I can see how it would be interesting to marry someone from a foreign country*'', ''*I would like to travel to strange, far-away places*'', ''*I think it's fun and exciting to perform or to speak before a group*'').

Subjects were asked to indicate the extent to which the items describe them on a four point Likert scale (1 = describes me very well, 2 = describes me somewhat, 3 = does not describe me very well, 4 = does not describe me at all). Each subscale contained ten items that were averaged (after reversing back some of the items that had been reversed) to find a total score. High scores on both the sub-scales and on total AISS score (the combined 'Novelty' and 'Intensity' scores) were indicative of high sensation seekers. The Cronbach's Alpha for the 'Intensity' subscale was 0.59, the 'Novelty' subscale was 0.49 and the whole 20-item AISS scale was 0.66.

Section 3: Driver Behaviour Questionnaire (DBQ)

In the third section the DBQ was used to measure the frequency of drivers' self-reported behaviour on the road (Appendix E). The DBQ was originally designed by Reason et al. (1990) and consists of three subscales that measure the frequency of engagement in 'Errors', 'Lapses' and 'Highway Code Violations' whilst driving. Driving 'Errors' refer to mistakes or omissions that are made whilst driving (for example, "*Brake too quickly on a slippery road,*

or steer the wrong way in a skid"), 'Lapses' are harmless mistakes that are made whilst driving that are caused by lapses in attention (for example, "*Hit something when reversing that you had not previously seen*") and 'Highway Code Violations' are deliberate deviations from safe driving practice (for example, "*Race away from traffic lights with the intention of beating the driver next to you*"). This measurement scale has been found to correspond highly with observed driving behaviour (Rolls et al., 1991).

Although there are several different versions of the scale the version chosen for this study consisted of 24 items in total; each of the subscales were composed of eight items (Parker, West et al., 1995). All violations were 'Highway Code violations' (Appendix E). 'Aggressive violations' (aggressive expressions of hostility towards other road users or drivers) were not included in the version of the DBQ used in this study because in previously conducted studies they produced low Cronbach's Alphas. Items consistently loaded on other factors and consequently 'Aggressive Violations' explained only a very small amount of variance (5.4% in Sullman et al., 2002). 'Aggressive Violations' have also been found to have no significant correlation with crash involvement (Gras, Sullman, Cunilla, Planes, Maria Aymerich & Font-Mayolas, 2006; Sullman et al., 2002). For this reason it was decided to follow Gras et. al's (2006) advice to omit aggressive violations from the DBQ.

Responses were measured on a six point Likert scale (0 = Never, 5 = All the time). The Cronbach's Alpha for the 'Error' subscale was 0.83, for the 'Lapses' subscale was 0.77, for the 'Highway Code Violations' subscale was 0.82 and for the complete 24-item DBQ scale was 0.91.

6.4.4 Procedure

AADEF sent letters to schools across New Zealand inviting them to take part in the study. Once schools had agreed to participate in the study they were sent questionnaires, parental/guardian consent forms and a set of instructions regarding the recruitment of participants and the procedure for completing questionnaires. The teachers at the schools were given the responsibility of recruiting student participants and the instructions provided them with information about participant demographics for the study (i.e., students aged between 13-18 years). The instructions also provided information about the procedure for completing questionnaires (i.e., that students needed to complete all three sections of the first questionnaire which would take approximately ten minutes). The schools' were instructed to send out the consent forms to the parents or guardians of students to inform them about the

research being undertaken and to give them the opportunity to withdraw their child from the study should they wish to do so. They were then asked to collect students' consent forms and to return only those questionnaires that had received parental or guardian consent.

Approximately 12 months after completing the 1st questionnaire the AADEF contacted the schools again by letter. The letter thanked the schools and teachers for encouraging their students to complete 'Questionnaire 1'. The letter also informed them about the final part of the study and asked them to get the same students to complete 'Questionnaire 2' (a set of questionnaires was enclosed). A list of the classes that had completed 'Questionnaire 1' was included to facilitate the schools and teachers in remembering which classes had already taken part in the first part of the study.

6.5 Results

This study looked at 'Questionnaire 2' and examined responses to the eight items asked in both questionnaires. It also looked for associations between scales used in the first questionnaire (when participants were pre-drivers) and second questionnaire (when some of the participants were drivers).

The data was explored in two ways:

1) Data collected from both 'Time 1' and 'Time 2' comparing responses from 'Time 2' drivers and non-drivers.
2) Data collected from participants who had become drivers by 'Time 2'.

The data was analysed using t-tests, ANOVAs and correlations. To establish whether a relationship existed between pre-driver road behaviour and attitudes ('Time 1') and self-reported driving behaviour and attitudes ('Time 2'), regressions were run which incorporated items from both questionnaires.

High scores on scale items indicated high risk-takers and people with positive (high-risk) attitudes towards driving violations.

6.5.1 Responses from 'Time 1' to 'Time 2'

6.5.1.1 Participants' Responses from 'Time 1' to 'Time 2'

To identify significant differences between participants' responses at 'Time 1' and at 'Time 2' a paired samples t-test was run on the data collected from the eight TPB and DAQ items that were asked in both questionnaires. The data was collected from all participants who completed both questionnaires regardless of whether or not they drove by 'Time 2'. The results showed that there were significant differences in responses between the two time periods (Table 6.1).

Table 6.1 – Responses 'Time 1' to 'Time 2' (n = 471)

'Time 1' & 'Time 2' items	'Time 1'	'Time 2'	Difference (T1-T2)
Speeding unsafe-safe	2.07	2.00	-0.07
Speeding reckless-cautious	2.92	2.42	**-0.50****
Speeding un-enjoyable – enjoyable	4.03	4.17	0.15
Speeding bad-good	2.42	2.18	**-0.24****
Intention to speed unlikely-likely	4.01	3.41	**-0.60****
Ok to speed disagree-agree	2.60	2.24	**-0.36****
Ok to not wear seat belts disagree-agree	1.64	1.43	**-0.21****
Ok to drink-drive disagree-agree	1.94	1.32	**-0.62****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
= Significant decrease from 'Time 1' to 'Time 2'

Mean scores dropped significantly from 'Time 1' to 'Time 2' on TPB attitudes to speeding being 'reckless-cautious' ($t(470) = 5.47$, $p < 0.001$, $d = 0.30$), TPB attitudes to speeding being 'bad-good' ($t(470) = 3.49$, $p < 0.001$, $d = 0.18$), DAQ 'ok to speed' ($t(470) = 6.34$, $p < 0.001$, $d = 0.33$), DAQ 'ok to not wear seat belts' ($t(470) = 3.83$, $p < 0.001$, $d = 0.23$) and DAQ 'ok to drink-drive' ($t(470) = 10.6$, $p < 0.001$, $d = 0.66$) and TPB 'intentions' to speed ($t(470) = 6.40$, $p < 0.001$, $d = 0.36$). Changes in responses over the two time periods for two of the speeding attitude items (unsafe-safe and un-enjoyable-enjoyable) were not significant (Figure 6.1, Table 6.1).

These results suggest that from 'Time 1' to 'Time 2' attitudes to 'speeding', 'not wearing seat belts', 'drink-driving' and 'intentions' to speed (whether currently driving or driving in the future) reduced and had therefore become less risky.

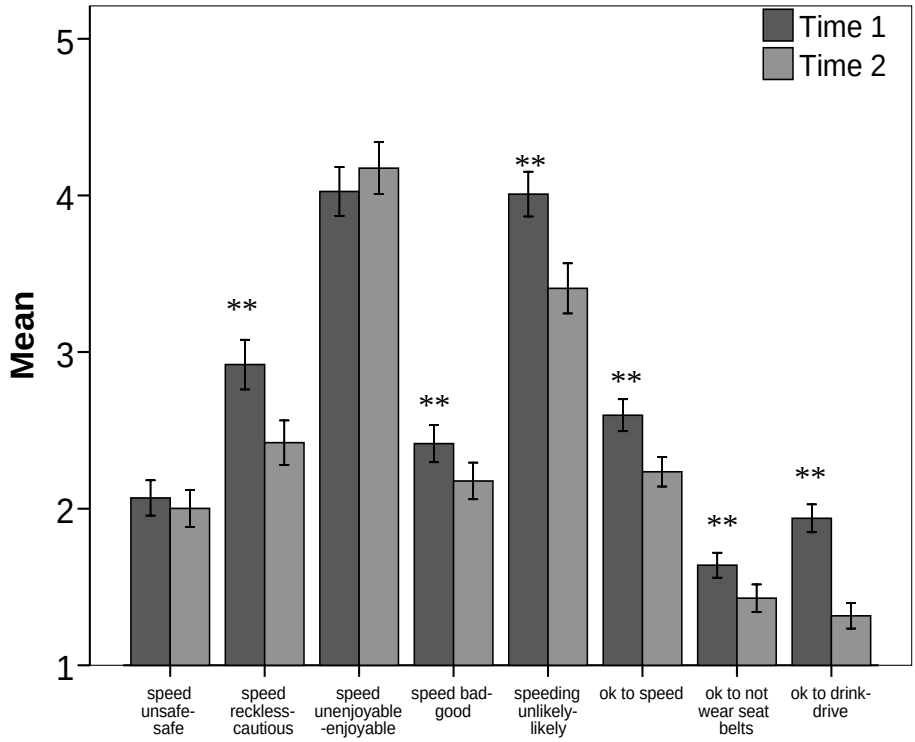


Figure 6.1 – Speeding Attitudes and Intentions and Attitudes to Violations Questions from 'Time 1' to 'Time 2'[2]

(TPB and DAQ; * = $p < 0.05$, ** = $p < 0.001$)

6.5.1.2 Drivers' and Non-Drivers' Responses from 'Time 1' to 'Time 2'

A paired samples test was conducted to look at the difference between responses made at 'Time 1' and 'Time 2' according to whether or not participants drove by 'Time 2' (Table 6.2).

Non-licence holders' scores decreased significantly on 'intention' to speed ($t(262) = 3.41$, $p < 0.001$, $d = 0.26$), attitudes to speeding being 'reckless-cautious' ($t(262) = 4.34$, $p < 0.001$, $d = 0.31$), and DAQ attitudes 'ok to speed' ($t(262) = 5.2$, $p < 0.001$, $d = 0.36$), 'ok to not wear seat belts' ($t(262) = 3.14$, $p < 0.05$, $d = 0.25$) and 'ok to drink-drive' ($t(262) = 7.06$, $p < 0.001$, $d = 0.61$). Attitudes to speeding being 'un-enjoyable-enjoyable' increased among the non-drivers from 'Time 1' to 'Time 2' ($t(262) = -1.974$, $p < 0.05$, $d = 0.12$; Figure 6.2, Table 6.2).

[2] The graphs in this thesis show 95% confidence intervals (mean +/- SE *1.96)

Table 6.2 – Drivers' and Non-drivers' Responses 'Time 1' to 'Time 2'

	Non-drivers (n = 263)		Difference	Drivers (n = 208)		Difference
	'Time 1'	'Time 2'	(T1-T2)	'Time 1'	'Time 2'	(T1-T2)
Speeding unsafe-safe	2.01	1.99	-0.02	2.14	2.01	-0.12
Speeding reckless-cautious	3.00	2.47	**-0.53****	2.82	2.36	**-0.46****
Speeding Un-enjoyable - enjoyable	3.92	4.13	**0.21***	4.16	4.23	0.07
Speeding bad-good	2.31	2.21	-0.10	2.55	2.13	**-0.42****
Intention to speed unlikely-likely	3.94	3.50	**-0.44****	4.10	3.29	**-0.81****
Ok to speed Disagree-agree	2.59	2.21	**-0.38****	2.60	2.27	**-0.33****
Ok to not wear seat belts disagree-agree	1.66	1.43	**-0.24***	1.61	1.43	**-0.18***
Ok to drink-drive Disagree-agree	1.93	1.35	**-0.58****	1.95	1.27	**-0.68****

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)

= Significant decrease from 'Time 1' to 'Time 2'

(NB: All participants were non-drivers at 'Time 1')

Licence holders' scores decreased significantly on 'intention' to speed ($t(207) = 5.93$, $p < 0.001$, $d = 0.49$), attitudes to speeding being 'reckless-cautious' ($t(207) = 3.34$, $p < 0.001$, $d = 0.29$), 'bad-good' ($t(207) = 3.96$, $p < 0.001$, $d = 0.31$) and DAQ attitudes 'ok to speed' ($t(207) = 3.71$, $p < 0.001$, $d = 0.30$), 'ok to not wear seat belts' ($t(207) = 2.23$, $p < 0.05$, $d = 0.20$) and 'ok to drink-drive' ($t(207) = 8.13$, $p < 0.001$, $d = 0.72$) (Figure 6.3, Table 6.2).

These results showed that whilst mean responses for both drivers and non-drivers dropped (becoming less risky) significantly from 'Time 1' to 'Time 2', scores on attitude to speeding being 'un-enjoyable-enjoyable' increased (riskier) significantly for the non-driving group.

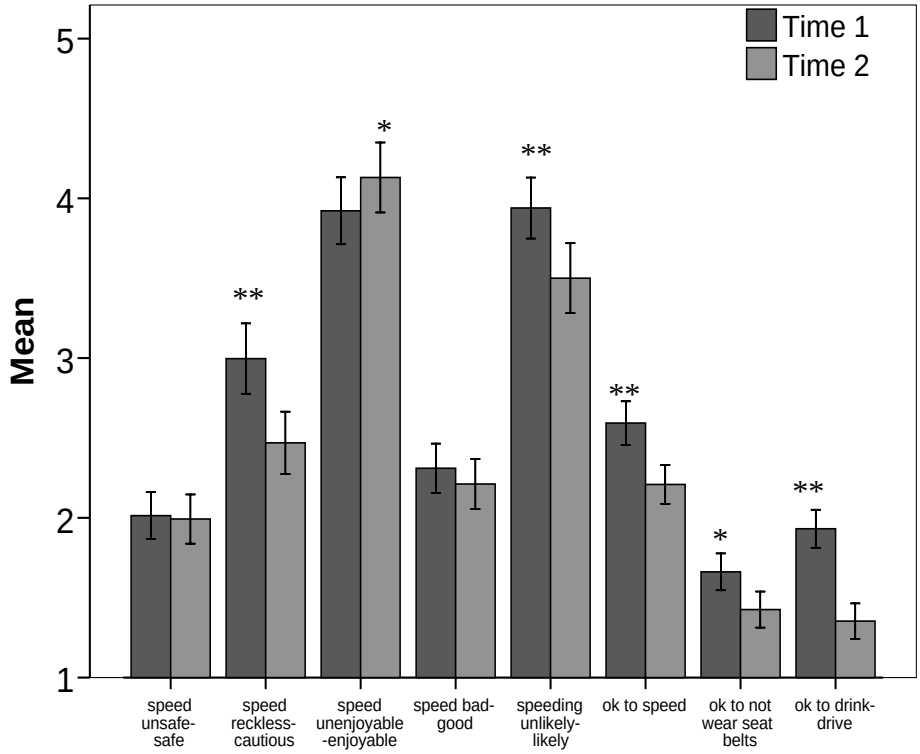


Figure 6.2 – Non-drivers' (n = 263) Speeding Attitudes, Intentions and Attitudes to Violations at 'Time 1' and 'Time 2'

(TPB and DAQ; * = p < 0.05, ** = p < 0.001)

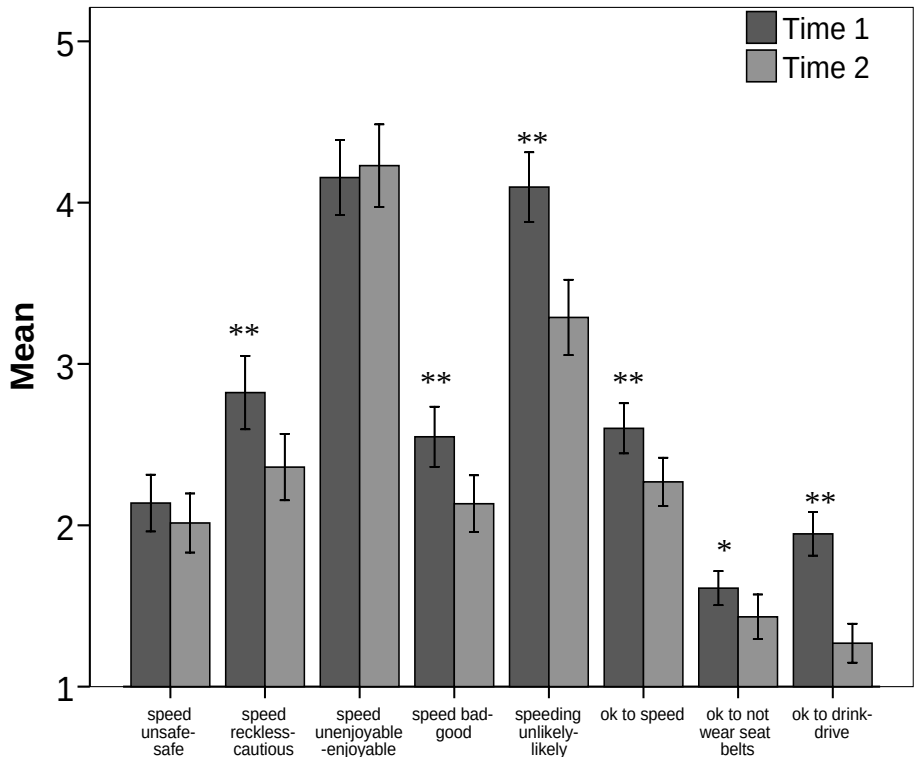


Figure 6.3 – Drivers' (n = 208) Speeding Attitudes, Intentions and Attitudes to Violations at 'Time 1' and 'Time 2'

(TPB and DAQ; * = p < 0.05, ** = p < 0.001)

An independent sample t-test that was run on each of the eight questions at 'Time 2' comparing responses of driving and non-driving participants did not reveal any significant differences (Figure 6.4).

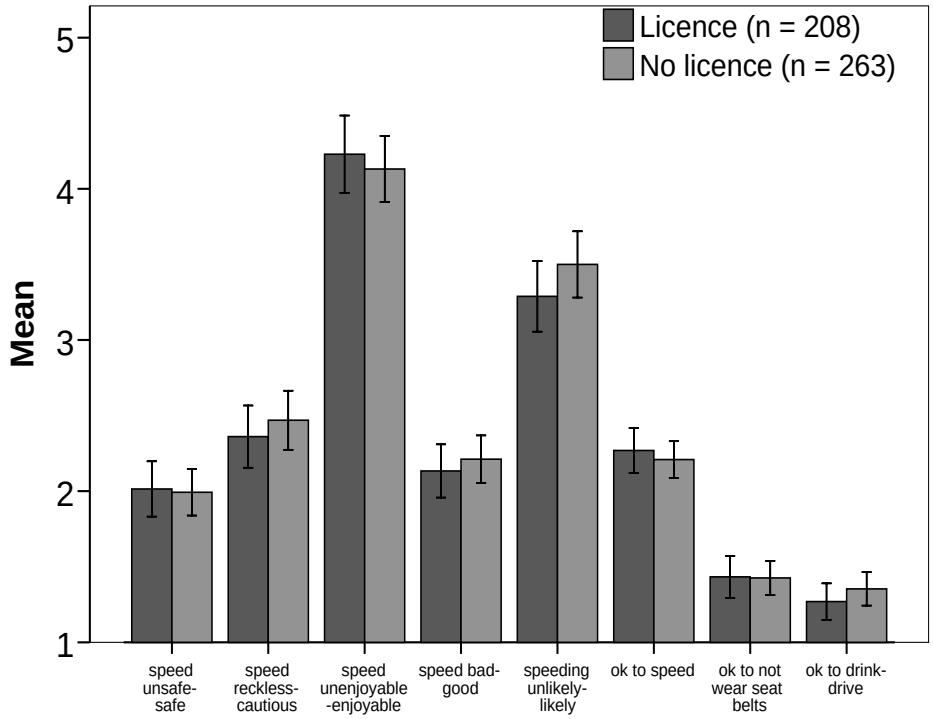


Figure 6.4 – Speeding Attitudes, Intentions and Attitudes to Violations at 'Time 2' According to Driving Status

(TPB and DAQ; * = $p < 0.05$, ** = $p < 0.001$)

An ANOVA was conducted to explore possible significant differences between Non-drivers, Learner and Restricted licence holders at 'Time 2' (Figure 6.5). The results did not find any significant differences between the three groups.

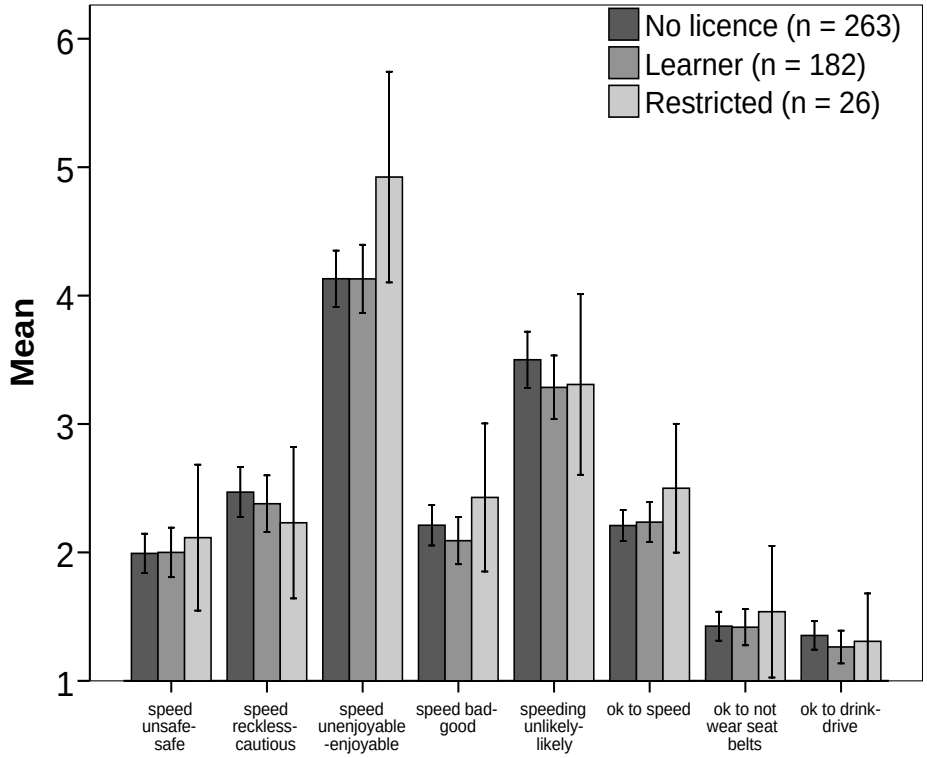


Figure 6.5 – Speeding Attitudes and Intentions and Attitudes to Violations at 'Time 2' According to Licence Category

(TPB and DAQ; * = $p < 0.05$, ** = $p < 0.001$)

6.5.2 'Time 2' Drivers (n = 195)

6.5.2.1 Driving Behaviour

The means for the 24 DBQ items for male drivers, female drivers and all drivers (male and female drivers combined responses) were ranked in descending order so that the most frequently committed behaviours appeared at the top of the list and the least committed behaviours appeared at the bottom of the list (Table 6.3).

For all drivers, the most frequently committed driving behaviours (behaviours with mean = >1) were two 'Lapses' (namely "*Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers*", "*Forget where you left your car in the car park*") and three 'Highway Code Violations' (namely "*Disregard the speed limit on the open road*", "*Disregard the speed limit on a residential road*" and "*Race away from the traffic lights with the intention of beating the driver next to you*").

Table 6.3 – Ranked Driving Behaviours

		All drivers (n = 195)			Males (n = 97)			Females (n = 98)		
Scale	**DBQ Item**	R	M	SD	R	M	SD	R	M	SD
L	Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers	1	1.61	1.39	1	1.24	1.19	1	1.98	1.47
L	Forget where you left your car in the car park	2	1.36	1.5	5	0.89	1.14	2	1.83	1.66
HCV	Disregard the speed limit on the open road	3	1.29	1.35	2	1.21	1.39	3	1.37	1.32
HCV	Disregard the speed limit on a residential road	4	1.16	1.25	4	1.11	1.3	4	1.21	1.2
HCV	Race away from the traffic lights with the intention of beating the driver next to you	5	1.04	1.45	3	1.14	1.53	7	0.93	1.36
L	Get into the wrong lane approaching a roundabout or an intersection	6.5	0.88	1.03	7	0.70	0.95	6	1.06	1.07
E	Fail to check your rear-view mirror before pulling out, changing lanes, etc	6.5	0.88	1.12	10	0.63	0.92	5	1.13	1.25
L	Realise that you have no clear recollection of the road along which you have just been travelling	8	0.84	1.07	6	0.84	1.14	8	0.84	1
E	Underestimate the speed of an oncoming vehicle when overtaking	9	0.71	1.11	9	0.65	1.04	9	0.77	1.17
HCV	Overtake a slow driver on the inside	10	0.63	1.12	8	0.69	1.21	17	0.57	1.03
E	Fail to notice that pedestrians are crossing when turning into a side street from a main road	11	0.61	0.99	12	0.53	0.84	12	0.70	1.12
L	Intending to drive to destination A, you "wake up" to find yourself heading for destination B, maybe because the latter is a more usual destination	12	0.60	0.98	11	0.61	0.97	15	0.60	0.99
E	Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front	13	0.59	0.94	14	0.47	0.84	11	0.71	1.02
L	Misread the signs and exit from a roundabout on the wrong road	14	0.57	0.91	13	0.48	0.82	14	0.66	0.98
L	Attempt to drive away from the traffic lights in third gear	15	0.57	1.04	17	0.40	0.84	10	0.73	1.2
E	Brake too quickly on a slippery road, or steer the wrong way in a skid	16	0.55	0.94	16	0.41	0.83	13	0.69	1.02
HCV	Drive so close to the car in front that it would be difficult to stop in an emergency	17	0.47	0.84	15	0.46	0.87	19	0.48	0.83
HCV	Cross an intersection knowing that the traffic lights have already turned against you	18	0.47	0.95	19.5	0.36	0.83	16	0.58	1.05
L	Hit something when reversing that you had not previously seen	19	0.44	0.91	18	0.37	0.89	18	0.51	0.92
E	Miss "Give Way" signs, and narrowly avoid colliding with traffic having right of way	20	0.42	0.81	19.5	0.36	0.78	20	0.47	0.84
E	On turning left, nearly hit a cyclist who has come up on your inside	21	0.35	0.74	22	0.27	0.67	21	0.42	0.8
HCV	Stay in a motorway lane that you know will be closed ahead until the last minute before forcing yourself into another lane	22	0.32	0.7	21	0.32	0.67	23	0.32	0.74
E	Attempt to overtake someone that you hadn't noticed to be signalling a right turn	23	0.30	0.72	23.5	0.24	0.57	22	0.36	0.84
HCV	Drive when you suspect you might be over the legal blood alcohol limit	24	0.22	0.68	23.5	0.24	0.61	24	0.19	0.74

L = Lapse; E = Error; HCV = Highway Code Violation; = *shared rank order of DBQ items for males/females/all drivers*

For male drivers, the most frequently committed driving behaviours (behaviours with mean = >1) were: one 'Lapse' (namely "*Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers*") and three 'Highway Code Violations' (namely "*Disregard the speed limit on the open road*", "*Race away from the traffic lights with the intention of beating the driver next to you*" and "*Disregard the speed limit on a residential road*").

For female drivers, the most frequently committed driving behaviours (behaviours with mean = >1) were three 'Lapses' (namely "*Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers*", "*Forget where you left your car in the car park*" and "*Get into the wrong lane approaching a roundabout or an intersection*"), two 'Highway Code Violations' (namely "*Disregard the speed limit on the open road*" and "*Disregard the speed limit on a residential road*") and one 'Error' (namely "*Fail to check your rear-view mirror before pulling out, changing lanes*").

These results show us that 'Lapses' are committed more than 'Highway Code Violations' or 'Errors' by all drivers, regardless of whether they are male or female. Males reported engaging in slightly more 'Highway Code Violations' than females; whereas female drivers reported engaging in more 'Errors' and 'Lapses' whilst driving. One important thing to be aware of when interpreting these results is that participants' mean scores did not exceed '1' (which represented that they "hardly ever" engaged in the behaviours they self-reported) even though they could have reported scores up to '5' (which represented that that engaged in the behaviours measured on the DBQ "all of the time"). Although these results may be interpreted as providing evidence to show that adolescent drivers "hardly ever" engage in the behaviours measured on the DBQ, they could also be interpreted as showing that participants under-estimated the frequency or withheld from reporting some of the driving behaviours they engage in due to social desirability.

6.5.2.2 Sensation Seeking and Driving

Correlations were conducted to explore possible relationships between the three driving behaviours ('Errors', 'Lapses' and 'Highway Code Violations') and the two sensation seeking subscales ('Novelty' and 'Intensity', Table 6.4).

The correlations revealed that 'Highway Code Violations' (HCV's) were significantly positively correlated with the AISS scale ($p < 0.05$) and both of its subscales 'Intensity'

(p < 0.05) and 'Novelty' (p < 0.05, Table 6.4). 'Errors' and 'Lapses' did not correlate significantly with the sensation seeking scales or subscales (p > 0.05, Table 6.4). As expected, 'Errors', 'Lapses' and 'Highway Code Violations' were significantly positively correlated with each other (p < 0.001, Table 6.4).

Table 6.4 – Driving Behaviour and Sensation Seeking

'Time 2' Subscales	Errors	Lapses	HCV	AISS	Novelty	Intensity
AISS	0.03	0.07	**0.21***		**0.82****	**0.84****
Novelty	0.05	0.14	**0.15***	**0.82****		**0.38****
Intensity	-0.004	-0.01	**0.21***	**0.84****	**0.38****	
Errors		**0.78****	**0.66****	0.03	0.05	-0.004
Lapses	**0.78****		**0.63****	0.07	0.14	-0.01
HCV	**0.66****	**0.63****		**0.21***	**0.15***	**0.21***

* = p < 0.05; ** = p < 0.001 (n = 195) **HCV** = Highway Code Violations

These results suggest that people who score highly on 'Intensity' and 'Novelty' in sensation seeking also score high on 'Highway Code Violations'.

6.5.2.3 Gender Differences and Driving

Independent t-tests were conducted to find significant gender differences on drivers' questionnaire responses. Significant gender differences were found on AISS sensation seeking subscales and the DBQ driving behaviour subscales (Figures 6.6-6.8, Table 6.5).

Table 6.5 – Gender, Sensation Seeking and Driving Behaviour

'Time 2' Subscales	Males (n = 97)	Females (n = 98)	Difference (males - females)
AISS scale	54.96"	51.74	**3.22****
AISS Intensity subscale	28.74"	26.10	**2.64****
AISS Novelty subscale	26.22"	25.64	0.58
DBQ Errors	3.56	5.26	**-1.70***
DBQ Lapses	5.53	8.20	**-2.67****
DBQ Violations	5.54	5.66	-0.12

* = Significant Difference (p < 0.05); **= Significant Difference (p < 0.001), *" = (n = 96)*
= males significantly higher means than females

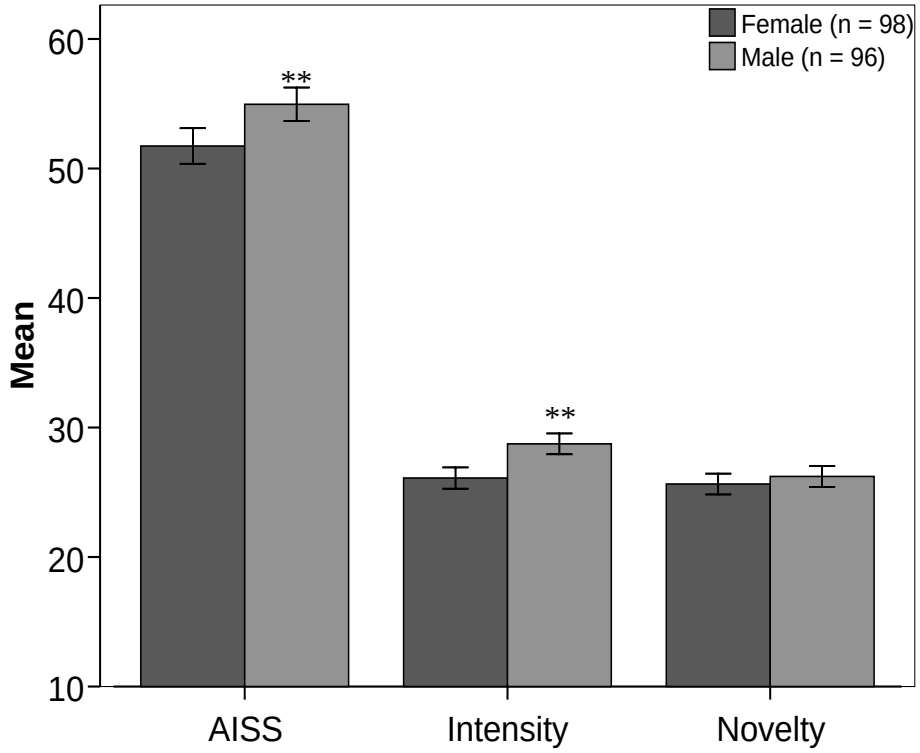


Figure 6.6 – Gender and Sensation Seeking

(AISS subscales; * = p < 0.05, ** = p < 0.001)

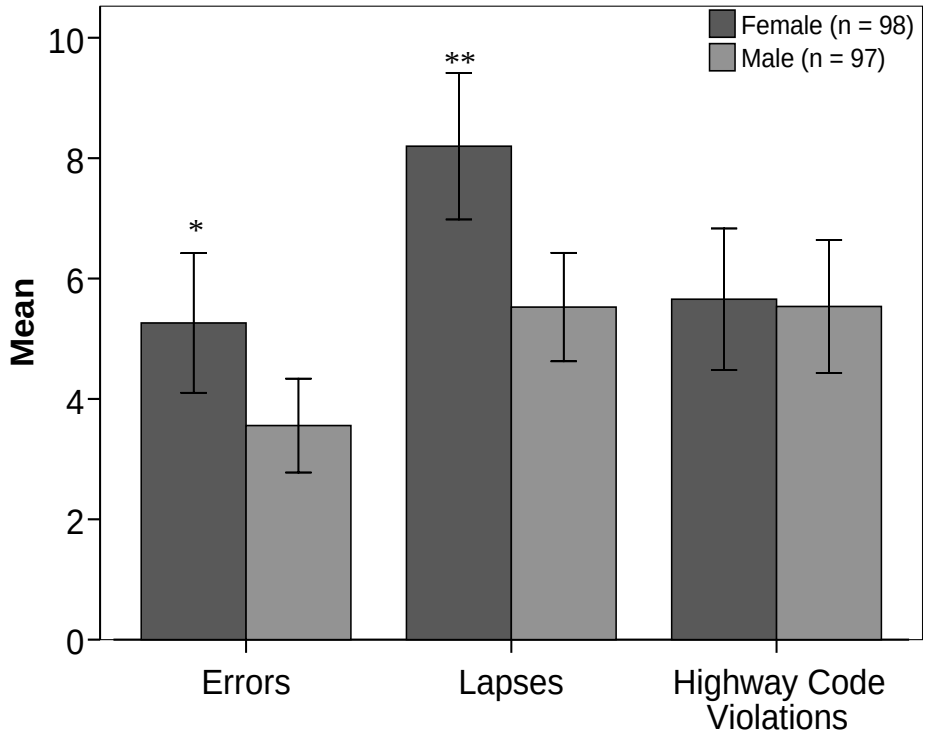


Figure 6.7 – Gender and Driving Behaviour

(DBQ; * = p < 0.05, ** = p < 0.001)

Males scored significantly higher means than females on the AISS scale (t (192) = 3.32, $p < 0.001$, d = 0.48, Figure 6.6) and on the 'Intensity' subscale (t (193) = 4.49, $p < 0.001$, d = 0.65, Figure 6.6). There were no significant gender differences on the 'Novelty' subscale of the AISS ($p > 0.05$). Females scored significantly higher than males on driving 'Errors' (t (193) = -2.39, $p < 0.05$, d = 0.34) and 'Lapses' (t (178) = -3.46, $p < 0.001$, d = 0.49, Figure 6.7). There were no significant gender differences on 'Highway Code Violations' ($p > 0.05$). Drivers' responses to the eight TPB and DAQ items ('Time 2') revealed only one significant gender difference (Table 6.6).

Table 6.6 – Gender, Attitudes to Driving and Intentions to Speed (TPB/DAQ scales)

'Time 2' Subscales	Males (n = 97)	Females (n = 98)	Difference (males - females)
Speeding unsafe-safe	2.14	1.89	0.25
Speeding reckless-cautious	2.34	2.39	-0.05
Speeding un-enjoyable – enjoyable	4.50	3.99	0.51
Speeding bad-good	2.33	1.89	**0.44***
Intention to speed unlikely-likely	3.26	3.36	-0.10
Ok to speed disagree-agree	2.28	2.22	0.06
Ok to not wear seat belts disagree-agree	1.41	1.41	0.00
Ok to drink-drive disagree-agree	1.35	1.20	0.15

* = Significant Difference ($p < 0.05$); **= Significant Difference ($p < 0.001$)
= males significantly higher means than females

Males scored significantly higher than females on attitude to speeding being 'bad-good' (t (193) = 2.42, $p < 0.05$, d = 0.35, Figure 6.8). These results show that males scored more towards the direction of speeding being 'good' compared to females who scored more towards the direction of speeding being 'bad'. Therefore males' perceptions of speeding are significantly riskier than females'. It must be noted that although there was a significant gender difference it was only a difference of 0.4 and both males' and females' responses were under the mid-point of the scale (on the seven point scale four was the 'neutral' or mid-point). Therefore it may be more cautious to interpret these results as suggesting that males are more neutral in their opinions towards whether speeding is 'bad' or 'good'.

These results suggest that males seek out more intense experiences than females**.** They also view speeding more positively than females perceiving that speeding is more 'good' than 'bad' (although this could equally be interpreted as males having a more neutral opinion). Females report significantly more 'Errors' and 'Lapses' whilst driving compared to males.

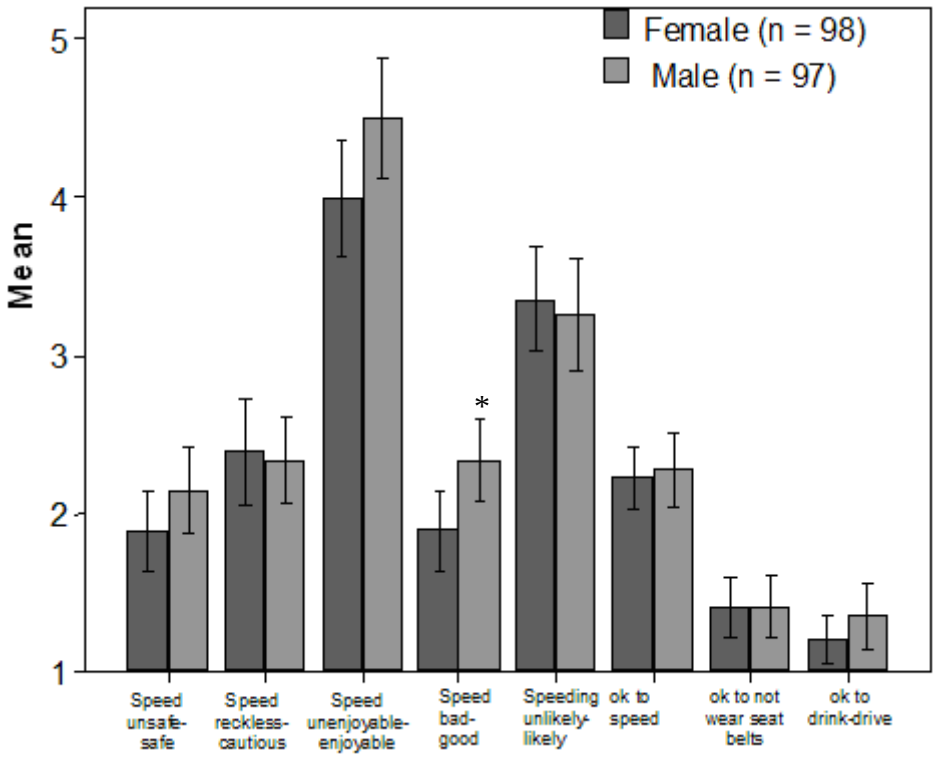


Figure 6.8 – Gender, Speeding Attitudes and Attitudes to Driving Violations

(TPB and DAQ; * = $p < 0.05$, ** = $p < 0.001$)

6.5.2.4 Location Differences and Driving

One-way ANOVA's were conducted to explore potential differences between drivers living on the North or South Islands of New Zealand and between drivers living in cities, towns and rural areas.

There were no significant differences between drivers living on the North or South Islands in New Zealand or between drivers living in cities, towns or rural areas .

6.5.2.5 Driving Behaviour, Sensation Seeking and Pre-driver Attitudes and Intentions

A correlation was conducted on items from 'Time 1' and 'Time 2' questionnaires to explore relationships between drivers' self-reported driving behaviour, sensation seeking, and their pre-driving attitudes and intentions (Table 6.7).

Table 6.7 – Driving Behaviour, Sensation Seeking, Driving Attitudes and Intentions

	Subscales from 'Time 2'					
Subscales from 'Time 1'	**Errors**	**Lapses**	**HCV**	**AISS**	**Novelty**	**Intensity**
DAQ Speeding	0.06	-0.02	**0.23****	0.12	0.02	**0.19***
DAQ Drink-Driving	0.1	0.08	**0.18***	0.12	-0.05	**0.23****
DAQ Seat belts	-0.04	-0.02	0.05	**0.20***	-0.01	**0.28****
ARBQ Unsafe Road Crossing Behaviour	**0.29****	**0.23****	**0.38****	**0.25****	**0.14***	**0.26****
ARBQ Play and Social Activity on the Road	**0.34****	**0.24****	**0.44****	**0.26****	0.11	**0.31****
ARBQ Non-engagement Planned Protective Behaviour	0.01	-0.05	0.11	0.11	0.01	**0.16***
TPB Moral Norm	0.12	0.11	**0.19****	0.14	0.1	**0.14***
TPB Anticipated Regret	**0.15***	0.07	**0.28****	**0.24****	**0.15***	**0.28****
TPB Speeding mean Attitude	0.1	0.06	**0.25****	**0.27****	0.07	**0.33****
TPB Subjective Norm	**0.18***	0.1	**0.33****	0.14	**0.17***	0.1
TPB PBC	**-0.17***	**-0.22***	**-0.19***	-0.03	0.07	-0.06
TPB Intention	0.12	0.11	**0.28****	0.02	0.01	0.05

* = $p < 0.05$, ** = $p < 0.001$ *(n = 195)*

The correlations showed that drivers' pre-driving attitudes to 'not wearing seat belts' (DAQ), 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' (ARBQ), anticipated regret and speeding attitude (TPB) were significantly positively associated with sensation seeking (total score on the AISS scale; $p < 0.05$, $p < 0.001$, Table 6.7). Pre-driver attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts' (the three DAQ subscales), 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road' (the three ARBQ subscales), speeding moral norm, anticipated regret, and attitude (three subscales from the TPB) were significantly positively correlated with the AISS subscale 'Intensity' ($p < 0.05$, $p < 0.001$; Table 6.7). Drivers' pre-driving 'Unsafe Road Crossing Behaviour', speeding anticipated regret and perception of subjective norms were significantly positively correlated with the AISS subscale 'Novelty' ($p < 0.05$, Table 6.7).

These results suggest that adolescents who scored high on sensation seeking (measured as total score on AISS) also score high (risky) on attitudes towards not wearing seat belts, engage in frequent unsafe road crossing behaviour and play and socialise on the roads. High sensation seekers also score high (risky) on anticipated regret and speeding attitude. They therefore anticipate feeling good rather than sorry for speeding and have an accepting attitude towards speed believing it to be 'safe', 'cautious', 'enjoyable' and 'good'.

Adolescents scoring high on 'Intensity' in sensation seeking also scored high (risky) on attitudes towards driving violations. They therefore have high-risk positive and condoning

attitudes towards drink-driving, speeding and people travelling in cars without wearing seat belts. High 'Intensity' scorers also scored high (risky) on pre-driving road behaviour. They reported frequently engaging in unsafe road crossing behaviours, socialising and playing on the roads and do not engage in frequent planned protective behaviours on the roads such as wearing high visibility clothing at night. Adolescents scoring high on 'Intensity' also scored high (risky) on moral norms, anticipated regret and attitudes to speed. They therefore do not think that it is morally wrong for people to speed, anticipated feeling 'good' rather than 'sorry' for speeding and have a relaxed attitude to speed believing it to be 'safe', 'cautious', 'enjoyable' and 'good'.

High scorers on the 'Novelty' sensation seeking subscale scored high on 'Unsafe Road Crossing Behaviour', anticipated regret and subjective norms regarding speeding. Therefore, adolescents who seek new and novel experiences frequently engaged in unsafe road crossing behaviours, anticipated feeling 'good' rather than 'sorry' for speeding and thought that people they knew would approve if they chose to speed when they drive.

Drivers' scores on 'Highway Code Violations' at 'Time 2' were significantly positively correlated ($p < 0.05$, $p < 0.001$) with their scores on the following items from 'Time 1': attitudes to 'speeding' and 'drink-driving' (from the DAQ), 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' (from the ARBQ), speeding moral norm, anticipated regret, attitude, subjective norm and intention (from the TPB, Table 6.7).

Drivers' scores on 'Errors' at 'Time 2' were significantly positively correlated ($p > 0.05$, $p < 0.001$) with their scores on the following items at 'Time 1': 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' (from the ARBQ), speeding anticipated regret and subjective norm (from the TPB, Table 6.7).

Drivers' scores on 'Lapses' at 'Time 2' were significantly positively correlated ($p > 0.05$, $p < 0.001$) with their scores on the following items at 'Time 1': 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' (from the ARBQ, Table 6.7).

Drivers' pre-driving ('Time 1') perception of their perceived behavioural control over speeding was significantly negatively correlated with their self-reported engagement in 'Highway Code Violations', 'Lapses' and 'Errors' at 'Time 2' ($p < 0.05$, Table 6.7).

These results suggest that as scores on pre-driver items measured at 'Time 1' increased (i.e., scores on attitudes towards driving violations, frequency of engaging in high-risk road behaviour, moral norms, anticipated regret, attitudes, subjective norms and intentions to speed increased), the frequency of engaging in 'Highway Code Violations' also increased (i.e., scores on this DBQ subscale increased). Therefore drivers who reported engaging in frequent 'Highway Code Violations' held positive (high-risk) attitudes towards driving violations (namely 'speeding' and 'drink-driving') and reported engaging in frequent high-risk road behaviour (namely 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road') as pre-drivers. Their pre-driving attitudes towards speed were risky, believing it to be 'safe', 'cautious', 'enjoyable' and 'good' and consequently they reported that they did not anticipate feeling regret after speeding. They did not think that speeding was morally wrong, they believed that people they knew would approve if they chose to speed when they drive and subsequently they reported a greater intention to speed.

As frequency of engaging in 'Errors' increased (and thus scores on this DBQ subscale increased) scores on pre-driving road behaviour, anticipated regret and subjective norms, measured at 'Time 1', increased. These results suggest that drivers who reported frequently engaging in 'Errors' whilst driving reported engaging in frequent high-risk road behaviour as pre-drivers (namely 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road'). As pre-drivers they also did not anticipate feeling 'bad' after speeding and believed that people they knew would approve if they chose to speed when they drive.

As frequency of engaging in 'Lapses' increased (and thus scores on this DBQ subscale increased) scores on pre-driving road behaviour increased. These results suggest that drivers who reported frequently engaging in 'Lapses' whilst driving also engaged in frequent unsafe road crossing behaviours and play and socialised on the roads.

As scores on all three violations ('Highway Code Violations', 'Errors' and 'Lapses') increased, scores on 'perceived behaviour control' over speeding (measured at 'Time 1') decreased. These results suggest that drivers who reported frequently engaging in driving violations felt that it would be difficult to refrain from speeding when they were pre-drivers (i.e., they had less confidence over their ability to control the behaviour).

A forward regression was conducted using items from 'Time 1' as predictors of engagement in 'Errors', 'Lapses' and 'Highway Code Violations' (Table 6.8). The following variables

were included as independent variables in the regression: TPB speeding items (moral norm, anticipated regret, subjective norm, perceived behavioural control and speeding intention), TPB speeding attitude (four attitude items and total mean attitude), DAQ attitude to driving violations (speeding, drink-driving, not wearing seat belts), ARBQ subscales ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road') and gender. A measure of sensation seeking was also included ('Novelty', 'Intensity' and total mean AISS).

Table 6.8 – Forwards Hierarchical Regressions to Find 'Time 1' Predictors of Driving 'Lapses', 'Errors' and 'Highway Code Violations' (from the DBQ)

	Lapses					**Model 4**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**β**
1	Gender	0.056			11.43	0.000	**0.26****
2	ARBQ Play and Social Activity on the Road ('Time 1')	0.122	0.066	6.6	13.26	0.004	**0.20***
3	TPB speeding perceived behavioural control ('Time 1')	0.148	0.026	2.6	10.98	0.014	**-0.17***
4	AISS Novelty in sensation seeking subscale ('Time 1')	0.165	0.017	1.7	9.35	0.049	**0.13***

	Errors					**Model 2**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**B**
1	ARBQ Play and Social Activity on the Road ('Time 1')	0.115			24.98	0.000	**0.36****
2	Gender	0.155	0.039	3.9	17.46	0.003	**0.20***

	Highway Code Violations					**Model 4**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**B**
1	ARBQ Play and Social Activity on the Road ('Time 1')	0.196			46.83	0.000	**0.39****
2	TPB speeding mean subjective norm ('Time 1')	0.250	0.053	5.3	31.76	0.002	**0.21***
3	TPB speeding intention ('Time 1')	0.270	0.020	2.0	23.40	0.013	**0.16***
4	DAQ ok to not wear seat belts ('Time 1')	0.286	0.036	3.6	18.89	0.042	**-0.13***

** = $p < 0.05$, ** = $p < 0.001$*

The best predictors for driving 'Lapses' were gender, 'Play and Social Activity on the Road' (from the ARBQ, 'Time 1'), perceived behavioural control of speeding (from the TPB, 'Time 1' and 'Novelty' in sensation seeking (from the AISS; Table 6.8). These predictors explained 16.5% of the r^2 variance in 'Lapses'. All predictors except perceived behavioural control had a positive directly proportional relationship with scores on 'Lapses' so that scores on the predictor variables increased as scores on 'Lapses' increased. Perceived behavioural control had a negative inversely proportional relationship with 'Lapses' (β = -0.17, $p < 0.05$) and therefore scores on perceived behavioural control decreased (i.e., they perceived that it will be difficult to refrain from speeding) as scores on 'Lapses' increased (Table 6.8). As males were entered as "0" and females were entered as "1" in the data sheet, the positive beta indicated

that females were more likely to have higher scores on 'Lapses'. Gender was the most important predictor of 'Lapses' and explained 5.6% of the r^2 variance.

Driving 'Errors' were predicted by 'Play and Social Activity on the Road' (from the ARBQ at 'Time 1') and gender (Table 6.8). These predictors explained 15.5% of the r^2 variance in 'Errors'. Both predictor variables had a positive relationship with scores on 'Errors'. They were directly proportional to scores on 'Errors' such that their scores increased as scores on 'Errors' increased. As males were entered as "0" and females were entered as "1" in the data sheet, the positive beta indicated that females were more likely to report more frequent 'Errors' (and thus have higher scores on this measure). Gender explained 3.9% of the r^2 variance in 'Errors'.

'Highway Code Violations' were predicted by 'Play and Social Activity on the Road' (from the ARBQ, 'Time 1'), subjective norm (from the TPB, 'Time 1'), speeding intention (from the TPB, 'Time 1') and '*it's ok to not wear seat belts, as long as you drive carefully*' (from the DAQ, 'Time 1'; Table 6.8). These predictors explained 28.6% of the r^2 variance in 'Highway Code Violations'. All predictor variables, with the exception of the DAQ item, had a positive relationship with 'Highway Code Violations' and increased directly proportional to increases in 'Highway Code Violations'. DAQ '*it's ok to not wear seat belts, as long as you drive carefully*' had a negative beta ($\beta = -0.13$, $p < 0.05$) and therefore as participants scores on this item decreased, scores on violations increased significantly.

These results suggest that there are a number of different factors that are each associated with greater involvement in 'Errors', 'Lapses' and 'Highway Code Violations'. Drivers who frequently have 'Lapses' whilst they drive were more likely to be females, were people who scored high on 'Novelty' in sensation seeking, were pre-drivers who believed that speeding would be difficult to control and pre-drivers who reported engaging in frequent 'Play and Social Activity on the Road'. Drivers reporting frequent 'Errors' whilst driving were more likely to be females, and pre-drivers who reported frequent 'Play and Social Activity on the Road'. Frequent 'Highway Code Violators' were pre-drivers who reported engaging in frequent 'Play and Social Activity on the Road', pre-drivers who believed others would approve if they chose to speed, pre-drivers who reported greater intentions to speed and pre-drivers who were less likely to agree that it was acceptable to drive without wearing seat belts.

6.5.2.6 Predicting Driving Behaviour

Three regressions were run to find those questionnaire items that significantly predicted driving 'Errors', 'Lapses' and 'Highway Code Violations' (from the DBQ) from both 'Time 1' and 'Time 2' (Table 6.9). The following 'Time 1' variables were included as independent variables in the regression: TPB speeding items (moral norm, anticipated regret, subjective norm, perceived behavioural control and speeding intention), TPB speeding attitude (four attitude items and total mean attitude), DAQ attitude to driving violations (speeding, drink-driving, not wearing seat belts), ARBQ subscales ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour') and gender. The following 'Time 2' variables were also included: AISS sensation seeking ('Novelty', 'Intensity', total mean AISS), TPB speeding attitude (four attitude items and total mean attitude), TPB speeding intention and DAQ attitude to driving violations (three items: ok to speed, drink-drive, not wearing seat belts).

Table 6.9 – Forwards Hierarchical Regressions to Find 'Time 1' and 'Time 2' Predictors of Driving 'Lapses', 'Errors' and 'Highway Code Violations' (from the DBQ)

	Lapses					**Model 4**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**β**
1	Gender	.056			11.43	0.000	**0.27****
2	ARBQ Play and Social Activity on the Road ('Time 1')	.122	0.066	6.6	13.26	0.002	**0.22***
3	TPB speed unsafe-safe ('Time 2')	.162	0.040	4.0	12.26	0.007	**0.18***
4	TPB Speeding perceived behavioural control ('Time 1')	.180	0.018	1.8	10.34	0.047	**-0.14***

	Errors					**Model 3**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**β**
1	ARBQ Play and Social Activity on the Road ('Time 1')	0.115			24.98	0.000	**0.35****
2	Gender	0.155	0.040	4.0	17.46	0.001	**0.21****
3	TPB speed unsafe-safe ('Time 2')	0.179	0.024	2.4	13.76	0.020	**0.16***

	Highway Code Violations					**Model 5**	
Model	**Predictors**	**R^2**	**R^2ch**	**% R^2ch**	**F**	**P**	**β**
1	ARBQ Play and Social Activity on the Road ('Time 1')	0.196			46.83	0.000	**0.34****
2	TPB Speeding intention ('Time 2')	0.333	0.137	13.7	47.69	0.000	**0.33****
3	TPB Speeding mean subjective norm ('Time 1')	0.365	0.032	3.2	36.43	0.001	**0.22****
4	TPB speed unsafe-safe ('Time 2')	0.385	0.020	2.0	29.58	0.004	**0.18***
5	DAQ ok to speed ('Time 1')	0.399	0.066	6.6	24.99	0.036	**-0.14***

** = $p < 0.05$, ** = $p < 0.001$*

The best predictors for driving 'Lapses' were gender, 'Play and Social Activity on the Road' (from the ARBQ, 'Time 1'), attitude to speed 'unsafe-safe' (from the TPB, 'Time 2') and perceived behavioural control of speeding (from the TPB, 'Time 1', Table 6.9). These predictors explained 18% of the r^2 variance in 'Lapses'. All predictors except perceived

behavioural control had a positive directly proportional relationship with scores on 'Lapses'. Perceived behavioural control had a negative inversely proportional relationship with 'Lapses' (**β** = -0.14, $p < 0.05$) and therefore scores on perceived behavioural control decreased (i.e., they perceived that it will be difficult to refrain from speeding) as scores on 'Lapses' increased (Table 6.9).

Driving 'Errors' were predicted by gender, 'Play and Social Activity on the Road' (from the ARBQ at 'Time 1') and attitude to speed 'unsafe-safe' at 'Time 2' (from TPB, Table 6.9). These predictors explained 18% of the r^2 variance in 'Errors'. All three predictor variables had a positive relationship with scores on 'Errors'. They were directly proportional to scores on 'Errors' such that their scores increased as scores on 'Errors' increased.

'Highway Code Violations' were predicted by 'Play and Social Activity on the Road' (from the ARBQ, 'Time 1'), speeding intention (from the TPB, 'Time 2'), subjective norm (from the TPB, 'Time 1'), attitude to speed 'unsafe-safe' (from TPB, 'Time 2') and '*It's OK to drive faster than the speed limit, as long as you drive carefully*' (from the DAQ, 'Time 1'; Table 6.9). These predictors explained 40% of the r^2 variance in 'Highway Code Violations'. All predictor variables, except for DAQ 'ok to speed', had a positive relationship with 'Highway Code Violations' and increased directly proportional to increases in 'Highway Code Violations'. DAQ 'ok to speed' had a negative relationship with 'Highway Code Violations' (**β** = -0.14, $p < 0.05$) and decreased (i.e., that it is not OK to drive faster than the speed limit) inversely proportional to increases in 'Highway Code Violations' scores.

These results suggest that there are a number of different factors that are each associated with greater involvement in 'Errors', 'Lapses' and 'Highway Code Violations'. Drivers who frequently have 'Lapses' whilst they drive were more likely to be females, were pre-drivers who believed that speeding would be difficult to control, were pre-drivers who believed that speed was more 'safe' than 'unsafe' and pre-drivers who engaged in frequent 'Play and Social Activity on the Road'. Drivers reporting frequent 'Errors' whilst driving were more likely to be females, were pre-drivers who believed that speed was more 'safe' than 'unsafe' and pre-drivers who reported frequent 'Play and Social Activity on the Road'. Frequent 'Highway Code Violators' were people who as pre-drivers reported engaging in frequent 'Play and Social Activity on the Road', were pre-drivers who disagreed that it was ok to speed as long as drivers were driving carefully, were pre-drivers who believed that people important to them (for example friends and family) would approve if they chose to speed, were drivers who

reported greater intentions to speed and were drivers who believed that speed was more 'safe' than 'unsafe'.

6.6 Discussion and Limitations

The results from this study have highlighted that there are gender differences among young drivers, attitude changes among adolescents (regardless of driving status) and links between pre-drivers' attitudes, road behaviour and their future self-reported driving behaviour. Correlations also found significant associations between 'Novelty' and 'Intensity' in sensation seeking and engagement in driving 'Highway Code Violations'. These results show that there is a great need for national pre-driver interventions to be implemented in schools and local communities that aim to reduce adolescents' high-risk pre-driving attitudes, road behaviour and ultimately their engagement in future high-risk driving behaviour. These interventions need to target the creation of safe attitudes and intentions towards driving and general road safety so that the frequency and occurrence of high-risk road behaviours and driving behaviours are prevented or reduced.

The null was rejected for the following hypotheses in this study:

1) Pre-drivers' high-risk attitudes towards driving are significantly associated with their reported engagement in high-risk driving behaviours. Correlations showed that high scorers on pre-driving attitudes to 'speeding' at 'Time 1' (measured using the DAQ) were high scorers on self-reported engagement in 'Highway Code Violations' (measured using the DBQ) at 'Time 2'. Therefore, pre-drivers' high-risk attitudes towards speeding were associated with self-reported engagement in high-risk 'Highway Code Violations' as drivers.

2) Pre-drivers' reported intentions to speed are significantly associated with their reported engagement in high-risk driving behaviours. Regressions showed that high scorers on pre-driving 'intention to speed' at 'Time 1' (measured using the extended TPB scale) were high scorers on self-reported engagement in 'Highway Code Violations' (measured using the DBQ) at 'Time 2'. However, this was only when 'Time 1' pre-driving measures were entered into the regression model. When both 'Time 1' and 'Time 2' measures were entered into the model their current intentions to speed rather than their pre-driving intentions were predictive of 'Highway Code Violations'. Therefore, intentions to speed (pre- and post-driver training) were associated with their reported engagement in high-risk driving 'Highway Code Violations' as drivers.

3) Pre-drivers' reported engagement in high-risk road behaviour is significantly associated with their reported engagement in high-risk driving behaviours. Regressions showed that high scorers on pre-driving 'Play and Social Activity on the Road' at 'Time 1' (measured using the Adolescent Road User Behaviour Questionnaire) were high scorers on self-reported driving 'Errors', 'Lapses' and 'Highway Code Violations' (measured using the DBQ) at 'Time 2'. Therefore, pre-drivers' who reported engagement in high-risk 'Play and Social Activity on the Road' were associated with their reported engagement in high-risk driving 'Errors', 'Lapses' and 'Highway Code Violations'.

4) Sensation seeking is significantly associated with reported engagement in high-risk driving behaviours. Correlations showed significant positive associations between 'Highway Code Violations' and scores on 'Novelty', 'Intensity' and overall sensation seeking (AISS). Regressions that were run to find predictors of driving behaviours using 'Time 1' (pre-driving) factors and sensation seeking subscales revealed that 'Novelty' in sensation seeking was a significant predictor of engagement in 'Lapses'. However, regressions run to find significant predictors of 'Highway Code Violations', 'Errors' and 'Lapses' using both 'Time 1' and 'Time 2' measures (post-driver training) did not reveal any of the sensation seeking subscales as significant predictors.

Lonero and Clinton (1997[a]), Rothe (1986) and the American Automobile Association (1994) reported that skill deficiencies and inadvertent errors have an important role in novice driver accidents. When the amount of information received by drivers exceeds their processing capacity, the likelihood of being involved in accidents increases (Fergenson, 1971). Maycock (1995) identified a positive association between female drivers' self-reported errors of awareness and accident liability. In this study females reported significantly more 'Errors' and 'Lapses' whilst driving than males. These findings support previous research using the DBQ that have reported significantly more frequent engagement in 'Errors' and 'Lapses' by females than males (Özkan et al., 2006).

It is commonly accepted that driving skills increase with driving experience (Michon, 1985). Research has shown that female novices drive less then their male counterparts (Forsyth, Maycock, & Sexton, 1995). Therefore, one possible explanation for why females in this study reported more 'Errors' and 'Lapses' whilst driving could be that they lack driving experience because they do not drive as often as males. Female drivers may therefore take longer than males to automate the driving task and use larger amounts of mental resources

when they drive to attend to activities such as changing gears at the expense of failing to attend to other stimuli (Gregersen, 2003). However, it must be noted that no measures of driving experience (in terms of hours/miles driven) were taken in this study that would provide evidence to support this explanation. Another plausible explanation for the significant gender difference in the self-reporting of 'Errors' and 'Lapses' by novice male and female drivers' is that females could be more open to reporting these behaviours than males who may see it as reporting their weaknesses.

A disregard for legal driving rules and regulations among adolescents is often related to a driver's intentional risk taking behaviour (Hirsch, 2003). Research has shown that a drivers' collision likelihood can be predicted one to three years in advance by measuring intentions and beliefs (Maycock, 1995; Rutter & Quine, 1996; West, Elander et al., 1993; West & Hall, 1997). Maycock (1995) found that in both males and females a willingness to violate informal codes of good behaviour such as failing to comply with signs, signals and markings, strongly predicted their accident involvement. Consequently, Maycock concluded that regardless of gender, high scores on violations are associated with high accident liability.

There were no significant gender differences in the reporting of 'Highway Code Violations' (HCV) in this study. Correlations showed that regardless of gender, driver's self-reported HCV's were positively associated with high-risk pre-driver attitudes towards speeding and drink-driving, frequent engagement in 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' and pre-driving intentions to speed in the future. HCV's were also positively associated with high-risk beliefs towards the morality of speeding (disagreeing that it is wrong to speed), anticipated regret (disagreeing that they would feel sorry for speeding) and subjective norms (agreeing that people would approve of their engaging in speeding) and negatively associated with perceived behavioural control (perceiving that it would be difficult to refrain from speeding). The results from these correlations suggest that positive (high-risk) intentions and beliefs towards speeding measured one year prior to learning to drive were positively associated with high frequency of self-reported HCV's as licensed drivers. Although no measure of accident-involvement was taken, following the logic of Maycock's (1995) results, high HCV reporters have a higher accident liability and they could be identified one year prior to driving according to their high-risk road behaviour, attitudes and intentions towards driving.

Males scored significantly higher on overall sensation seeking and on 'Intensity' in sensation seeking thus supporting findings from previous research (Harré et al., 2000; Mallet & Vignoli, 2007; Waylen & McKenna, 2002[abc], 2008). Correlations showed significant positive associations between scores on 'Highway Code Violations' and scores on overall sensation seeking, 'Novelty' and 'Intensity'. However, 'Novelty' was only a significant predictor of engagement in 'Lapses' when 'Time 1' (pre-driving) measures were added into the regression model. When 'Time 1' and 'Time 2' (post-driver training) measures were entered as predictors of 'Errors', 'Lapses' or 'Highway Code Violations' neither overall sensation seeking or its subscales, 'Novelty' and 'Intensity', were significant predictors. Therefore this study concludes that although there may be a significant association between sensation seeking and driving behaviour there are other factors that are more predictive of engagement in risky driving behaviours. These findings are not surprising as previous studies using the AISS have been unable to report significant relationships between 'Novelty' and risk behaviours (Andrew & Cronin, 1997; Arnett, 1994; Roth, 2003).

Drivers who have inappropriate attitudes towards driving violations such as speeding (i.e., they think they are acceptable behaviours) have higher accident rates than drivers who have appropriate attitudes (Assum, 1997; Lancaster & Ward, 2002; West & Hall, 1997). Attitudes formed during childhood and adolescence tend to persist throughout life as individuals will tend to only seek out new information that supports their original views and ignore conflicting information (Worchel & Shebilske, 1986). The results from this study showed that for all participants' attitude and intention scores dropped (became less risky) from 'Time 1' to 'Time 2'. These attitude changes suggest that between 13-18 years old attitudes are still being formed and therefore interventions promoting safe driving practices could still create safe driving attitudes among adolescents that persist throughout their life.

Research has shown that our most strongly held attitudes, and those most resistant to change, are those formed as a result of direct personal experience with attitude objects (Olson & Zanna, 1983). The results from the regression analysis conducted in this study showed that once adolescents were drivers their attitudes as drivers towards speeding being safe or unsafe rather than their pre-driver attitudes predicted their actual self-reported engagement in driving violations. It is therefore imperative for road safety efforts to target pre-drivers and newly licensed drivers who do not have a vast amount of driving experience and have not developed strongly held high-risk attitudes towards driving dangerous practices. Pre-driver self-reported frequent exposure to the roads via play and socialising activities predicted self-reported

engagement in all three driving behaviours ('Violations', 'Errors' and 'Lapses'). These results therefore imply that adolescents who play and socialise on roads do not have a high regard for road safety.

Previous research has shown that adolescents who report positive (low-risk) attitudes towards traffic safety are less likely to report risky driving behaviour (Iversen, 2004; Ulleberg & Rundmo, 2003). It is therefore entirely plausible that by reducing inappropriate (high-risk) attitudes towards driving violations and dangerous road behaviours adolescents' accident involvement could be reduced. Interventions that educate adolescents about safe road behaviour (as both pedestrians and motor vehicle users) and aim to change pre-driver attitudes and behaviours towards general road safety could ultimately change their future attitudes towards road safety and their behaviours on the roads (as both pedestrians and motor vehicle users).

Future longitudinal studies need to be conducted over a longer period of time if road safety professionals are to be successful at finding the precise age when attitudes are most easily influenced and the age at which they become difficult to change. This information would prove useful to road safety professionals. However, in order to create long-lasting attitude change, individuals would need to be exposed to regular interventions that reinforce positive (low-risk) safe driving practices.

There were a few limitations with this study; firstly, it was not known whether road safety interventions had been implemented in some or all of the schools that took part in New Zealand during the course of the longitudinal study (1 year). Any interventions could have helped towards lowering the attitudes reported between the two time points. Secondly, as the questionnaires were asking about socially undesirable behaviour it is entirely possible that participants completed the questionnaire in a more socially desirable manner or under-reported 'Highway Code Violations', 'Errors' and 'Lapses'.

It would be interesting to include adolescents' intentions to drink and drive and to not wear seat belts as a pre- and post-driver training measure to find out if they are significant predictors of 'Highway Code Violations', 'Errors' or 'Lapses'. Also, it would be better to leave more than a year between sampling points, or to add a 'Time 3', to allow the new drivers to gain more experience. This would help to ascertain how their attitudes may or may not have changed from pre- to post-driver training.

Once the idea for examining the importance of pre-driver attitudes and road behaviour on future driving behaviour was formulated there were a few problems with using Scottish participants, which is why this study was conducted in New Zealand. The problems with using Scottish participants were to do with tracking them over the course of the longitudinal study from pre-driving to post-driver training. 'Time 1' would not be problematic because as participants' needed to be under the legal driving age, which is 17 years of age in Scotland, they would be at school and easy to track down. The problems were however with 'Time 2' when the same participants from 'Time 1' would need to be re-tested when they were over the legal driving age (thus over 17 years old). Since young people in Scotland tend to leave school at 17 years old and either go to University/move/travel/or go into employment, trying to follow them up would have been very problematic within the time constraints of a PhD. Instead, New Zealand (NZ) was chosen as the alternative venue for the longitudinal study because the legal driving age is 15 years of age and the driving terrain is very similar to that in Scotland. Participants would therefore be at school both pre-driving ('Time 1') and post-driver training ('Time 2') so easier to contact over the course of the study.

With studies being conducted in two countries it thus made it possible for cross-national comparisons to be made between Scotland and New Zealand at 'Time 1' of both studies. After 'Time 1' (Chapter Five) both studies were very different; whereas New Zealand adolescents reached the legal driving age and some became drivers, in Scotland none of the adolescents reached the legal driving age so no one became drivers. Therefore, only in New Zealand could the progression of time from pre- to post-driver training be monitored by measuring changes in driving attitudes and intentions before and after driver training. The findings from this study therefore cannot be generalised to all adolescents because there is a possibility that the attitudes, intentions and behaviours that were expressed are culturally bound within New Zealand. This is particularly so because the 'Time 1' findings (Chapter Five) revealed that pre-driving adolescents in Scotland engaged in significantly more 'Unsafe Road Crossing Behaviour' than New Zealand adolescents. Therefore, there is a possibility that in Scotland 'Unsafe Road Crossing Behaviour' would be a significant predictor of future engagement in risky driving behaviour not 'Play and Social Activity on the Road'.

This study has provided evidence to show that past behaviour, attitudes and intentions predict future engagement in driving violations. This study therefore attempts to bridge the existing gap between past research conducted on pre-driver attitudes and road behaviour and research conducted on novice driver attitudes and behaviour. The findings from this study support

previous health research that has shown links between past behaviour and attitudes as well as between past behaviour and intentions (Bagozzi, 1981; Bagozzi et al., 1992; Bentler & Speckart, 1979, 1981; Conner & Armitage, 1998; Ouellette & Wood, 1998; Triandis, 1977).

Evidence has also been provided in this study to support the Problem Behaviour Theory (Jessor & Jessor, 1977; Chapter Three), in that one form of problem behaviour, namely high-risk adolescent road behaviour (in the form of 'Play and Social Activity on the Road'), was associated with risky driving behaviour (frequent engagement in 'Highway Code Violations' whilst driving) which is another form of problem behaviour. The results also lend support to West et al.'s (1998) study, as participants scoring high on sensation seeking reported riskier behaviour on the roads. Negative (high-risk) attitudes towards road safety were also linked to risk taking, thus supporting Iversen (2004) and Ulleberg and Rundmo's (2003) studies. This study however showed that both negative (high-risk) attitudes towards safe driving practices and engagement in dangerous pedestrian behaviour among pre-driving adolescents are predictors of future negative (high-risk) attitudes towards safe driving practices and engagement in dangerous driving behaviours. Therefore, efforts to prevent both the formation of negative road safety attitudes (towards both pedestrian and driving behaviour) and the occurrence of high-risk pedestrian behaviour could ultimately prevent future negative attitudes towards road safety (towards both pedestrian and driving behaviour) and engagement in dangerous driving practices.

This study builds on findings from the previous study (Chapter Five) by examining links between pre-driver attitudes, road behaviour, intentions to speed and driving behaviour. The results have supported the links found in Chapter Five between pre-driver behaviour, attitudes and future driving intentions and highlighted the need for pre-driving interventions. Due to the fluctuations in attitudes and intentions that were reported in this study, these interventions need to be implemented on a regular basis to reinforce road safety messages and ensure that the next generation of young drivers are more safety-conscious and are under-represented in road accident statistics.

The third study presented in Chapter Seven explores the stability of adolescents' attitudes in Scotland over a six-month period and looks at the potential for pre-driver road safety interventions to be effective at changing adolescents' attitudes and behaviours.

6.7 Results Summary

Pre-driving Adolescents:

1. Adolescent males are higher sensation seekers than females and report an enjoyment for intense experiences (for example, watching car crashes, standing on the edge of high places, gambling, listening to loud music).

2. High sensation seeking adolescents were more condoning of people choosing not to wear seat belts in cars, engaged in frequent unsafe road crossing behaviours and frequently played and socialised on the roads. They anticipated that they would feel good rather than sorry after engaging in speeding behaviour and they had a more accepting (riskier) attitude towards speed believing it to be 'safe', 'cautious', 'enjoyable' and 'good'.

3. Adolescents who desired significantly more 'Intensity' in sensation seeking had riskier (more condoning) attitudes towards driving violations such as 'speeding', 'drink-driving' and people 'not wearing seat belts'. They reported engaging in significantly riskier non-driving behaviours on the roads and reported frequently engaging in unsafe road crossing behaviour, social activity on the roads and engaged in significantly less protective behaviour on the roads such as wearing high visibility clothing at night. They also did not think that it is morally wrong for people to speed, anticipated that they would feel 'good' rather than 'sorry' after engaging in speeding behaviour and they had a more relaxed (condoning) attitude towards speed believing it to be 'safe', 'cautious', 'enjoyable' and 'good'.

4. Adolescents who desired significantly more 'Novelty' in sensation seeking reported frequently engaging in unsafe road crossing behaviour, anticipated that they would feel 'good' rather than 'sorry' after engaging in speeding behaviour and thought that people who were important to them (for example, friends and family members) would approve if they engaged in speeding in the future when they drive.

Changes in Attitudes and Intentions

5. Participants' general attitudes to speeding and its acceptability, their 'intentions' to speed and their attitudes to 'not wearing seat belts' and 'drink-driving' reduced from 'Time 1' to 'Time 2' and had therefore become less risky.

6. At 'Time 2' when 208 participants were driving and 263 were non-drivers; there were no significant differences between the two groups according to their general attitudes towards speeding, their intentions to speed in the future or their attitudes towards the acceptability of speeding, drink-driving and not wearing seat belts.

7. At 'Time 2' when 263 participants were non-drivers and 208 were drivers (182 learner licence holders and 26 restricted licence holders); there were no significant differences between the three groups according to their general attitudes towards speeding, their intentions to speed in the future or their attitudes towards the acceptability of speeding, drink-driving and not wearing seat belts.

8. Speeding intention scores at 'Time 1' significantly correlated with 'Highway Code Violations' scores on the DBQ. Regressions to find 'Highway Code Violations' showed that intentions to speed at 'Time 1' was a predictor when only 'Time 1' predictors were present. When items from 'Time 1' and 'Time 2' were present in the regression model, intention to speed at 'Time 2' was a predictor. Although intention scores decreased over the course of the study, participants with the highest intention scores at 'Time 1' and also at 'Time 2' were more likely to engage in driving'Highway Code Violations' at 'Time 2'.

Adolescent Drivers:

9. Adolescent drivers who reported a desire for 'Novelty' in sensation seeking experiences reported engaging in significantly more frequent 'Lapses' whilst driving. However, this association between 'Novelty' and 'Lapses' disappeared when post-driver training measures ('Time 2') were introduced.

10. Drivers who reported frequently engaging in driving 'Highway Code Violations', 'Errors' and 'Lapses' reported that it would be difficult to refrain from speeding as pre-drivers (i.e., they perceived that it would be difficult to have control over refraining from this behaviour).

11. Correlations showed that drivers who reported engaging in frequent 'Highway Code Violations' held riskier (more condoning) attitudes towards speeding and drink-driving violations and reported engaging in frequent high-risk unsafe road crossing and play and social activities on the road as pre-drivers. Their pre-driving attitudes towards speed were also riskier (more condoning) believing it to be 'safe', 'cautious', 'enjoyable' and 'good' and consequently they reported that they did not anticipate that they would feel regret after speeding. As pre-drivers they did not think speeding was morally wrong, they believed that important people they knew (for example, friends and family) would approve if they chose to speed in the future and they reported a greater intention to speed.

12. Correlations showed that drivers who reported frequently engaging in 'Errors' whilst driving reported engaging in frequent high-risk unsafe road crossing and play and socialised on the roads as pre-drivers. As pre-drivers they also did not anticipate feeling 'bad' after speeding and believed that important people they knew (for example, friends and family) would approve if they chose to speed when they drive.

13. Correlations showed that drivers who reported frequently engaging in 'Lapses' whilst driving engaged in significantly more frequent unsafe road crossing and frequently played and socialised on the roads as pre-drivers.

14. The best predictors of driving 'Lapses' were gender (being female), drivers' beliefs that speeding is safe (as opposed to unsafe) and, as pre-drivers, frequent engagement in 'Play and Social Activity on the Road' and a perception that they would find it difficult to refrain from speeding.

15. The best predictors of driving 'Errors' were gender (being female), drivers' beliefs that speeding is safe (as opposed to unsafe) and, as pre-drivers, frequent engagement in 'Play and Social Activity on the Road'.

16. The best predictors of 'Highway Code Violations' were drivers' beliefs that speeding is safe (as opposed to unsafe), beliefs that it was not ok to speed as long as driving carefully, current intentions to speed and, as pre-drivers, frequent engagement in 'Play and Social Activity on the Road', beliefs that important people (for example, friends and family) would approve of their choosing to speed in the future and less condoning attitudes (low risk) towards speeding being acceptable if drivers are driving carefully.

17. Adolescent female drivers reported significantly more ‘Errors’ and ‘Lapses’ whilst driving than males.

18. Adolescent males’ perceptions of speeding were slightly riskier and more condoning than adolescent females’ perceptions.

19. There were no significant differences between young drivers’ self-reported driving behaviour and attitudes with regard to whether they lived on the North or South Islands in New Zealand or between whether they lived in urban, suburban or rural areas

CHAPTER 7 - THE STABILITY OF PRE-DRIVING ATTITUDES AND INTENTIONS

7.1 Summary

Results from Chapters Five and Six showed that pre-drivers' attitudes were linked to their intentions to speed in the future. It was concluded that pre-drivers' need to be encouraged to develop positive (low-risk) attitudes towards safe driving practices if their intentions to speed are to be lowered. Subjective norms (perceptions of other's attitudes and behaviours) were also found to be a powerful source of influence in pre-drivers' attitudes and intentions. The findings from Chapters Five and Six also showed small but significant links between risky road behaviour and intentions to speed in the future, particularly with regards to unsafe road crossing behaviour. It was concluded that whilst efforts should continue to encourage safe road behaviour practice among pre-drivers, more can be done to create desirable attitudes and change undesirable attitudes and intentions towards driving among pre-drivers.

The study documented in this chapter takes the findings from the previous two experimental chapters into consideration. It looks at the temporal stability of adolescents' attitudes and intentions over a six-month period in order to assess the potential for school-based road safety interventions (such as Road Safety Scotland's "Crash Magnets" intervention) to change adolescent attitudes towards driving.

Young people under the age of 25 years are over-represented in all types of road accidents (from pedestrian accidents to driving accidents) and thus appear to attract accidents (DfT, 2007[c], 2008; Elliott & Baughan, 2004; Vernick, Ogaitis, Li, MacKenzie, Baker, & Gielen, 1999; Williams, 2003). In Britain, 30 per cent of car accidents in 2007 involved at least one young driver aged 17-24 years old and 64 per cent of accident-involved young drivers were male (DfT, 2007[c]). Young drivers aged 16-19 years old have been reported to engage in risk-taking behaviour because they cannot see the danger of not engaging in safe driving practices (McKnight & McKnight, 2003). In Scotland, to aid the reduction of high-risk driving practices among young drivers, Road Safety Scotland (RSS), an organisation funded by the Scottish Executive (Government) to develop and co-ordinate Scotland-wide road safety initiatives and campaigns, designed an intervention aimed at pre-driving adolescents. The intervention, known as "Crash Magnets", was designed to encourage adolescents to think about the consequences of engaging in dangerous driving behaviours that can cause serious or fatal accidents.

"Crash Magnets" also addressed the problem of powerful social influences on young drivers, such as subjective norms (the influence of significant others' attitudes and behaviours on individuals) and peer pressure. Peers have a profound influence on individuals, particularly with regard to risk-taking behaviour and high-risk driving behaviour (Arnett et al., 2002; Gardner & Steinberg, 2005; Gregersen & Berg, 1994; Keating, 2007; Moller, 2002; Shope et al., 2003; Simons-Morton et al., 2005; Twisk, 1994). This intervention was designed to try and change the attitudes and behaviours of the whole peer group. The activities included in the "Crash Magnets" teachers' pack encouraged students to work together and the DVD featured adolescents of a similar age sharing their own experiences of driving or being a passenger.

In this study, questionnaires were used to assess pre-drivers' attitudes and intentions over a six-month period. Pre-drivers' attitudes towards rule violations and speeding were examined through the questionnaires and "Crash Magnet" intervention. Iversen (2004) found that drivers with positive (high-risk) attitudes towards rule violations and speeding engaged in more risky driving behaviours. The aim of the "Crash Magnets" intervention was to reduce the occurrence of risky driving behaviour among young drivers by encouraging individuals' to reduce their positive (high-risk) attitudes towards rule violations and speeding into more negative (and thus less risky) attitudes.

The attitudes and intentions of pre-drivers did fluctuate over the course of the study. Adolescents between the ages of 12-18 years old are therefore still forming their attitudes towards driving. Whilst their attitudes and intentions remain unstable, as opposed to being fixed, it is entirely possible that driving interventions such as "Crash Magnets" could reduce high-risk perceptions about driving. However, due to the fluctuations in attitudes and intentions reported in this study, it may be necessary for frequent interventions to be implemented in schools so that safe driving messages are reinforced.

7.2 Hypotheses

The main hypotheses for this Scottish study were as follows;

1) Adolescent attitudes to driving violations (measured using the Driver Attitude Questionnaire - DAQ) will reduce from 'Time 1' to 'Time 3'. Attitude scores will move towards the less risky/more desirable ends of the scales.

2) Adolescent attitudes towards speeding (measured using the extended Theory of Planned Behaviour scale - TPB) will reduce from 'Time 1' to 'Time 3'. Attitude scores will move towards the less risky/more desirable ends of the scales.

3) Adolescent intentions towards engaging in speeding (measured using the extended TPB scale) will reduce from 'Time 1' to 'Time 3'. Intention scores will decrease and move towards the less risky/desirable end of the scales.

4) Adolescents' intentions to speed (measured using the extended TPB scale) are associated with high risk-taking on the roads (measured using the ARBQ). High scorers on intention to speed will also be high scorers on the ARBQ and its subscales.

5) Pre-driving adolescent males' scores on sensation seeking (measured using the Arnett Inventory of Sensation Seeking - AISS) will be higher (and thus riskier) compared to females.

6) Adolescents' sensation seeking (measured using the AISS) is associated with high risk-taking on the roads (measured using the Adolescent Road User Behaviour Questionnaire - ARBQ). High scorers on sensation seeking will also be scorers on the ARBQ and its subscales.

7.3 Methodology

7.3.1 Research Design

This study employed a within participants design where a single group was measured pre- and post-intervention over a six-month period (six months was chosen to see the effects of the intervention over time on self-reported attitudes).

7.3.2 Participants

522 participants (256 males, 266 females) aged 12-18 years (M = 14.6 years, SD = 1.27) were randomly selected by teachers at 24 schools across Scotland to complete 'Questionnaire 1' in the first part of this study (Appendix I and Chapter Five). Six months later, 155 participants (72 males, 83 females) from 12 of the original schools went on to complete 'Questionnaire 2' (Appendix J) in the second and final part of this study (29.7% completion rate). They were aged between 12-16years (M = 14.1 years, SD = 1.13).

In this chapter, all statistical analysis conducted on responses to 'Questionnaire 1' and 'Questionnaire 2' used data collected from the 155 participants who completed both questionnaires (refer to Chapter Five for analysis of all 522 participants' responses to 'Questionnaire 1').

7.3.3 Measures

Two questionnaires were designed to measure adolescent attitudes towards driving and were administered before, during and after the classroom-based pre-driver intervention (RSS's "Crash Magnets"; Appendix I and J). 'Questionnaire 1' consisted of two parts: Part One - questions to be answered before the pre-driver intervention ('Time 1'); and Part Two - a selection of questions repeated from part one to be answered immediately after the pre-driver intervention ('Time 2'). In 'Questionnaire 2' the same questions that were asked immediately post-intervention ('Time 2') were asked again for a third time, six months post-intervention ('Time 3').

7.3.3.1 Questionnaire 1: Part one ('Time 1')

Part one of the questionnaire (pre-intervention, 'Time 1') was divided into three sections (Chapter Five):

i) Adolescent road behaviour (questions taken from the ARBQ, Elliott & Baughan, 2004; Appendix A)
ii) Attitudes and intentions to engage in speeding behaviour (questions were extracted from the 'Extended TPB scale' and included measures of moral norm; Parker, Manstead & Stradling, 1995; Appendix B)
iii) Attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts' (questions adapted from Parker, Manstead, Stradling and Senior's (1998) DAQ; Appendix C).

Some of the Likert scales for items in the questionnaire were reversed randomly to encourage participants to think about each question. When answers to reversed questions were reversed back to the correct direction, high-risk drivers and people with positive (high-risk) attitudes towards high-risk driving practices scored high on all three scales (the ARBQ scale, the TPB speeding scale and the DAQ scale).

Section 1: Adolescent Road Behaviour

In the first section, Elliott and Baughan's (2004) ARBQ was used to measure road behaviour (Appendix A). These items were divided into three subscales that measured 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Protective Behaviour on the Road'. Elliott and Baughan (2004) reduced their scale from 43 items to 23 items because they felt that when the full scale was used in conjunction with other self-report measures the questionnaires would be too long for self-completion. They arrived at 23 items after conducting a principal axis factor analysis on the original 43 item scale and selecting the eight items that loaded most strongly on 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road' and the seven items that loaded most strongly on 'Planned Protective Behaviour on the Road'. After a second principal axis factor analysis using the shortened 23 items scale Elliott and Baughan (2004) reduced the ARBQ scale further to 21 items. The 21-item ARBQ scale was used in this study as recommended by Elliott and Baughan (2004).

For the purposes of directionality, the items measuring 'Planned Protective Behaviour on the Road' (for example, *"wear bright or reflective clothing when riding a bike in the dark", "use lights on your bike when it is dark"*) were reversed and re-labelled 'Non-engagement in Planned Protective Behaviour on the Road'. Consequently dangerous road users were those

participants who scored high on each of the three sections of the ARBQ. The reduced 21-item ARBQ scale therefore consisted of eight 'Unsafe Road Crossing Behaviour' items, eight 'Play and Social Activity on the Road' items and five 'Non-engagement in Planned Protective Behaviour on the Road' items. All items were measured using a five point Likert scale (1 = never, 2 = hardly ever, 3 = sometimes, 4 = fairly often, 5 = very often). The Cronbach's Alpha for the 21-item scale was 0.81, for 'Unsafe Road Crossing Behaviour' 0.78, for 'Play and Social Activity on the Road' 0.78 and for 'Non-engagement in Planned Protective Behaviour on the Road' 0.78.

Section 2: Attitudes and Intentions to Speed

The 'Extended TPB scale' (Parker, Manstead et al., 1995) was used to measure pre-drivers' attitudes and intentions to speed (referred to as the TPB speeding scale in this study), which included measures of personal norm (moral norm and anticipated regret, Appendix B). As Parker, Manstead et al. (1995) designed the extended TPB for their study on drivers, only those questions which were deemed to be relevant to pre-drivers were included in this study. There were 13 items in total (one moral norm, two anticipated regret, four attitude items, two subjective norm, three perceived behavioural control and one measure of intention) taken from Parker, Manstead et al.'s (1995) original questionnaire and the wording slightly modified so that pre-drivers could reasonably answer the questions.

Some of the TPB components were measured using more than one item (for example, attitudes to speeding were measured using four items), responses to each of these facets were added together and averaged. Of the three perceived behavioural control items (PBC) only one was used in the statistical analysis in this study *("My refraining from speeding would be easy/difficult"*) because of the low Cronbach's Alpha produced when the three items were combined in the first study conducted in Chapter Five (which was 0.12; Chapter Five, Table 5.1, page 108). Parker, Manstead et al. (1995) produced low Cronbach's Alphas for PBC in their study and consequently they chose to use the one PBC item that had correlated most highly with the belief-based measure of PBC. Parker, Manstead et al. (1995) calculated the belief-based measure of PBC by multiplying ratings for a set of salient control beliefs by the perceived power of each control factor to inhibit or facilitate performance and then summing the products). The calculations and correlations conducted by Parker, Manstead et al. (1995) could not be performed in this study because participants were pre-drivers and could not rate internal or external factors that affect driving (i.e., their control beliefs) nor the frequency they encountered them (which would have produced an indication of the power of

these control factors). A decision was made to use only one PBC item in the statistical analysis in this study. This decision was based partly upon Parker, Manstead et al.'s (1995) suggestion but also on the results of Cronbach's Alphas conducted on the complete TPB scale. In Chapter Five, when the two PBC items were removed from the complete TPB scale the Cronbach's Alpha value increased from 0.76 to 0.78 (Chapter Five, Table 5.2, page 108).

After removing two PBC items, 11 items were used to measure the components of the extended TPB in this study. The items were measured using a seven point Likert scale with the end points being appropriate to the question (for example: 1 = Strongly agree, 7 = Strongly disagree; 1 = Very likely, 7 = Very unlikely; 1 = Very easy, 7 = Very difficult), the Cronbach's Alpha for all items was 0.78.

Section 3: Attitudes to Driving Violations

The DAQ was used to assess attitudes towards driving violations such as 'speeding', 'drink-driving' and 'not wearing seat belts'. There were 22 questions (nine 'speeding' items, eight 'drink-driving' items and five attitudes to 'not wearing seat belts' items). 16 items were taken from Parker, Manstead et al.'s (1998) 40-item DAQ (see Appendix C). The DAQ consisted of four sub-sections (10 items in each section) measuring attitudes towards: 'drink-driving', 'speeding', 'over-taking' and 'close following'.

The 16 items from the original 40-item DAQ used in this study only addressed attitudes to 'speeding' and 'drink-driving' as it was felt that some pre-drivers might not have any knowledge about over-taking and close following. A new subscale (attitudes towards 'not wearing seat belts') was created to measure adolescent attitudes towards wearing seat belts in cars.

From the original DAQ scale, seven items from the 'drink-driving' subscale were chosen to be used in this study. Three 'drink-driving' items from the original subscale measuring attitudes towards breath-testing and knowledge of the legal blood alcohol limit were removed because as participants were below the legal drinking age it was assumed that they may not know about legal limits or breath-testing. A new item ("*it's ok to drink and drive*") was added to the 'drink-driving' subscale in this study. The Cronbach's Alpha for the eight items in the attitudes to 'drink-driving' subscale was 0.67.

From the original DAQ scale only nine items on 'speeding' were used in this study. One item, namely "*I know exactly how fast I can drive and still drive safely*", was omitted because it was felt that it would not have been applicable to the pre-drivers answering the questionnaire. The Cronbach's Alpha for the nine items in the attitudes to 'speeding' subscale was 0.83.

A third subscale on 'attitudes to not wearing seat belts' consisting of five questions was created for the purposes of this study. Some of the questions used in the other two sections on 'speeding' and 'drink-driving' were re-worded so that they could be applied to attitudes towards non-use of seat belts. The Cronbach's Alpha for the five items in the attitudes to 'not wearing seat belts' subscale was 0.84.

All items were measured using a five point Likert scale (1 = Strongly agree, 5 = Strongly disagree). The Cronbach's Alpha for the 22-item DAQ scale was 0.83.

7.3.3.2 Questionnaire 1: Part Two ('Time 2')

Part Two of the questionnaire ('Time 2') was not divided into sections; it consisted of a selection of questions from Part One that were repeated in order to re-assess participants' attitudes and intentions. Four of the items that measured attitudes to speeding were included (responses to the four items were averaged), and one item on intentions regarding speeding. Three items from the 22-item DAQ scale in Part One measuring attitude towards 'speeding', 'drink-driving' and 'not wearing seat belts' were also included.

7.3.3.3 Questionnaire 2 ('Time 3')

This questionnaire was completed six months after the previous questionnaire (i.e., post-intervention at 'Time 3') and consisted of two sections:

1) Re-assessment of driving attitudes and intentions to speed (8 items repeated from Questionnaire 1 & 2)
2) Sensation seeking tendency (questions taken from the AISS, Arnett, 1994; Appendix D).

Unlike the first questionnaire where Part One was completed before the "Crash Magnets" intervention and Part Two was completed immediately after the intervention, both sections of Questionnaire 2 were completed without interruption.

Section 1: Re-assessing Driving Attitudes and Intentions to Speed

The first section was designed to establish whether attitudes and intentions had changed during the intervening six-month period. Eight items from Parts One and Two of 'Questionnaire 1' were replicated in this section. As in Part Two of 'Questionnaire 1', four of the extended TPB items that measured attitudes to speeding were included in 'Questionnaire 2', one item on speeding intention and three items from the DAQ measuring attitude towards 'speeding', 'drink-driving' and 'not wearing seat belts' were included. This was the third time participants had answered these questions.

Section 2: Arnett's Inventory of Sensation Seeking (AISS)

In the second section the AISS (Arnett, 1994) was used to measure sensation seeking tendencies. The scale consisted of 20 items that formed two sub-scales: 'Novelty' and 'Intensity' (Appendix D). Each subscale had ten items. The 'Intensity' scale assessed the need for stimulation and experiences that provide intense sensory input (e.g., ''*When I listen to music, I like it to be very loud*'', ''*It would be interesting to see a car accident*'', ''*I like a movie with a lot of explosions and car chases*''), whereas the items in the 'Novelty' scale referred to the openness to experience (e.g., ''*I can see how it would be interesting to marry someone from a foreign country*'', ''*I would like to travel to strange, far-away places*'', ''*I think it's fun and exciting to perform or to speak before a group*'').

Subjects were asked to indicate the extent to which the items describe them on a four point Likert scale (1 = describes me very well, 2 = describes me somewhat, 3 = does not describe me very well, 4 = does not describe me at all). Each subscale contained ten items that were averaged (after reversing back some of the items that had been reversed) to find a total score. High scores on both the sub-scales and on total AISS score (the combined 'Novelty' and 'Intensity' scores) were indicative of high sensation seekers. The Cronbach's Alpha for the 'Intensity' subscale was 0.59, the 'Novelty' subscale was 0.41 and the whole 20-item AISS scale was 0.63.

7.3.4 Procedure

RSS designed a pre-driver awareness campaign called "Crash Magnets" aimed at Scottish secondary school students in classes S3-S6 (co-responding to the final three years of secondary or high-school education). Schools from across Scotland were contacted by RSS and asked whether or not they would be prepared to take part in the study. Participation

required schools to run two or three classes on issues surrounding young drivers structured using RSS' "Crash Magnets" resource pack and DVD.

All participating schools were sent a copy of the "Crash Magnets" DVD. The DVD was 58 minutes long and divided into five sections:

- Section one: discussed pedestrian distraction, passenger behaviour, cycling and seat belt wearing.
- Section two: addressed pedestrian drinking, drink-driving, cruising and in-car behaviour.
- Section three: looked at cruising (this behaviour broadly involves people driving down streets in a manner that allows them to be seen by other people; for example playing loud music or driving erratically), young drivers, mobile phones and the consequences of car crashes.
- Section four: explored the influence of alcohol and drugs on young drivers.
- Section five: discussed how breaching the rules on the road (violations) along with 'Errors' (engaging in actions that are not as planned such as failing to see a cyclist coming up on your inside whilst turning left) or 'Lapses' of concentration (such as going from 2nd gear to 5th gear) often lead to crashes.

The DVD featured mainly young people who talked about their attitudes and experiences of driving or being a passenger. The emergency services were also featured in the presentation with contributions from Strathclyde Police, the Ambulance service and the Fire service. There were also people speaking who had been involved in crashes and were severely damaged due to a crash. There was also a young man who had been sent to a young offender's prison for reckless driving and a mother who had lost her two children to a 23-year-old drink-driver.

Four sheets of quotes taken from sections one, two and four of the DVD were provided for teachers to photocopy and handout to students. Students selected quotes that they agreed with (for example, *"My friends won't let me get into a car unless I'm wearing a seat belt"*) and answered some questions that were designed to encourage them to think about the topics covered in the DVD sections and provided an opportunity for them to analyse their own attitudes or behaviour (for example, *"Can you think of an occasion when you would either forget or decide not to put on your seat belt?"*).

Ten optional class activities were designed to reinforce the messages presented in the "Crash Magnets" DVD. By generating class discussion, the activities should encourage students to think about driving and the consequences of dangerous driving (such as using mobile phones whilst driving, drink-driving, drug-driving and speeding). As the activities were optional it is unknown which activities teachers used during their lessons (Appendix K).

Copies of 'Questionnaire 1' were also included in the "Crash Magnets" pack along with teachers' instructions. The instructions asked the teachers to hand out the questionnaires to their students and informed them that the questionnaire had to be completed in two parts: Part One to be completed before the lesson and Part Two to be completed after the DVD and lessons.

Six months after completing 'Questionnaire 1', RSS contacted the schools again by letter. The letter thanked the schools and teachers for taking part in the "Crash Magnets" intervention and for encouraging students to complete 'Questionnaire 1'. The letter also informed them about the final part of the study and asked them to get the same students to complete 'Questionnaire 2' (a set of questionnaires was enclosed). The letter informed the teachers and schools that unlike 'Questionnaire 1', 'Questionnaire 2' was not divided into parts and could be completed without interruption. A list of the classes that had completed 'Questionnaire 1' was included to facilitate the schools and teachers in remembering which classes had already taken part in the first part of the study.

7.4 Results

7.4.1 Attitudes, Intentions and Changes in Responses from 'Time 1' to 'Time 3'

Three sets of mean scores were calculated for the eight questionnaire items asked at each time period in Questionnaires 1 and 2 ('Time 1', 'Time 2' and six months later 'Time 3'), and for total mean speeding attitude (calculated by averaging the four TPB speeding attitude items at each time period). The majority of the means were under the mid-points of the scales which suggested that participants tended not to report attitudes that were high-risk. However attitudes to speed 'un-enjoyable-enjoyable', 'ok to speed' and intentions to speed were just over the mid-points of the scales. 'Ok to speed was only over the mid-point at 'Time 1' and then decreased at 'Time 2' and 'Time 3' (Table 7.1). Intentions to speed were over the mid-points at all three time sampling points showing that adolescents' intentions to speed were likely. Attitude to speed 'un-enjoyable-enjoyable' were over the mid-point of the scale at

'Time 2' and 'Time 3' and increased (risky and more condoning) in the direction of speed being enjoyable from 'Time 2' to 'Time 3'.

The means showed that four items were higher at 'Time 3' than at 'Time 1' and five items decreased and were lower at 'Time 3' than at 'Time 1'. Friedman's and Wilcoxon's signed ranks tests revealed that five items showed statistically significant increases or decreases between 'Time 1', 'Time 2' or 'Time 3'. The means showed that the majority of participants' responses decreased significantly towards the less risky end of the scale over the three sampling points with one exception, responses to the TPB item 'attitude to speeding being un-enjoyable or enjoyable' increased (Table 7.1).

Table 7.1 – Significant Differences in Driving Attitudes and Intentions from 'Time 1' to 'Time 3' (n = 155)

				Mean Difference			
	'Time 1' (T1) Pre-intervention	**'Time 2' (T2) Immediately post-intervention**	**'Time 3' (T3) 6mths post-intervention**	**T1-T2**	**T1-T3**	**T2-T3**	**Sig. change**
Scale 1 (low risk) – 7 (high risk) – Speed is….							
Unsafe / Safe	2.05	1.99	2.24	-0.06	0.19	0.25	-
Reckless / Cautious	3.10	2.89	2.86	-0.21	-0.24	-0.03	-
Un-enjoyable / Enjoyable	3.78	4.32	4.44	**0.54****	**0.66****	0.12	Increase
Bad / Good	2.60	2.59	2.68	-0.01	0.08	0.09	-
Total mean speeding attitude	2.88	2.95	3.05	0.07	0.17	0.10	-
Intention unlikely / likely	4.48	4.11	4.21	**-0.37***	**-0.27***	0.10	Decrease
Scale 1 (low risk) –5 (high risk)							
ok to drive over speed limit	2.72	2.58	2.48	-0.14	**-0.24***	-0.10	Decrease
ok to not use seat belts	1.84	1.56	1.48	**-0.28****	**-0.36****	**-0.08****	Decrease
ok to drink-drive	3.36	1.36	1.20	**-2.0****	**-2.16****	**-0.16***	Decrease

* = Significant difference ($p < 0.05$); ** = Significant difference ($p < 0.001$);
= scores above the mid-point of the scale which indicate high-risk responses

A Friedman's test revealed that over the course of the study attitudes towards speeding had become more favourable (positive) with participants believing speeding to be enjoyable (X^2 (2) = 15.42, $p < 0.001$). Wilcoxon's signed ranks tests identified there were significant increases in 'attitudes to speeding being un-enjoyable or enjoyable' from 'Time 1' to 'Time 2' ($Z = -4.32$, $p < 0.001$) and between 'Time 1' and 'Time 3' ($Z = -4.14$, $p < 0.001$).

Attitudes towards driving faster than the speed limit decreased (became more negative) over the course of the study (X^2 (2) = 6.62, $p < 0.05$). Mean scores for differences in 'attitudes to driving faster than the speed limit' decreased significantly from 'Time 1' through to 'Time 3'($Z = -2.75$, $p < 0.05$).

Attitudes towards travelling in a car without wearing seat belts decreased (became more negative) over the course of the study (X^2 (2) = 21.22, $p < 0.001$). Mean scores for differences in 'attitudes to not wearing seat belts' decreased significantly from 'Time 1' to 'Time 2' ($Z = -3.71$, $p < 0.001$), from 'Time 2' to 'Time 3' ($Z = -7.84$, $p < 0.001$) and from 'Time 1' through to 'Time 3' ($Z = -4.10$, $p < 0.001$).

Attitudes towards drink-driving decreased (became more negative) over the course of the study (X^2 (2) = 176.78, $p < 0.001$). Mean scores for differences in 'attitudes to drinking and driving' decreased from 'Time 1' to 'Time 2' ($Z = -9.41$, $p < 0.001$), from 'Time 2' to 'Time 3' ($Z = -2.97$, $p < 0.05$) and from 'Time 1' to 'Time 3' ($Z = -9.79$, $p < 0.001$).

Intentions to engage in speeding in the future were also found to decrease (become more negative) over the course of the study (X^2 (2) = 10.91, $p < 0.05$). Intentions decreased significantly from 'Time 1' to 'Time 2' ($Z = -2.76$, $p < 0.05$) and from 'Time 1' to 'Time 3' ($Z = -2.06$, $p < 0.05$).

These results show that participants' perceived speeding to be more enjoyable over the course of the study (as their scores had increased). However, their attitudes towards the three driving violations (attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts') and their intentions to engage in speeding decreased over the course of the study. Consequently their attitudes towards driving violations and their intentions to speed had become safer and less condoning from 'Time 1' to 'Time 3'.

7.4.2 Gender Differences in Attitudes, Intentions and Changes in Responses from 'Time 1' to 'Time 3'

The majority of the mean scores for males and females (Table 7.2) on questionnaire items decreased from 'Time 1' to 'Time 3', however there were a few items that were higher at 'Time 3' than at 'Time 1'. Scores on some items decreased between 'Time 1' and 'Time 2' but by 'Time 3' their scores had started to increase and, in some instances, were higher than their original responses at 'Time 1'. However, after statistical analysis using Wilcoxon signed ranks tests some of these increases and decreases in means were not statistically significant.

Female's attitudes towards speeding being 'un-enjoyable' or 'enjoyable' increased significantly and moved towards the undesirable (risky) end of the scale over the three

sampling periods (X^2 (2) = 14.4, p < 0.001; Table 7.2). A Wilcoxon's signed ranks test revealed that females' attitudes increased significantly from 'Time 1' to 'Time 2' (Z = -4.17, p < 0.001) and from 'Time 1' to 'Time 3' (Z = 3.81, p < 0.001).

Table 7.2 – Significant Differences in Males' and Females' Driving Attitudes and Intentions from 'Time 1' to 'Time 3'

					Mean difference			
	Males (n =72) Females (n = 83)	**'Time 1' (T1) Pre-intervention**	**'Time 2' (T2) Immediately post-intervention**	**'Time 3' (T3) 6mths post-intervention**	**T1-T2**	**T1-T3**	**T2-T3**	**Sig. change**
Scale 1-7 – Speed is…								
Safe/ Unsafe	Males	**2.40**	**2.30**	**2.74**	-0.10	0.34	0.44	-
	Females	**1.75**	**1.72**	**1.80**	-0.03	0.05	0.08	-
Reckless/ Cautious	Males	**2.99**	**2.96**	**2.79**	-0.03	-0.20	-0.17	-
	Females	**3.21**	**2.82**	**2.93**	-0.39	-0.28	0.11	-
Un-enjoyable/ Enjoyable	Males	**4.42**	**4.79**	**4.88**	0.37	0.46	0.09	-
	Females	**3.23**	**3.92**	**4.06**	**0.69****	**0.83****	0.14	Increase
Bad/ Good	Males	**3.09**	**3.02**	**3.00**	-0.07	-0.09	-0.02	-
	Females	**2.17**	**2.22**	**2.39**	0.05	0.22	0.17	-
Total mean speeding attitude	Males	**3.22**	**3.27**	**3.35**	0.05	0.13	0.08	-
	Females	**2.59**	**2.67**	**2.79**	0.08	0.20	0.12	-
Intention unlikely/ Likely	Males	**4.96**	**4.57**	**4.63**	**-0.39***	**-0.33***	0.06	Decrease
	Females	**4.06**	**3.72**	**3.84**	-0.34	-0.22	0.12	-
Scale 1-5								
Ok to drive over speed limit	Males	**3.22**	**2.78**	**2.82**	**-0.44****	**-0.40***	0.04	Decrease
	Females	**2.28**	**2.40**	**2.18**	0.12	-0.10	-0.22	-
Ok to not use seat belts	Males	**2.03**	**1.64**	**1.71**	**-0.39****	**-0.32***	0.07	Decrease
	Females	**1.67**	**1.50**	**1.29**	-0.17	**-0.38****	**-0.21***	Decrease
Ok to drink-drive	Males	**3.14**	**1.42**	**1.31**	**-1.72****	**-1.83****	-0.11	Decrease
	Females	**3.55**	**1.31**	**1.11**	**-2.24****	**-2.44****	**-0.20****	Decrease

* = Significant difference (p < 0.05); ** = Significant difference (p < 0.001)
= scores above the mid-point of the scale that indicate high-risk responses

Males' attitudes towards driving faster than the speed limit decreased significantly and moved towards the desirable (less risky) end of the scale over the course of the study (X^2 (2) = 14.6, p < 0.001; Table 7.2). Males' attitudes decreased significantly from 'Time 1' to 'Time 2' (Z = -3.69, p < 0.001) and from 'Time 1' to 'Time 3' (Z = -2.90, p < 0.05).

Both males' and females' attitudes towards not wearing seat belts decreased significantly towards the desirable (less risky) end of the scale (males' X^2 (2) = 9.64, $p < 0.05$, females' X^2 (2) = 13.8, $p < 0.001$; Table 7.2). Males' attitudes decreased significantly from 'Time 1' to 'Time 2' ($Z = -3.46$, $p < 0.001$) and from 'Time 1' to 'Time 3' ($Z = -2.23$, $p < 0.05$); females' attitudes decreased significantly from 'Time 1' to 'Time 3' ($Z = -3.81$, $p < 0.001$) and from 'Time 2' to 'Time 3' ($Z = -2.76$, $p < 0.05$).

Both males' and females' attitudes towards drink-driving decreased and moved towards the desirable (less risky) end of the scale from 'Time 1' to 'Time 3' (males' X^2 (2) = 71.6, $p < 0.001$, females' X^2 (2) = 105.9, $p < 0.001$; Table 7.2). Males' attitudes decreased significantly from 'Time 1' to 'Time 2' ($Z = -5.98$, $p < 0.001$) and from 'Time 1' to 'Time 3' ($Z = -6.37$, $p < 0.001$); females' attitudes decreased significantly from 'Time 1' to 'Time 2' ($Z = -7.27$, $p < 0.001$), from 'Time 2' to 'Time 3' ($Z = -3.47$, $p < 0.001$) and from 'Time 1' to 'Time 3' ($Z = -7.38$, $p < 0.001$).

Males' intentions towards engaging in speeding behaviour decreased significantly towards the desirable (less risky) end of the scale (X^2 (2) = 6.09, $p < 0.05$; Table 7.2). Males' intentions to speed decreased significantly from 'Time 1' to 'Time 2' ($Z = -2.28$, $p < 0.05$) and from 'Time 1' to 'Time 3' ($Z = -2.02$, $p < 0.05$).

These results show that the only increase in TPB attitudes to speeding was among females whose perceptions of speeding became more enjoyable (their attitude scores increased) from pre- to post-intervention ('Time 1' to 'Time 3'). Males' attitudes to driving over the speed limit and their intentions to engage in speeding decreased from 'Time 1' to 'Time 3'. Attitudes towards the other two driving violations, 'not wearing seat belts' and 'drink-driving' also decreased over the course of the study for both males and females.

Differences between males' and females' mean scores were calculated from 'Time 1' to 'Time 3'. Independent t-tests revealed that there were significant gender differences on TPB attitudes to speeding (Table 7.3; Figure 7.2).

Table 7.3 – Significant Gender Differences in Driving Attitudes and Intentions from 'Time 1' to 'Time 3'

	'Time 1' Pre-intervention			'Time 2' Immediately post-intervention			'Time 3' 6mths post-intervention		
	Males (n = 72)	Females (n = 83)	Diff.	Males (n = 72)	Females (n = 83)	Diff.	Males (n = 72)	Females (n = 83)	Diff.
Scale 1-7 – Speed is…									
Safe/ Unsafe	2.40	1.75	**0.65****	2.30	1.72	**0.58***	2.74	1.80	**0.94****
Reckless/ Cautious	2.99	3.21	-0.22	2.96	2.82	0.14	2.79	2.93	-0.14
Un-enjoyable/ Enjoyable	4.42	3.23	**1.19****	4.79	3.92	**0.87****	4.88	4.06	**0.82***
Bad/ Good	3.09	2.17	**0.92****	3.02	2.22	**0.80****	3.00	2.39	**0.61***
Total mean speeding attitude	3.22	2.59	**0.63****	3.27	2.67	**0.60****	3.35	2.79	**0.56****
Intention unlikely/ Likely	4.96	4.06	**0.90****	4.57	3.72	**0.85****	4.63	3.84	**0.79***
Scale 1-5									
Ok to drive over speed limit	3.22	2.28	**0.94****	2.78	2.40	**0.38***	2.82	2.18	**0.64****
Ok to not use seat belts	2.03	1.67	**0.36***	1.64	1.50	0.14	1.71	1.29	**0.42***
Ok to drink-drive	3.14	3.55	-0.41	1.42	1.31	0.11	1.31	1.11	0.20

* = Significant difference (p < 0.05); ** = Significant difference (p < 0.001);

= males significantly higher means than females

Males reported consistently greater intentions to speed in the future over the three sampling points. Males scored higher than females on TPB speeding intention at 'Time 1' ($t(153) = 3.36$, $p < 0.001$, $d = 0.54$), 'Time 2' ($t(153) = 3.54$, $p < 0.001$, $d = 0.57$) and 'Time 3' ($t(153) = 3.03$, $p < 0.05$, $d = 0.49$; Table 7.3 and Figure 7.1).

Males scored higher and had more positive (high-risk) attitudes towards speeding being 'safe' rather than 'unsafe' compared to females at 'Time 1' ($t(135.4) = 3.34$, $p < 0.001$, $d = 0.54$), 'Time 2' ($t(119.7) = 3.20$, $p < 0.05$, $d = 0.52$) and 'Time 3' ($t(120.3) = 4.50$, $p < 0.001$, $d = 0.73$). They scored significantly higher than females and had positive (high-risk) attitudes to speeding being 'enjoyable' rather than 'un-enjoyable' at 'Time 1' ($t(153) = 4.47$, $p < 0.001$, $d = 0.72$), 'Time 2' ($t(153) = 3.34$, $p < 0.001$, $d = 0.54$) and 'Time 3' ($t(153) = 2.98$, $p < 0.05$, $d = 0.48$). Males scored significantly higher than females and had more positive (high-risk) attitudes to speeding being 'good' rather than 'bad' at 'Time 1' ($t(129.2) = 3.90$, $p < 0.001$, $d = 0.64$), 'Time 2' ($t(153) = 4.01$, $p < 0.001$, $d = 0.64$) and 'Time 3' ($t(153) = 2.48$, $p < 0.05$, $d = 0.40$).

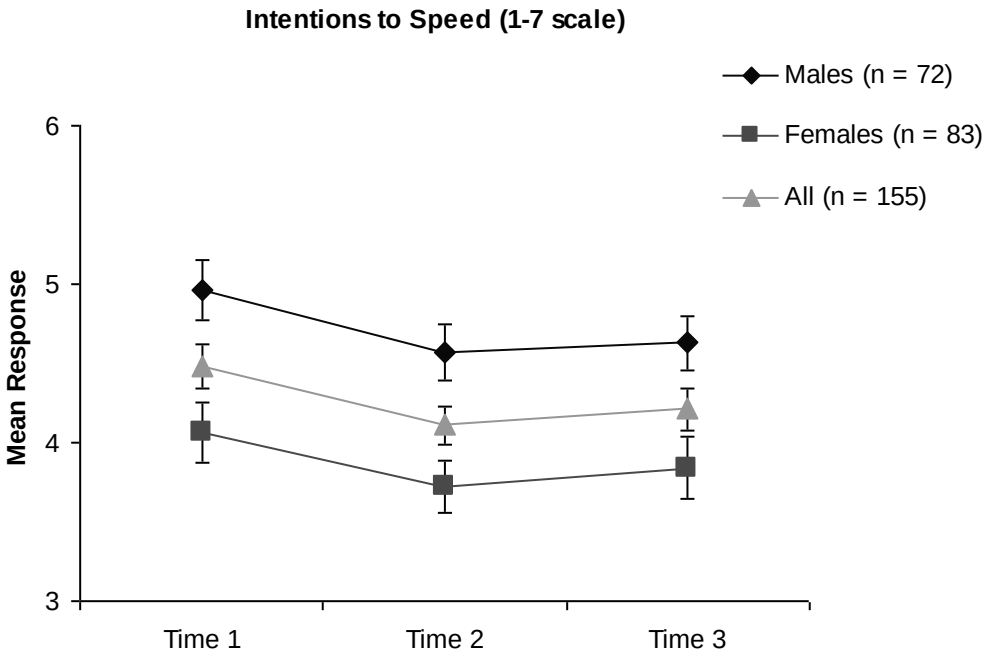


Figure 7.1 – Changes in Intentions to Speed from 'Time 1' to 'Time 3'

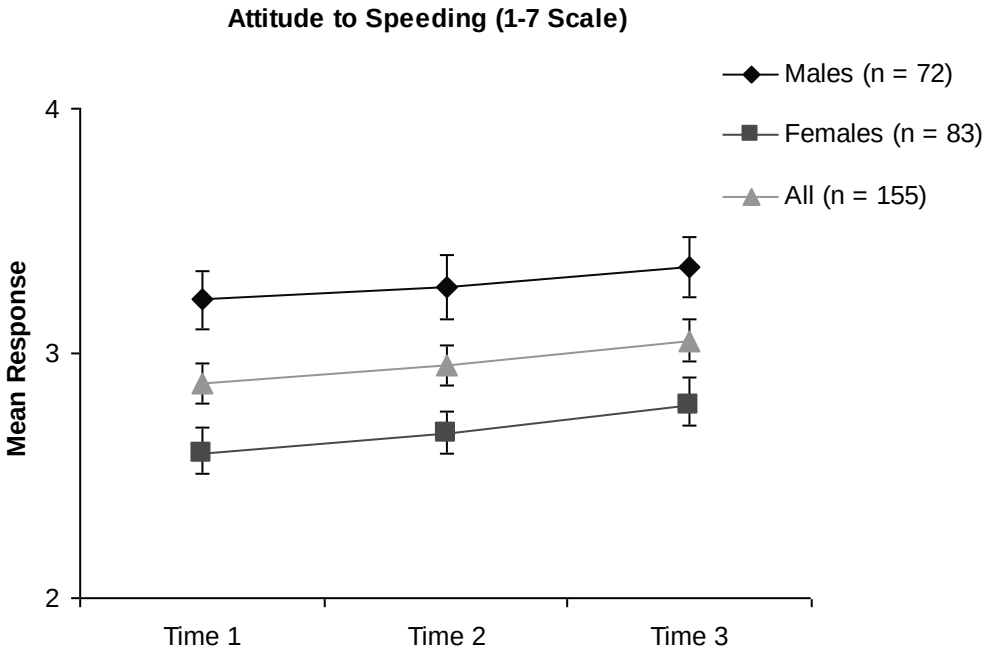


Figure 7.2 – Changes in Total Mean Attitude to Speed from 'Time 1' to 'Time 3'

Males also scored significantly higher than females on total mean speeding attitude at 'Time 1' ($t(153) = 4.06$, $p < 0.001$, $d = 0.65$), 'Time 2' ($t(133.3) = 3.63$, $p < 0.001$, $d = 0.59$) and at 'Time 3' ($t(153) = 3.34$, $p < 0.001$, $d = 0.54$; Table 7.3 and Figure 7.2).

Males had consistently riskier attitudes to both speeding and not wearing seat belts compared to females. Females scored significantly lower on DAQ 'attitude to speeding' at 'Time 1' ($t(153) = 5.55$, $p < 0.001$, $d = 0.89$), 'Time 2' ($t(153) = 2.53$, $p < 0.05$, $d = 0.41$) and 'Time 3' ($t(153) = 4.05$, $p < 0.001$, $d = 0.65$). They also scored significantly lower than males on DAQ 'attitude to not wearing seat belts' at 'Time 1' ($t(153) = 2.23$, $p < 0.05$, $d = 0.36$) and at 'Time 3' ($t(98.3) = 3.18$, $p < 0.05$, $d = 0.52$; Table 7.3).

These results show that males' attitudes towards speeding and their intentions to speed in the future were higher (riskier) than females' attitudes and intentions over the three time sampling periods. They typically reported that drivers' who choose to speed were engaging in a behaviour that was 'safe', 'enjoyable' and 'good'. Males also scored significantly higher (riskier) than females on DAQ attitude to 'not wearing seat belts' at 'Time 1' and at 'Time 3' (but not at 'Time 2'). These results suggest that pre-driving males are more condoning of speeding and the non-use of seat belts by car passengers compared to females, they also have greater intentions to speed in the future when they become drivers.

7.4.3 Sensation Seeking

Independent t-tests were run on the AISS subscales to identify gender differences in sensation seeking (Figure 7.3).

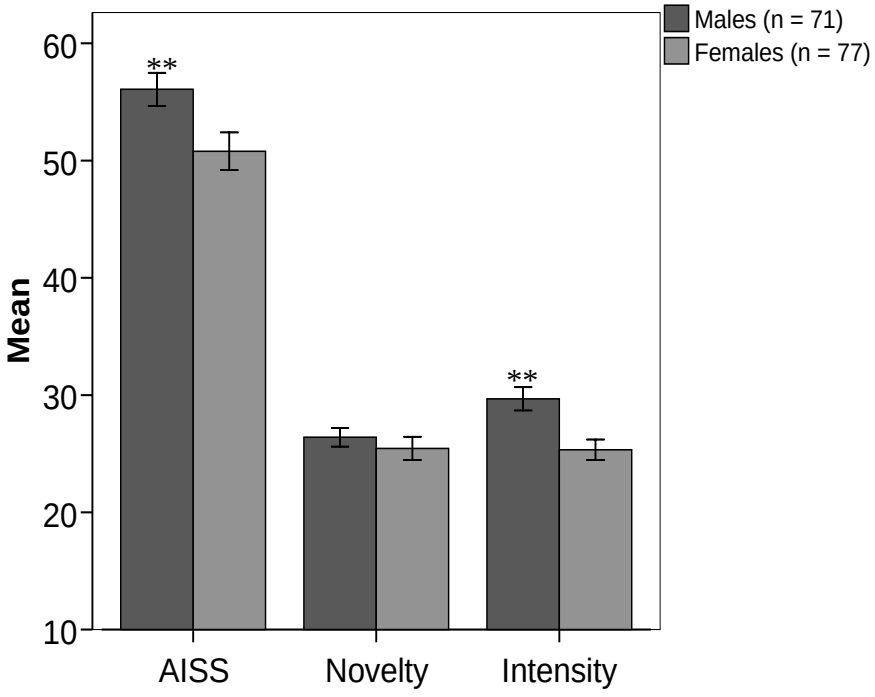


Figure 7.3 – Gender Differences in Sensation Seeking

(*= $p < 0.05$, ** = $p < 0.001$)

Males scored significantly higher than females on total AISS sensation seeking ($t(146) = 4.81$, $p < 0.001$, $d = 0.79$) and on the 'Intensity' subscale of the AISS ($t(146) = 6.457$, $p < 0.001$, $d = 1.06$; Figure 7.3). These results suggest that males are higher sensation seekers than females and seek out more intense experiences. There were no significant gender differences on the 'Novelty' subscale of the AISS.

A forward regression was run to find predictors of AISS. All eight questionnaire items from 'Time 1' to 'Time 3', ARBQ subscales measured at 'Time 1' ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road'), TPB speeding items from 'Time 1' (moral norm, anticipated regret, subjective norm, perceived behavioural control and speeding intention), TPB total mean speeding attitude ('Time 1', 'Time 2' and 'Time 3'), DAQ attitude to driving violations (speeding, drink-driving, not wearing seat belts) and gender were included (Table 7.4).

Table 7.4 – Forwards Hierarchical Regression to find Predictors of Sensation Seeking

						Model 3	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	Gender	0.137			23.17	0.000	**-0.28****
2	Speeding un-enjoyable-enjoyable ('Time 3')	0.216	0.08	8.0	19.94	0.000	**0.27****
3	Unsafe road crossing Behaviour ('Time 1')	0.247	0.03	3.0	15.70	0.016	**0.18***

* = $p < 0.05$, ** = $p < 0.001$

The results showed that 24.7% of the r^2 variance in AISS sensation seeking was explained by gender, 'Time 3' attitudes to speeding as 'un-enjoyable-enjoyable' and 'Time 1' 'Unsafe Road Crossing Behaviour'. All of these predictor variables, except gender, had a positive beta, which suggested that high scores on these variables indicated high scores on sensation seeking. The negative beta for gender indicated that gender scores decreased as scores on sensation seeking increased. As males were entered as "0" and females were entered as "1" in the data sheet, the negative beta indicated that males were more likely to have higher AISS scores. Gender was the most important predictor of AISS in sensation seeking and explained 13.7% of the r^2 variance.

A forward regression was run to find predictors of 'Intensity'. All eight questionnaire items from 'Time 1' to 'Time 3', ARBQ subscales measured at 'Time 1' ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned

Protective Behaviour on the Road'), TPB speeding items from 'Time 1' (moral norm, anticipated regret, subjective norm, perceived behavioural control and speeding intention), DAQ attitude to driving violations (speeding, drink-driving, not wearing seat belts) and gender were included (Table 7.5).

Table 7.5 – Forwards Hierarchical Regression to find Predictors of 'Intensity' in Sensation Seeking

						Model 4	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	Gender	0.222			41.69	0.000	**-0.36****
2	Speeding un-enjoyable-enjoyable ('Time 2')	0.310	0.09	9.00	32.58	0.001	**0.25****
3	Unsafe Road Crossing Behaviour ('Time 1')	0.330	0.02	2.00	23.60	0.010	**0.19***
4	Speeding reckless-cautious ('Time 1')	0.357	0.03	3.00	19.86	0.014	**-0.17***

* = $p < 0.05$, ** = $p < 0.001$

The results showed that 35.7% of the r^2 variance in 'Intensity' was explained by gender, 'Time 2' attitudes to speeding as 'un-enjoyable-enjoyable', 'Time 1' 'Unsafe Road Crossing Behaviour' and 'Time 1' attitudes to speeding as 'reckless-cautious'. All of these predictor variables, except gender and speeding 'reckless-cautious', had a positive beta, which suggested that high scores on these variables indicated high scores on 'Intensity' in sensation seeking. The negative beta for gender indicated that gender scores decreased as scores on sensation seeking increased. As males were entered as "0" and females were entered as "1" in the data sheet, the negative beta indicated that males were more likely to have higher 'Intensity' in sensation seeking scores. The negative beta for speeding 'reckless-cautious' indicated that as scores on 'Intensity' in sensation seeking increased scores on this item decreased in the direction of attitude to speeding being more reckless than cautious. The most important predictor of 'Intensity' in sensation seeking was gender, which explained 22.2% of the r^2 variance.

A forward regression was run to find predictors of 'Novelty' in sensation seeking. Only one factor predicted scores on 'Novelty', namely attitude to speeding as 'un-enjoyable-enjoyable' ('Time 3'), which explained 6.1% of the r^2 variance. The beta for speeding as 'un-enjoyable-enjoyable' was positive which indicated that as scores on 'Novelty' increased scores on this item increased in the direction of attitude to speeding being more enjoyable than un-enjoyable.

7.4.4 Predicting Speeding Intention

A forward regression was run to find predictors of speeding intention at 'Time 3' (Table 7.6). The following independent variables were entered into the regression as potential predictors of speeding intention score; all eight questionnaire items asked at each sampling point ('Time 1', 'Time 2' and 'Time 3'), TPB total mean speeding attitude ('Time 1', 'Time 2' and 'Time 3'), ARBQ subscales measured at 'Time 1' ('Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' and 'Non-engagement in Planned Protective Behaviour on the Road'), AISS subscales (total AISS, 'Intensity' and 'Novelty'), speeding intention 'Time 1' and 'Time 2' and gender.

Table 7.6 – Forwards Hierarchical Regression to find Predictors of Intention to Speed (measured at 'Time 3')

						Model 3	
Model	**Forward regression**	**R^2**	**R^2ch**	**%R^2ch**	**F**	**P**	**β**
1	Speeding intention ('Time 1')	0.294			60.88	0.000	**0.35****
2	Speeding Intention (Time 2)	0.367	0.07	7.0	42.01	0.000	**0.27****
3	Total mean speeding attitude ('Time 3')	0.412	0.05	5.0	33.67	0.001	**0.23****

* = p < 0.05, ** = p < 0.001

Three factors were found to explain 41.2% of the r^2 variance in "intention to speed" at 'Time 3': speeding intention at 'Time 1' and 'Time 2' and total mean speeding attitude at 'Time 3'. All of these predictor variables had a positive beta, which suggested that high scores on these variables indicated high scores on intentions to speed at 'Time 3'. The most important predictor was "intention to speed" measured at the pre-intervention ('Time 1') stage which explained 29.4% of the r^2 variance.

7.5 Discussion and Limitations

The results from this study indicate that pre-driving males hold more undesirable (high-risk) attitudes towards driving violations such as 'speeding' and 'not wearing seat belts' compared to females. The results showed that they also reported being more likely to engage in speeding behaviour in the future compared to females. It was not surprising to see that males' attitudes were riskier than females as literature in the driving domain has consistently shown that males are riskier than females in both their attitudes and their driving behaviour (Laapotti, Keskinen, Hatakka & Katila, 2001; Parker, Manstead et al., 1992[b]). Therefore, it would appear that more attention might be needed to lower the undesirable driving attitudes and intentions of adolescent males in particular.

The null was rejected for the following hypotheses in this study:

1) Adolescent attitudes to driving violations (namely 'speeding', 'drink-driving' and 'not wearing seat belts') reduced significantly from 'Time 1' to 'Time 3' (attitude scores moved towards the less risky and desirable end of the scales).

3) Adolescent intentions towards engaging in speeding measured using a TPB speeding intention item reduced significantly from 'Time 1' to 'Time 3' (intention scores moved towards the less risky and desirable end of the scales). Looking at gender differences in intentions over the six-month period, the decrease in response was significant for males but not for females.

5) Pre-driving adolescent males' scores on sensation seeking were significantly higher than females' on the 'Intensity' subscale of the AISS but not on the 'Novelty' subscale. Therefore pre-driving males report a greater desire to seek out intense (riskier) experiences than females.

6) Adolescents' sensation seeking is associated with high risk-taking on the roads (high scorers on sensation seeking were also high scorers on the ARBQ and its subscales). High 'Intensity' scores on the AISS were predicted by high scores on 'Unsafe Road Crossing Behaviour'.

The null was accepted for the following hypotheses in this study:

2) Adolescent attitudes towards speeding measured using TPB speeding attitude items did not reduce significantly from 'Time 1' to 'Time 3' (attitude scores did not move towards the less risky and desirable end of the scales). Scores on speeding being 'un-enjoyable – enjoyable' increased significantly from 'Time 1' to 'Time 3'.

4) Adolescents' intentions to speed were not associated with high risk-taking on the roads (high scorers on intention to speed were not high scorers on the ARBQ and its subscales).

Having identified males as being high scorers on the questionnaire items and classed them as 'higher risks' on the roads compared to females, it was encouraging to see that their attitudes towards the acceptability of driving faster than the speed limit, drink-driving and travelling without wearing seat belts had reduced (and had thus become less risky) over the course of

the study. Over the six-month period from 'Time 1' to 'Time 3' their attitudes towards driving faster than the speed limit, drink-driving and their intentions to engage in speeding behaviour had reduced significantly (females' attitudes towards drink-driving had also reduced over the six-months). Males' attitudes towards travelling without wearing seat belts also decreased significantly from 'Time 1' to 'Time 3', however, between 'Time 2' and 'Time 3' their scores begun to increase. Although this increase was not found to be significant in this study it may warrant further investigation to determine whether the original decrease from 'Time 1' to 'Time 3' was due to the effects of the pre-driver intervention.

Scores for both genders tended to be on or under the mid-point of the scale (which was 4), although males scored higher than females on TPB items. Mean responses to the speeding intention item were nearer '5' on the scale, whereas self-reported attitudes and intentions were neutral or towards the desirable (less risky) end of the scale. Males also scored higher than females on attitudes towards driving violations items (DAQ) but again their mean scores for both genders on these items tended to be below the mid-point of the scale. Therefore, along with the TPB items, DAQ attitude responses tended to be neutral or towards the desirable end of the scale. These results were very encouraging as they showed that the adolescents in this study did not hold very risky attitudes to driving violations and other components of the TPB when applied to speeding.

Regardless of gender, there were significant attitude changes over the three time sampling periods (from 'Time 1' to 'Time 3' six months later) and also changes in intentions to speed in the future. Attitudes towards driving violations ('speeding', 'not wearing seat belts' and 'drink-driving') decreased over the course of the study. Intentions to speed in the future decreased from 'Time 1' to 'Time 3', with adolescents reporting fewer intentions to speed.

Attitudes towards speeding being 'un-enjoyable or enjoyable' increased significantly over the three sampling periods (and thus became riskier) for both males and females. These results indicated that attitudes towards speeding had become more favourable, with participants believing speeding to be enjoyable. In contrast to this increase, attitudes towards speeding being 'unsafe or safe', 'reckless or cautious' and 'bad or good' decreased from 'Time 1' to 'Time 2' (thus becoming less risky). By 'Time 3', scores for attitudes towards speeding being 'unsafe or safe', 'bad or good' and total meal speeding attitude had increased (thus becoming riskier) and were above scores at 'Time 1'. Although these decreases and increases in attitude scores were not statistically significant they may warrant further investigation.

Some of the items measured in this study appeared to decrease as their means were higher at 'Time 1' than at 'Time 3'. These fluctuations could simply be characteristic of adolescence, which is often regarded as a time when adolescents are trying to stabilise their attitudes, but they may also be reflecting temporary attitude changes induced by the "Crash Magnets" pre-driver intervention. This study needs to be replicated with the addition of a control group who have not been exposed to the "Crash Magnets" pre-driver intervention. By comparing responses from the control group with responses from those adolescents exposed to the pre-driver intervention, it should be possible to further deduce whether or not changes in attitudes and intentions are as a result of the intervention or fluctuations characteristic of adolescence. It was not practical to have a control group in this study because Road Safety Scotland wanted to offer the intervention to all adolescents and felt that it would be unethical not to do so.

The fact that adolescents' attitudes towards speeding being enjoyable increased significantly over the course of this study whilst the other attitudes towards speeding temporarily decreased could simply show that this particular attitude towards speeding is impervious to changes by interventions. Further investigation is needed to examine whether this pre-driver attitude towards speeding is more predictive of future risky driving behaviour than other attitudes towards speeding. The results from the previous chapter (Chapter Six) did not find this attitude to be a predictor of the following risky driving behaviours: 'Highway Code Violations', 'Errors' or 'Lapses' in driving.

The TPB (Ajzen, 1991) postulates a link between attitudes, intentions and behaviour. It is important to address adolescents' positive (high-risk) pre-driving attitudes towards driving violations and intentions to engage in speeding (and other driving violations), if their engagement in future risky driving behaviour is to be reduced. In this study past attitudes and intentions to speed predicted current intentions to speed, therefore, by intervening before adolescents become drivers it may be possible to reduce their risky attitudes and intentions towards driving in order to prevent them from habitually carrying out high-risk driving behaviours in the future that they already have sympathy with as pre-drivers.

The practical nature of this study resulted in several limitations. Methodologically, it was not possible to include a control group. Road Safety Scotland, who sponsored the "Crash Magnets" intervention, pragmatically could not justify the non-provision of the intervention to those who were offered it. It was therefore difficult to conclude whether or not the changes in attitudes and intentions were due to developmental/maturational changes or influenced by the

"Crash Magnets" intervention they received. However, findings relating to the 'Time 2' data collection immediately after the intervention cannot reasonably be dismissed in terms of potential developmental or maturation effects. The reduction in scores that were recorded provides some evidence that the "Crash Magnets" pre-driver intervention may have been influencing the reduction in pre-driving adolescents' attitudes and intentions; further evidence is needed to prove this tenuous link and to emphasise the need for pre-driver education in schools. Future replications of this study should incorporate a control group to circumvent this limitation in the design.

Within the road safety domain, particularly in local government, there are substantial opportunities to learn from interventions undertaken at schools and local communities. However, it is rare for road safety professionals to be able to incorporate scientific evaluations into their interventions at present. Currently within the UK road safety community there is a move towards evidence-based practice in the work culture, supporting the transfer of knowledge to and from the workplace through partnerships with universities.

It was also not known whether any previous pre-driver interventions had taken place at the schools that participated in this study. Also, as the use of the class activities included in the teachers' "Crash Magnets" pack were optional it is not known which of the activities, if any, the teachers used in their lessons to accompany the DVD. The number or type of activities chosen may have had more or less of an effect on the attitude changes that were recorded. Future replications of this study should not only incorporate a control group but also ask teachers to report back which activities they chose and whether their students had received school-based pre-driver interventions in the past.

This study has shown that the attitudes towards driving reported among the adolescents in this population were still fluid and in a state of fluctuation. Pre-driver education initiatives could therefore be used to create desirable attitudes towards driving among adolescents before their attitudes become established and less malleable. However, to support these claims, there is a need to explore the effects of pre-driving interventions in more detail by using control groups as comparisons. Further investigation is also required to determine the approximate age at which driving attitudes begin to form and the age at which driving attitudes become permanent. This information could then be used to help road safety professionals develop a successful pre-driver curriculum.

Further research is needed in order to validate identified links between pre-driving attitudes, behaviour, intentions and post-driver training attitudes and behaviours. Establishing these would provide further objective evidence of the need for pre-driver initiatives, such as RSS's "Crash Magnets", and the potential value of regular implementation, so that they can have a real safety impact on the next generation of drivers.

Over the past three experimental chapters a multitude of findings have been presented regarding pre-driver road behaviour, attitudes and young driver behaviour. In Chapter Eight, all of these findings will be drawn together in order to emphasise the contribution to knowledge that the research presented in this thesis has made to the driver behaviour domain. Recommendations will also be made regarding the direction in which future research in this area should progress.

7.6 Results Summary

Sensation seeking

1) Adolescent males are higher sensation seekers than females and report an enjoyment for intense experiences (for example, watching car crashes, standing on the edge of high places, gambling, listening to loud music).

2) The best predictors of sensation seeking (total AISS score) were gender, attitudes to speeding as 'un-enjoyable-enjoyable' ('Time 3') and pre-driving 'Unsafe Road Crossing Behaviour' ('Time 1').

3) The best predictors of 'Intensity' in sensation seeking were gender, attitudes to speeding as 'un-enjoyable-enjoyable' ('Time 2'), pre-driving 'Unsafe Road Crossing Behaviour' ('Time 1') and attitudes to speeding as 'reckless-cautious' ('Time 1').

4) The best predictor of 'Novelty' in sensation seeking was attitude to speeding as 'un-enjoyable-enjoyable' ('Time 3').

Changes in attitudes and intentions

5) Self-reported attitudes and intentions were neutral or towards the desirable (less risky) end of the scale. Therefore adolescents in this study did not hold very risky attitudes to driving violations and other aspects of the TPB applied to speeding.

6) Attitudes towards the three driving violations (attitudes to 'speeding', 'drink-driving' and 'not wearing seat belts') and intentions to engage in speeding decreased over the course of the study and thus became safer and less condoning.

7) Attitudes to speeding as 'un-enjoyable-enjoyable' increased over the course of the study and thus became riskier and more condoning.

8) Females' attitudes towards speeding as 'un-enjoyable-enjoyable' increased significantly over the course of the study.

9) Males' attitudes to speeding and their intentions to engage in speeding decreased significantly over the course of the study.

10) Attitudes towards ‘not wearing seat belts’ and ‘drink-driving’ decreased significantly over the course of the study for both males and females. However, the fact that attitudes towards ‘ok to not wear seat belts’ and ‘ok to drink and drive’ had started to increase by ‘Time 3’ highlights the need for constant reinforcement through regular interventions in order to maintain attitude change.

11) The best predictors of intention to speed at ‘Time 3’ were speeding intention at ‘Time 1’ and ‘Time 2’ and total mean speeding attitude at ‘Time 3’.

12) Past intentions and attitudes to speeding are significant predictors of current intention.

Gender differences

13) Males’ had significantly riskier (more condoning) attitudes towards speeding and greater intentions to speed in the future than females’ over the three time sampling periods. They typically reported that drivers’ who choose to speed were engaging in a behaviour that was ‘safe’, ‘enjoyable’ and ‘good’.

14) Males had significantly riskier (more condoning) attitudes towards people ‘not wearing seat belts’ than females at ‘Time 1’ and at ‘Time 3’ (but not at ‘Time 2’). These results suggest that pre-driving males are more condoning of speeding and the non-use of seat belts by car passengers compared to females, they also have greater intentions to speed in the future when they become drivers.

15) More attention needs to be paid to lowering the attitudes and intentions of males in particular.

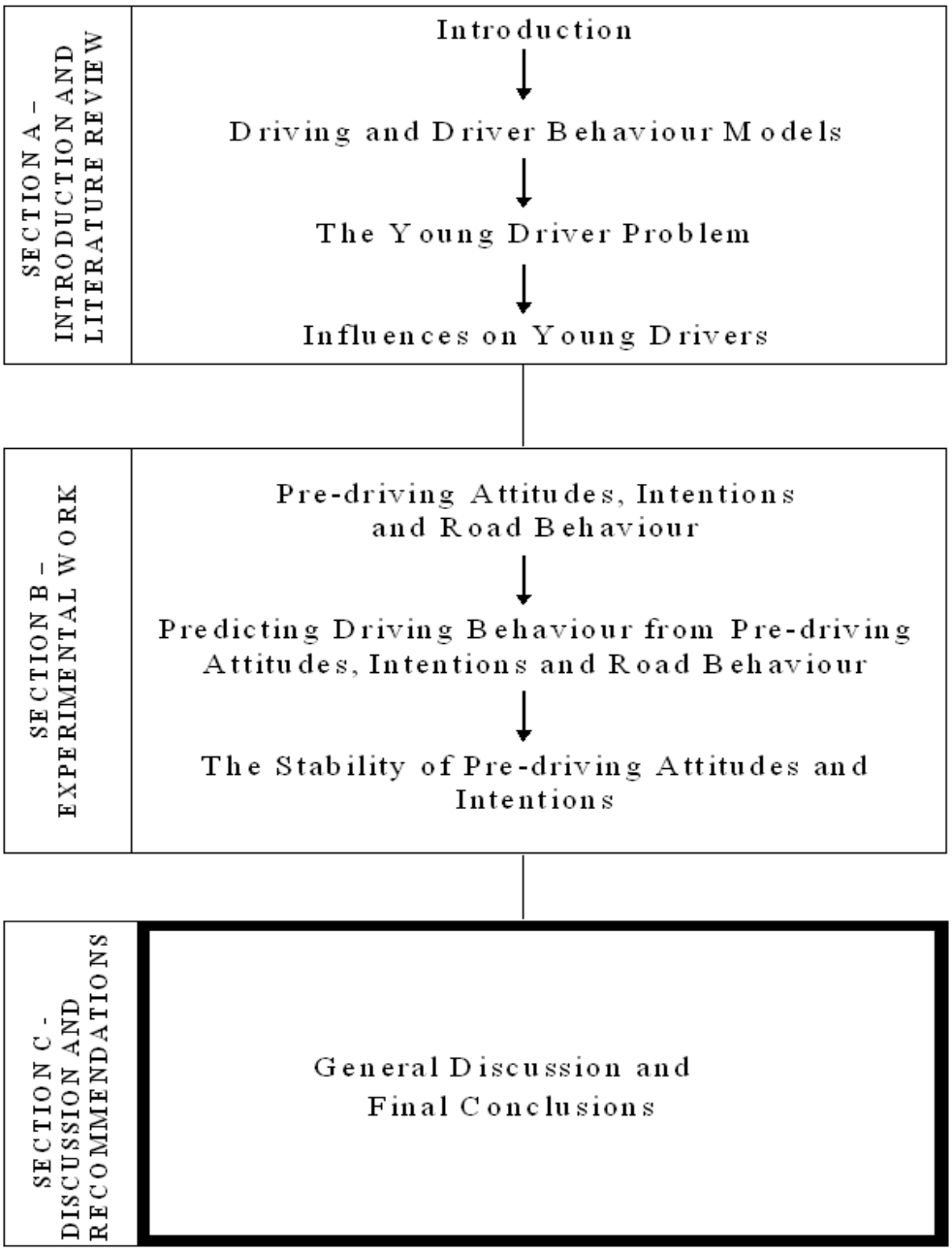
SECTION B - CONCLUSIONS

This section has presented the results of three experiments conducted in Scotland and New Zealand. The first study (Chapter Five) identified a relationship between pre-driver road behaviour and attitudes towards driving violations. The second study (Chapter Six) identified links between pre-driver road behaviour, attitudes, intentions and future driving behaviour. The third study (Chapter Seven) explored the stability of adolescents' attitudes and intentions towards driving. Two possible explanations were put forward to explain the changes in attitudes and intentions that were measured over the course of the study:

1) The fluctuations were due to the instability of adolescents' attitudes and intentions
2) The fluctuations were due to exposure to a road safety intervention ("Crash Magnets").

In the next section the findings from these studies will be discussed in relation to the thesis aims, and recommendations for future research will be presented.

SECTION C DISCUSSION AND RECOMMENDATIONS



SECTION C - SUMMARY

This section provides a summary of the research presented in this document and re-examines the thesis aims in relation to the results of the longitudinal studies. A summary of recommendations for approaching the young driver problem is also offered. This section ends by discussing the contributions to knowledge that this research has made, provides some suggestions for future research and proposes some final conclusions.

SECTION C – INTRODUCTION/RESEARCH SUMMARY

The research presented in this manuscript has examined issues surrounding young drivers' over-representation in road accidents. The emphasis of this research was on pre-driving influences that affect future driving behaviour. The research had five aims (originally stated in Section A, on pages 104-107):

1. To examine pre-drivers' attitudes and intentions towards driving
2. To explore associations between pre-drivers' road behaviour, driving attitudes and intentions, and their future self-reported driving behaviour
3. To look at the stability of adolescents' attitudes and intentions towards driving violations
4. To associate sensation seeking with risky pre-driver driving attitudes, intentions, road behaviour and driving behaviour
5. To propose an extension to the Theory of Planned Behaviour, which incorporates past behaviour as a predictor of future behaviour

The first study (Chapter Five – ('The Attitudes, Intentions and Behaviours of Pre-Drivers') explored adolescent pre-drivers' behaviour on the roads, their attitudes towards driving violations and their intentions to engage in speeding in the future as drivers. The results showed that pre-drivers who had the greatest intentions to speed also frequently engaged in high-risk unsafe road crossing behaviour on the road and had more positive (high-risk/condoning) attitudes towards driving violations. To reduce intentions to speed among pre-drivers, the results from this study have shown that road safety professionals need to target interventions at adolescents who already display high-risk behaviour on the roads and who subsequently report the most high-risk (condoning) attitudes towards driving violations.

The development of attitudes and intentions from pre-driving through to post-driver training was explored in the second study (Chapter Six – 'Predicting Driving Behaviour from Pre-Driving Attitudes, Intentions and Road Behaviour'). The results found that drivers who frequently engaged in violating behaviour on the roads had more lenient (condoning) attitudes towards driving violations and frequently engaged in high-risk behaviour on the roads as pre-drivers. The results from this study have shown that more needs to be done pre-driving to reduce high-risk behaviour on the roads and to reduce high-risk attitudes towards driving violations if a reduction in young drivers' high-risk driving behaviour is to be achieved. Although there are several approaches that could be taken in order to reduce these behaviours and attitudes, one approach suggested in this chapter was targeted school-based interventions.

Other approaches may involve enforcement and engineering (such as designing roads that make bad driving practices difficult).

In the third study (Chapter Seven – 'The Stability of Pre-Driving Attitudes and Intentions'), the stability of pre-driver's intentions to engage in speeding behaviour in the future (as drivers) and their attitudes towards driving violations were examined. The results showed that over the course of the study (which was a period of six months), attitudes towards driving violations (namely 'speeding', 'drink-driving' and 'not wearing seat belts') had become less condoning (lower risk) and their intentions to engage in speeding behaviour in the future had decreased. Also, males reported significantly riskier attitudes towards driving violations and greater intentions to speed compared to females. Consequently this study found that pre-drivers' intentions to speed and their attitudes towards driving violations fluctuate and are not stabilised during adolescence. This therefore indicates that there is potential for pre-driving interventions to change or create desirable attitudes towards safe driving among future drivers.

In Chapter Eight the results from the three studies conducted in the previous section will be discussed in relation to the research aims (originally stated in Section A, Chapter One, pages 87-89).

CHAPTER 8 - GENERAL DISCUSSION AND FINAL CONCLUSIONS

8.1 Assessment of Research Aims

The main rational behind the research conducted in this thesis (Section B), was to identify pre-driving factors that are associated with future driving behaviour. It was proposed that by understanding pre-driving adolescents' behaviours on the roads and their attitudes and intentions towards driving violations, it might be possible to identify whether some adolescents are more pre-disposed to becoming risky drivers than others. It was also proposed that by assessing the stability of adolescents' attitudes and intentions over a period of time, an informed assessment could be made as to whether or not pre-driver interventions have the capability to effectively reduce potential high-risk driving attitudes and intentions.

The following sections review the results of the research presented in this thesis according to the research aims (originally stated in Section A, Chapter One, pages 87-89), which are as follows:

1. To define pre-drivers' road behaviour, driving attitudes and intentions (section 8.1.1)

2. To determine the relationship between pre-driving attitudes, intentions, road behaviour and self-reported driving behaviour (section 8.1.2)

3. To assess the stability of adolescents' driving attitudes and intentions (section 8.1.3)

4. To explore the relationship between sensation seeking, risky pre-driver driving attitudes, intentions, road behaviour and driving behaviour (section 8.1.4)

5. To incorporate a measurement of past behaviour into the Theory of Planned Behaviour (section 8.1.5)

These research aims will now be discussed individually with reference to the results from the studies presented in this report.

8.1.1 Pre-drivers' Road Behaviour, Driving Attitudes and Intentions

Prior to the research presented in this thesis (and publications from this research, Mann & Lansdown, 2009; Mann & Sullman, 2007; Appendix L), no literature existed within the domain of transport psychology that had considered associations between pre-driving road behaviour, attitudes and intentions towards driving violations. Whilst studies had been conducted that had looked at each of these factors individually (Elliott, 2004; Elliott & Baughan 2003[ab], 2004; Waylen & McKenna 2002[abc], 2008), there were no published studies linking them together. It was felt necessary to explore these associations in this thesis in an attempt to see whether efforts to reduce risky pre-driving behaviours could also reduce high-risk driving attitudes and intentions.

The results from the first study (Chapter Five – 'The Attitudes, Intentions and Behaviours of Pre-Drivers'), the pre-driving survey conducted in New Zealand and Scotland, showed that road behaviour and pre-driving attitudes were significantly predictive of intentions towards engaging in driving violations. For example, in Scotland adolescents who frequently engaged in 'Unsafe Road Crossing Behaviour' reported significantly higher risk (more accepting) attitudes towards driving violations and significantly greater intentions to engage in speeding in the future. In New Zealand and the combined countries group, adolescents who infrequently engaged in 'Play and Social Activity on the Road' reported significantly greater intentions to speed in the future. However, in all three groups (New Zealand, Scotland and the combined countries) attitudes and subjective norms were the most important predictors of pre-drivers' intentions to engage in speeding behaviour. For example, "*I would be happier if speed limits were more strictly enforced by the Police*", an attitude item taken from the DAQ, and "*Most people I know would approve of my speeding whilst driving*", an item from the extended TPB scale, were among several scale items that were found to be associated with speeding intention.

These results highlight the power of social influence on adolescents' intentions and support the notion that pre-driving adolescents who frequently engage in higher risk behaviours on the road have riskier attitudes towards driving. Since adolescents reported that there are key people within their lives who have a profound influence upon them, road safety professionals need to identify who these people are and try to incorporate them into their initiatives. By encouraging these influential figures to participate in interventions it is hoped that they would model the appropriate driving attitudes and behaviours that the road safety campaigns are

trying to emphasise. Utilizing these important social influences could thus make campaigns have stronger and more prolonged impacts on adolescents.

Since road behaviour was associated with attitudes, subjective norms and intentions, it is suggested that any efforts that are made to change one of these factors could have a simultaneous influence on the others. This research confirms the need for road safety education to continue to teach behavioural aspects (i.e., how to cross the road safely), but it also needs to address adolescents' road safety attitudes (i.e., encouraging adolescents to want to be safe on the roads regardless of whether they are walking, driving vehicles or passengers in vehicles). It also needs to consider how to reduce the perceived social pressure on individuals to engage in high-risk behaviour on the roads as pedestrians, drivers or passengers. Adolescents who engage in high-risk behaviour may normalise risky behaviours and carry their high-risk attitudes with them into the driving environment. Consequently road safety professionals need to reinforce the rules of the road, encourage safe road practices and reduce perceived social pressure to engage in high-risk behaviours. Schools and councils may also need to enforce safe behaviour on the roads around schools (i.e., give more powers to school crossing patrol wardens).

The results also highlighted significant gender differences in road behaviour and attitudes. Male adolescents reported engaging in significantly more frequent 'Play and Social Activity on the Road' and had significantly riskier attitudes towards driving violations than females. They also believed that: 1) speeding was not morally wrong, that 2) significant others (such as parents, siblings or friends) would approve if they engaged in speeding, 3) they did not anticipate that they would feel regret after they had engaged in speeding, and 4) they reported a greater intention to speed in the future. These results were mirrored in both New Zealand and Scotland and therefore it was concluded that these results were in all probability a true reflection of pre-driving adolescents' attitudes, intentions and road behaviours that were not culturally bound. These results, which are in keeping with findings from other studies conducted within the driving research domain, support the widely accepted view that males hold higher risk attitudes towards driving and engage in riskier behaviours on the roads compared to females. In an attempt to lower adolescents' engagement in risky road behaviour and reduce high-risk driving attitudes, road safety professionals need to pay particular attention towards adolescent males. Parents, schools and local communities could encourage young males to engage in socially acceptable forms of risk-taking (e.g., boxing, football,

rugby, martial arts) in order to reduce the likelihood of their engaging in risk-taking activities on the roads.

The results from the first study (Chapter Five) have helped to address the first aim, which was to determine pre-drivers' road behaviour, driving attitudes and intentions. The findings have shown that there is a significant association between these three factors. Consequently it is believed that efforts that are made towards reducing high-risk attitudes and intentions towards driving among pre-drivers may also need to simultaneously reduce adolescents' engagement in high-risk activities on or near roads. These results support suggestions made at various stages throughout this report for road safety education and interventions to target adolescent males primarily and for the topic of safe driving (i.e., addressing appropriate behaviours and attitudes) to be addressed among pre-drivers. It also proposes that males should be encouraged to engage in socially acceptable forms of risk-taking in an effort to draw them away from potentially dangerous forms of risk-taking on the roads.

8.1.2 The Relationship between Pre-driving Attitudes, Intentions, Road Behaviour and Self-reported Driving Behaviour

Although previous research has been conducted which has explored the behaviours and attitudes of drivers and pre-drivers independently, no studies could be identified in the published transport psychology literature prior to this research (Mann & Sullman, 2007), which had explicitly tried to associate driving behaviour with pre-driving factors (namely road behaviour, driving attitudes and intentions). The studies conducted in this thesis have explored the relationship between these factors in an attempt to identify antecedents of high-risk driving behaviour (i.e., whether high-risk adolescent road users become high-risk drivers).

In the second study (Chapter Six), driving behaviour was significantly associated with drivers' current attitudes and speeding intentions and the road behaviour that they engaged in as pre-drivers. The findings showed that adolescent drivers who engaged in frequent 'Highway Code Violations' had significantly riskier (more accepting) attitudes towards speeding compared to other drivers and reported greater speeding intentions. The results also showed that drivers who had reported engaging in bad driving practices (e.g., 'Highway Code Violations', 'Errors' and 'Lapses') had frequently engaged in high-risk road behaviour pre-driving (e.g., 'Play and Social Activity on the Road'). Although significant gender differences were also found, with female drivers reporting that they engaged in significantly

more ‘Errors’ and ‘Lapses’ than males, studies have shown that these two driving behaviours are not as significantly linked to accident involvement as ‘Highway Code Violations’ are.

These results therefore support the view presented throughout this thesis that risky pre-driving behaviour is associated with risky driving behaviour. To reduce risky pre-driving behaviour on the roads a standardised spiral curriculum of road safety education needs to be designed alongside methods for discouraging adolescents from socialising on or near the roads (e.g., Police enforcement). Parents may also need to be educated about how to teach their children about road safety and participate in school-based initiatives with their children to model appropriate behaviours.

The results from the first study (Chapter Five) showed that pre-driver attitudes, intentions and road behaviours correlate significantly with each other (and that pre-drivers’ attitudes and behaviour on the roads predicted their driving intentions). However, the results from the second study (Chapter Six) suggest that it is adolescents’ behaviour on the roads (namely engagement in ‘Play and Social Activity on the Road’) that is more predictive of their future engagement in risky driving behaviours. The results from the third study conducted in this thesis (Chapter Seven – ‘The Stability of Pre-Driving Attitudes and Intentions’) showed that the attitudes and intentions of pre-driving adolescents aged 12-18 years old are still fluid; this could explain why these factors either did not contribute or contributed poorly as predictors of driving behaviour in the second study (Chapter Six). Therefore although adolescents’ pre-driving attitudes, intentions and road behaviour are significantly associated; road behaviour (namely engagement in ‘Play and Social Activity on the Road’) is more strongly associated with future engagement in risky driving behaviour (such as ‘Highway Code Violations’, ‘Errors’ and ‘Lapses’).

The combined results from the three studies conducted in this thesis have helped to address the second research aim, which was to determine the relationship between pre-drivers’ road behaviour, driving attitudes and intentions, and self-reported driving behaviour. The results from the studies have shown that although these factors correlate significantly with each other, engagement in high-risk pre-driving road behaviour is more predictive of future engagement in high-risk driving behaviour. In an attempt to reduce the future occurrence of high-risk driving behaviour among adolescents, it is suggested that a standardised curriculum for road safety education be established. It is also suggested that parents should be educated about how to teach road safety to their children. They should also be encouraged to

participate in initiatives alongside their children so that they can model appropriate behaviours.

8.1.3 The Stability of Adolescents' Driving Attitudes and Intentions

To assess the potential for pre-driver interventions to be effective at reducing high-risk driving attitudes it was decided to examine the stability of adolescents' driving attitudes and intentions between the ages of 12-18 years. Excluding the research presented in this thesis and the publications that have arisen from this research (Mann & Lansdown, 2009; Appendix L), no known research has been identified in the published transport psychology literature which has looked specifically at the stability of pre-driving adolescents' driving attitudes and intentions. It was therefore hypothesised that if adolescents' driving attitudes and intentions have stabilised they could be more resistant to change and thus compromise the effectiveness of pre-driving interventions.

The results of the second study (Chapter Six) showed that over a 12-month period, from pre- to post-driver training, intentions to speeding decreased significantly. Regressions showed that pre-driving intention was only a significant predictor of 'Highway Code Violations' when 'Time 1' predictors were entered into the equation. When both 'Time 1' (pre-driving) and 'Time 2' (post-driver training) predictors were present, only their current intentions as drivers ('Time 2') were significant predictors of engagement in 'Highway Code Violations'. These results suggest that intentions fluctuate from pre- to post-driver training and that when individuals have driving experience their current intentions to speed are stronger predictors of their driving behaviour than their past intentions.

The results from the third study (Chapter Seven), which was conducted over a six-month period, looked in detail at pre-drivers' attitudes and intentions. The results showed that pre-driving adolescents' attitudes and intentions towards driving violations were still in a state of flux and had not yet stabilised. The majority of attitudes to speed decreased (became less risky) over the course of the study. Intentions to speed also decreased (i.e., adolescents reported that they were less likely to engage in speeding in the future when they became drivers), however this decrease was not significant for females. Males' attitudes towards speeding and their intentions to engage in future speeding behaviour decreased significantly and became more desirable (less risky) over the course of the study. Although there were fluctuations in both males' and females' attitude scores throughout the study, males consistently reported significantly riskier attitudes towards speeding and greater intentions to

engage in speeding in the future compared to females. Regarding attitudes towards drivers engaging in the three driving violations ('speeding', 'drink-driving' and 'not wearing seat belts'), adolescents' attitudes towards drivers who chose to engage in violating behaviour become less lenient and they decreased significantly over the three sampling periods. Compared to females, males were significantly more lenient towards people who chose to travel in cars without wearing seat belts.

In both of these studies (Chapter Six and Chapter Seven), adolescents' attitudes and intentions were found to fluctuate. The results of the second study (Chapter Six) showed that drivers' current intentions to speed were more predictive of their engagement in 'Highway Code Violations' than their intentions as pre-drivers. The findings from both of these studies suggest that any safe-driving interventions that are made before adolescents become drivers could be effective at changing/shaping their future attitudes and intentions as drivers and ultimately have positive effects on their driving behaviour (i.e., that they would become safe drivers). In the third study, although the attitudes and intentions of both male and female pre-driving adolescents were still in a state of flux, male's attitudes and intentions remained significantly higher than females throughout the course of the study. These results indicate that road safety professionals should focus their efforts on male adolescents in particular. It is also recommended that pre-driving interventions should be conducted with proper scientific evaluations (i.e., they incorporate pilot groups) in order to document whether or not the end result of these interventions are significant shifts in attitudes and behaviours.

8.1.4 The Relationship between Sensation Seeking, Risky Pre-driver Driving Attitudes, Intentions, Road Behaviour and Driving Behaviour

Previous research conducted by Waylen and McKenna (2008, 2002[abc]; Chapter Three) reported a positive relationship between sensation seeking tendency, deviant behaviour and attitudes towards road use among pre-driving adolescents. Adolescents who reported enjoying fast speeds and/or found driving violations to be more acceptable were also more likely to report a desire for novel/thrilling experiences (Waylen & McKenna 2008, 2002[abc]). Engagement in socially deviant behaviour (such as such as leaving a shop without paying for goods or riding on public transport without a ticket) and tendency towards sensation seeking behaviours predicted between 6-8% of the variance in driving violations scores (Waylen & McKenna 2008, 2002[abc]). Two of the studies conducted in this thesis (Chapters Six and Seven) aimed to examine the relationship between sensation seeking, pre-driving road behaviour and driving behaviour. They aimed to determine whether pre-driver attitudes and

intentions towards engaging in speeding were also significantly associated with sensation seeking.

The results from the third study (Chapter Seven) found a significant predictive relationship between sensation seeking and pre-driver road behaviour. Regressions revealed that high sensation seekers engaged in more frequent 'Unsafe Road Crossing Behaviour'. High scores on the 'Intensity' sensation seeking subscale, in particular, were predictive of frequent engagement in 'Unsafe Road Crossing Behaviour'. Independent t-tests revealed significant gender differences in sensation seeking tendency, with males reporting a greater desire for sensation seeking than females.

In the second study (Chapter Six), sensation seeking correlated significantly with pre-driving road behaviour (namely self-reported engagement in 'Unsafe Road Crossing Behaviour' and 'Play and Social Activity on the Road') and post-driver training behaviour (namely self-reported engagement in 'Highway Code Violations'). Correlations revealed that as scores on sensation seeking increased, scores on 'Unsafe Road Crossing Behaviour', 'Play and Social Activity on the Road' (as pre-drivers) and 'Highway Code Violations' (as drivers) also increased. This suggested that as sensation seeking tendency increased, the frequency of these behaviours also increased significantly. Regressions showed that this predictive relationship between sensation seeking preference and driving behaviour was significant only when 'Time 1' (pre-driving) predictors were entered into the regression. High sensation seekers (i.e., those scoring high on the 'Novelty' subscale) engaged in more frequent risky driving behaviours (namely, engagement in 'Lapses'). When 'Time 1' and 'Time 2' (post-driver training) predictors were entered into the regression none of the sensation seeking subscales showed significant relationships with any of the driving behaviours. These results suggest that the effects of sensation seeking on driving behaviour are masked by other more significant factors, namely their past 'Play and Social Activity on the Road', their perceptions about significant others, their current speeding attitudes and intentions (as drivers) and gender.

The findings from the second study (Chapter Six) also showed that sensation seeking preference was positively correlated with pre-driver attitudes towards driving violations, anticipated regret and attitudes towards speeding. High sensation seekers were more lenient about people choosing 'not to wear seat belts' in cars, they anticipated feeling 'good' rather than 'sorry' after engaging in speeding and they had a more accepting (riskier) attitude

towards speeding believing it to be 'safe', 'cautious', 'enjoyable' and 'good'. There were no significant correlations between sensation seeking preference and intentions to speed. Independent t-tests highlighted significant gender differences in sensation seeking. Male adolescents reported a greater desire for sensation seeking than females. These results support findings from previous studies, which have reported that males display significantly more sensation seeking behaviour than females (Arnett, 1994, 2002[a]; Waylen & McKenna 2008, 2002[abc]; Zuckerman, 1994).

The aim of exploring the relationship between sensation seeking, risky pre-driver driving attitudes, intentions and road behaviour was addressed using the results from both the second and third studies (Chapters Six and Seven). The results from both of these studies show that high sensation seeking tendencies are significantly associated with high-risk driving attitudes and behaviour on the roads both pre- and post-driver training. The findings in this thesis have also shown that sensation seeking is directly linked to pre-driving road behaviour which in turn is a predictor of driving behaviour. Therefore, as well as education and attempts to encourage youths to engage in socially acceptable forms of risk-taking behaviour, another approach that could be used to curb high sensation seeking behaviour on the roads could be to limit the engine size of vehicles that newly qualified drivers can operate. Speed cameras, particularly mobile speed cameras, could also be set up in areas where adolescent drivers congregate.

8.1.5 Incorporating a Measurement of Past Behaviour into the Theory of Planned Behaviour

The final aim of this thesis was to propose an extension to the Theory of Planned Behaviour (TPB), incorporating past behaviour as a predictor of future behaviour. The TPB is a socio-cognitive model that was originally derived from the theory of reasoned action (TRA) and is used to predict engagement in behaviour from behavioural intentions and from three main components, namely attitudes, subjective norms and perceived behavioural control (Chapter Two). In this report, to assess the ability of past behaviour to predict future behaviour, two longitudinal studies were conducted where past behaviour (namely pre-driving road behaviour) was incorporated as an extra component in the TPB model (Chapters Six and Seven). Whilst some studies have been conducted that have incorporated past behaviour into the TRA (Bentler & Speckart, 1979; Budd, North & Spencer, 1984; Fredricks & Dossett, 1983; Chapters One and Three), no known studies had been conducted within the driving behaviour research domain that had incorporated past behaviour into the TPB.

Regression analysis was conducted on pre-driver data from the third study (Chapter Seven) in order to identify whether past behaviour on the roads (measured six months previously) was predictive of intentions to speed six months later. Two factors were significant predictors of pre-driver's speeding intentions**:**

1) Past speeding intentions (measured six-months previously)
2) Attitudes to speeding

These results revealed that in Scotland, pre-drivers' past road behaviour did not predict their future speeding intention. However, their (past) intentions and attitudes towards speeding (which were also recorded at the start of the study) were predictors of their intention to speed six-months later. These results suggest that past intentions and attitudes to speeding are more significant predictors of future (pre-driving) speeding intention compared to self-reported engagement in risky road behaviour.

Regression analysis was conducted on data from the second study (Chapter Six) in order to identify whether past pre-driving behaviour on the roads (measured one year previously) was predictive of (future) self-reported driving behaviour. Four factors were significant predictors of drivers' self-reported engagement in either 'Lapses', 'Errors' or 'Highway Code Violations':

1) Pre-driving (past) engagement in 'Play and Social Activity on the Road'
2) Pre-driving (past) attitude to speed
3) Current attitudes (post-driver training)
4) Current intentions (post-driver training)

These results revealed that in New Zealand, pre-driving road behaviour was significantly predictive of self-reported driving behaviour. Adolescent drivers who self-reported engaging in frequent 'Highway Code Violations', 'Errors' and 'Lapses' whilst driving also reported engaging in significantly more frequent 'Play and Social Activity on the Road' as pre-drivers. Drivers' attitudes and intentions towards driving violations and engaging in speeding were also associated with self-reported driving behaviour. Drivers who self-reported engaging in frequent 'Highway Code Violations' reported significantly riskier (more accepting/positive) attitudes towards speeding and reported greater intentions to speed. These results suggest that past pre-driving behaviour on the roads is a significant predictor of driving behaviour and is associated with the type of driving attitudes and intentions that individuals hold as drivers.

Drivers' attitudes towards violations and their intentions toward speeding were more significant predictors of their driving behaviour than their pre-driving attitudes and intentions.

By simultaneously examining the results from the second and third studies (Chapter Six and Chapter Seven), it is apparent that pre-driving road behaviour is independent of pre-driving attitudes and intentions towards driving. As past (pre-driving) road behaviour was a significant predictor of future driving behaviour in Chapter Six, it is recommended that past behaviour would be an important addition to the TPB particularly when applied to driving (Figure 8.1). Past pre-driving intentions were not predictive of self-reported engagement in either driving 'Errors' or 'Lapses'. Regressions showed that when only pre-driving factors were present, pre-driving intentions were significant predictors of engagement in 'Highway Code Violations' (explaining only 2% of the r^2 variance). However, when post-driver training measures were added into the regression model, it was their current speeding intentions as drivers and not their pre-driving speeding intention that predicted their engagement in 'Highway Code Violations' (explaining 13.7% of the r^2 variance). Consequently, the results from both of these studies suggest that whilst it is entirely plausible for the TPB to be expanded to incorporate a measure of past behaviour when looking at driving behaviour, it would not be plausible to incorporate measures of past attitudes and intentions. The results from the first study (Chapter Five) also support the addition of anticipated regret into the TPB model. Anticipated regret was the main predictive factor for speeding intention and explained between 10.8-18.3% of the r^2 variance.

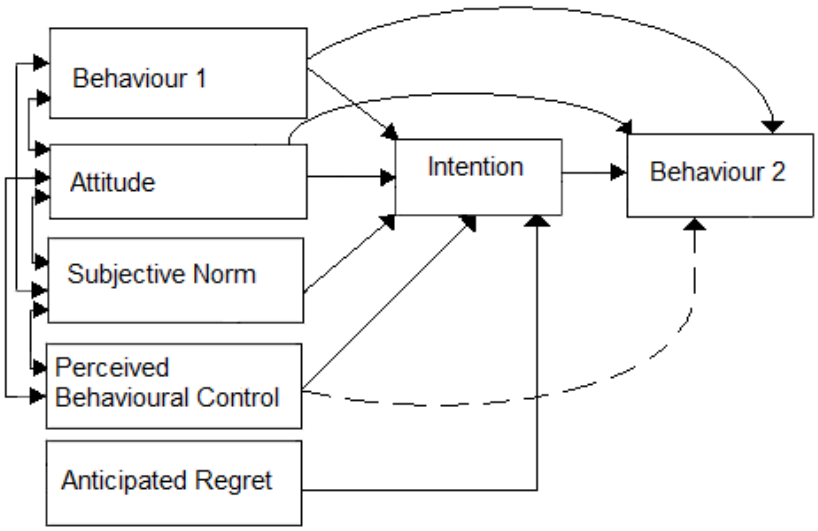


Figure 8.1 – Extending the Theory of Planned Behaviour

One explanation as to why past (pre-driving) attitudes and intentions are not highly significant predictors of future driving behaviour is that adolescent attitudes and intentions towards

driving are still in a fluid state. Although these findings could be interpreted to suggest that road safety professionals need to focus their efforts entirely on encouraging adolescents to engage in safe road behaviours, this is not necessarily the case. The results from the second study (Chapter Six) showed that among pre-driving measures, pre-driving attitudes and intentions predicted future engagement in 'Highway Code Violations'. However, when both pre- and post-driver training measures were entered into regressions to predict 'Highway Code Violations', individuals' current attitudes and intentions as drivers rather than their pre-driving attitudes and intentions were significant predictors. This therefore implies that adolescents' attitudes and intentions are still fluid until they become drivers and they are both important influences on high-risk driving behaviour. Therefore, interventions that are implemented from pre- through to post-driver training could help shape adolescents' driving attitudes and intentions. This could ensure that our future drivers learn the appropriate (safe) attitudes and intentions towards driving.

8.2 General Discussion and Summary of Key Recommendations

The results from all three studies support previous studies which have shown that drivers' attitudes towards rule violations and speeding are strong predictors of engagement in risk-taking behaviour whilst driving (Iversen, 2004). Adolescents with positive (safe) attitudes towards safety were found to be those least likely to engage in risky driving behaviour, thus supporting results of studies conducted by Ulleberg and Rundmo (2003) and Iversen (2004). Consequently, West and Lancaster (2003) appear to have been correct in their beliefs that inappropriate attitudes rather than skills are to blame for crashes.

According to Worchel and Shebilske (1986), the attitudes that are formed during childhood and adolescence tend to persist throughout life. Therefore, it is important to create desirable attitudes towards driving and road safety as early as possible. Lonero and Clinton (1997[b]) believed that if attitudes could be changed appropriate behaviours would be more likely to follow. The results from the third study in this report (Chapter Seven) found significant changes in adolescents' driving attitudes and intentions over a six-month period. It was suggested that these changes could have been caused by adolescents' exposure to a pre-driving intervention during the course of the study however these claims could not be supported due to the lack of a control group.

As there was no behavioural measure taken it is difficult to prove or disprove Lonero and Clinton's (1997[b]) beliefs that changing attitudes leads to changes in behaviour and therefore

further research would be needed to substantiate their claims. Although the findings from this study did not report that changing attitudes changes behaviour, the findings from the first study (Chapter Five) conducted in this report found significant relationships between pre-driving adolescents' frequent engagement in risky behaviour, risky driving attitudes and greater intentions to speed. These relationships suggest that reducing high-risk behaviour on the roads could reduce high-risk driving attitudes and intentions and ultimately reduce the likelihood of engaging in future risky driving behaviour. However, more research needs to be conducted to explore these associations and the associations proposed by Lonero and Clinton (1997 [b]).

Significant differences between males and females in their attitudes and expectations of driving have been found in children as young as 11 years (Elliott, 2004; Elliott & Baughan, 2003[ab], 2004; Waylen & McKenna 2002, 2002[c]). Although the studies in this report looked at 12 year olds, the results have provided evidence to support previous findings that pre-driving adolescents' hold attitudes and intentions towards driving. As with Elliott's (2004) study, pre-driving males reported more condoning attitudes towards speeding and their greater affinity for speed could be seen in their greater intention to speed as drivers in the future. Research has shown that male drivers have a higher mean number of accidents in comparison to female drivers; chose to drive at higher speeds, and report significantly higher scores on desirability for control (Chliaoutakis et al., 1999; Hammond & Horswill, 2002). The results from the three studies in this report show that pre-driving male adolescents have more negative (high-risk) intentions and attitudes towards engaging in safe behaviours (cycle helmet use and road crossing). It is therefore important to implement interventions, which encourage safe behaviour, before adolescent males form their high-risk attitudes. Reducing risky attitudes could ultimately lead to a reduction in adolescent males' driving accident rates.

The third study (Chapter Seven) looked at the stability of pre-driver driving attitudes and intentions. The findings showed that adolescents' attitudes and intentions were still in a fluid state. It was therefore suggested that by introducing adolescents to pre-driving interventions, their driving attitudes and intentions could be effectively changed either in the short or long-term. In the study, adolescents were given a pre-driving intervention ("Crash Magnets"). Decreases in attitudes and intentions towards driving violations were noted over the three time periods (pre-intervention, immediately post-intervention and six months post-intervention). However, due to the lack of a control group it was difficult to conclude whether or not these significant changes were due to the intervention they received. Although further studies are

required to assess the effectiveness of pre-driving interventions, it was concluded that attitude change among adolescents is possible due to the fluctuations that were measured.

The results of the second study (Chapter Six) showed that speeding intention was significantly predictive of engagement in risky driving behaviour (e.g., 'Highway Code Violations'). Pre-driver training speeding intention was predictive of 'Highway Code Violations' in regressions that only had pre-driver training measures and post-driver training speeding intention was predictive in regressions that had both pre and post-driver training measures. Pre-driving attitudes, however, were correlated with engagement in 'Highway Code Violations'. Regressions that were conducted, 1) with only pre-driver training measures present and 2) when both pre- and post-driver training measures were entered, showed that low risk attitudes towards not wearing seat belts and speeding were associated with 'Highway Code Violations'. Therefore, it is important to address driving attitudes and intentions in road safety education. Attitudes and intentions fluctuate until people are older and have experience driving (as evidenced by the results from the third study, Chapter Seven). The results from Chapter Six also support this theory, as drivers' current attitudes and intentions were predictive of their speeding intention. If adolescents are exposed to interventions that run from pre-driving through to post-driver training, then it is possible that this could have a positive influence on their attitudes, intentions and ultimately their driving behaviour. In the third study (Chapter Seven), the fact that attitudes towards driving were already formed among 12 year olds highlights that pre-driver interventions would be more effective if they targeted younger children who may not have formed attitudes towards driving.

The influence of pre-driver attitudes towards rule violations and speeding were explored in the second study (Chapter Six). Links were found between risky pre-driving attitudes and engagement in high-risk behaviour on the road and between risky road behaviour and risky driving practices in the future. The link that was found between engagement in high-risk behaviour on the road and risky driving supported Jessor's Problem Behaviour Theory (1987[ab]), because risky road behaviour predicted risky driving behaviour. It also lent support to the implementation of pre-driving interventions in schools and local communities. Jessor (1987[ab]) explained that problem behaviours co-occur because they share the same social, psychological and behavioural variables. It is therefore entirely plausible that by reducing risky behaviour on the road, future engagement in risky driving behaviour could also be reduced.

The results from the second study (Chapter Six) have shown the influence of past behaviour on attitudes, intentions and driving behaviour, thus supporting previous studies that have highlighted these links (Bagozzi et al., 1992; Bentler & Speckart, 1981; Conner & Armitage, 1998; Ouellette & Wood, 1998). As Sutton, (1994) Triandis, (1977) and Bagozzi (1981) suggested, the results from the second study (Chapter Six) found that past behaviour on the roads (as measured using the ARBQ) was a good predictor of future driving behaviour (as measures using the DBQ) and thus its influence could potentially ruin the impact of road safety interventions. Therefore risky behaviour on the road needs to be reduced, particularly engagement in 'Play and Social Activity on the Road', which was found to be a significant predictor of future engagement in 'Errors', 'Lapses' and 'Highway Code Violations'. It is important to discourage adolescents from socialising on or near the roads from an early age otherwise they could normalise high-risk behaviour and ignore road safety messages. There are several approaches that could be used to resolve this problem. For example, as well as educating children about the dangers of the road it may also be necessary to educate parents and carers about the need to discourage their children from socialising near roads. Adolescents could also be encouraged to attend youth clubs and after school activities. Local Police could also monitor the activity of young people in their areas and intervene in discouraging the youths from socialising on the roads.

In all three studies, males reported engaging in more undesirable behaviours on the road than females thus supporting previous results gathered by Elliott (2004). It is therefore entirely possible that gains in safety could arise from bringing about desirable changes in risky behaviour on the road (Elliott & Baughan, 2003[ab], 2004). Links between unsafe road crossing and poor driving behaviour in the future were identified in the third study (Chapter Seven); both of these behaviours therefore need to be targeted simultaneously in order to help increase the success of future road safety campaigns.

Yagil (2001) stated that the Theory of Planned Behaviour (TPB) and sensation seeking are the two main approaches used to explain the commission of driving violations. Both the TPB and sensation seeking measures were used in the studies conducted in this thesis. The results showed that elements from both measures were useful in predicting the commission of risky driving behaviours. However, it must be noted that the effects of sensation seeking on driving behaviour were only measurable when post-driving measures were not included in the regressions. Although correlations in the New Zealand longitudinal study (Chapter Six) reported a small but significant association between sensation seeking and driving behaviour,

the findings from the regressions revealed that in the presence of other predictive factors, sensation seeking was not a significant predictor of engagement in 'Errors', 'Lapses' or 'Violations'.

Arnett's (1994) findings showed that sensation seeking could predict engagement in risky driving behaviour. The studies presented in this thesis found that sensation seeking predicted risky road behaviour and attitudes towards driving violations but it did not predict risky driving behaviour. Findings from Chapters Six and Seven showed that pre-drivers who were high sensation seekers reported more pro-speeding attitudes and condoned driving violations, thus supporting Waylen and McKenna's results (2002[abc]). They also reported engaging in more risky behaviour as pre-drivers. Although a significant relationship between sensation seeking and driving behaviour could not be found in this report, it is important to note that there was an association between sensation seeking and risky pre-driving road behaviour. Regressions showed that risky pre-driving road behaviour significantly predicted future engagement in 'Errors', 'Lapses' and 'Highway Code Violations' in Chapter Six. Therefore, although sensation seeking was not a direct predictor of driving behaviour, the findings from the second study reveal that sensation seeking has a direct influence on pre-driving road user behaviour which in turn has a direct influence on driving behaviour.

The research presented in this thesis has addressed the research aims originally stated in Section A (Chapter One, pages 87-89). Pre-drivers' road behaviours, driving attitudes and intentions have been defined; the relationship between pre-driving (namely attitudes, intentions, road behaviour) and post-driver training factors (namely self-reported driving behaviour) has been supported; sensation seeking has been significantly associated with risky pre-driver driving attitudes, intentions and road behaviour; the instability of adolescents' driving attitudes and intentions has been highlighted and past behaviour has been successfully incorporated into the Theory of Planned Behaviour.

The key recommendations that have been proposed as a result of the research conducted in this report are as follows:

- The findings from Chapter Five ('The Attitudes, Intentions and Behaviours of Pre-Drivers') and Chapter Six ('Predicting Driving Behaviour from Pre-Driving Attitudes, Intentions and Road Behaviour') show the impact of social influences on adolescents, who reported that they would be influenced by the opinions and behaviours of significant people in their lives. It is recommended that these influential figures should be identified and included in initiatives. By encouraging these role models to engage in appropriate driving behaviours, road safety campaigns could be more effective and have prolonged impacts on adolescents.

- 'Unsafe Road Crossing Behaviour' was a significant predictive factor in explaining pre-driver's future intentions to speed in Chapter Five, and 'Play and Social Activity on the Road' was a significant predictive factor in explaining young drivers' future engagement in driving violations in Chapter Six ('Predicting Driving Behaviour from Pre-Driving Attitudes, Intentions and Road Behaviour'). Therefore, road safety professionals need to continue with their efforts to teach safe practices on the road and try to discourage youths from socialising on or near roads.

- The results from Chapter Six highlight the need for road safety professionals to focus their efforts on reducing the engagement in high risk road behaviour, particularly among high sensation seekers. They also need to reduce risky attitudes towards engaging in driving violations. It was recommended that by encouraging adolescents (males in particular) to engage in socially acceptable forms of risk-taking (e.g., football, rugby) their engagement in risk-taking on the roads could be reduced.

- Road safety professionals need to pay particular attention towards adolescent males in order to lower their engagement in risky behaviours on the road and reduce their high-risk driving attitudes (Chapter Six).

- Since past (pre-driving) behaviour on the road was predictive of future driving behaviour in Chapter Six it was considered to have made an important contribution to the TPB model. It is therefore recommended that the TPB, when applied to driving, should expand to incorporate a measure of past behaviour.

- Findings from all three studies support the need for road safety education to shape driving attitudes and intentions from pre- through to post-driver training to ensure that safe attitudes and intentions are learnt and maintained.

8.3 General Limitations

For each of the three studies conducted in this report there were several limitations. These limitations were detailed at the end of each study (Chapters Five - Seven). However, there were several main limitations which will now be discussed. With regard to all three studies, time was a major limitation; it would have been good to conduct the longitudinal studies over a longer period of time to allow young people to gain more driving experience. The pre- to post-driver training longitudinal study (Chapter Six) was also only conducted in New Zealand, ideally it would have been conducted simultaneously in both New Zealand and Scotland. By conducting the study in both countries it would have made it easier to ascertain whether or not the driving attitudes, intentions and driving behaviours measured were representative of adolescents' views and behaviours in general or whether they were culturally bound within New Zealand or Scotland. Since the study was only conducted in New Zealand it was difficult to make generalisations about adolescents' driving attitudes, intentions and driving behaviours.

In the second study (Chapter Six) the positive associations that were found between risky road behaviour, driving attitudes and intentions could have been associated with adolescents' social economic status (SES). It may be worth replicating this study with a measure of SES to see whether playing on the street, being pro-speeding and driving dangerously in later life are all characteristics associated with certain SES groups.

In the third study (Chapter Seven) it was difficult to attribute the changes in driving attitudes and intentions that were measured to the pre-driving intervention ("Crash Magnets") they received because a control group could not be provided. Therefore, it was difficult to conclude whether these changes were natural fluctuations (due to adolescents' attitudes being fluid) or due to the impact of the intervention.

Finally, one of the limitations of conducting questionnaire-based studies is the influence of social desirability on participants' responses. For example, male participants may have responded to questions about their attitudes and intentions towards speeding according to how they think they should respond as a male (the social norm) rather than what they think as an

individual. Consequently, it has been suggested that future replications of the studies in this report should be conducted over a longer period of time and incorporate behavioural measures (such as accident data) that might identify more reliable gender differences.

8.4 Contributions to Knowledge

The research presented in this thesis examined pre-driving attitudes, intentions, road behaviour, sensation seeking tendency and driving behaviour. It also examined the stability of pre-driving adolescents' attitudes and intentions towards driving and the possibility of expanding the Theory of Planned Behaviour model to include a measure of past behaviour. Prior to this thesis no known research had been conducted that had specifically focused on 1) the association between pre-driver behaviour and driving behaviour, 2) the stability of adolescents' attitudes and intentions towards driving, nor 3) the incorporation of past road behaviour into the Theory of Planned Behaviour as a predictor of future driving behaviour.

The Literature Review presented in Section A identified several gaps in knowledge within the young driver and pre-driver domain (Chapter One, pages 86-89). The results from the three studies conducted in this thesis have contributed towards bridging these gaps in knowledge particularly within the areas of young driver and pre-driver research. Firstly, the studies have looked at behavioural indicators from pre- to post-driver training and found that pre-driving behaviour on the road is an important factor in whether or not adolescents become high-risk drivers. They have also found that sensation seeking is linked with engagement in high-risk behaviours on the road. Secondly the studies conducted in this report have provided further understanding with regard to the stability of adolescents' driving attitudes showing that adolescents' attitudes are still fluid until they have gained direct personal experience of driving. Finally, the studies also examined the effects of a pre-driving intervention ("Crash Magnets") in order to see whether this type of intervention can shape and maintain adolescents' attitudes; however, more research needs to be done in this area utilising control groups to see whether the marked reduction in attitudes that were measured were definitely due to the interventions that were given.

The findings from the studies that were conducted have contributed towards research on the TPB by proposing the expansion of the model to incorporate a measure of past behaviour. It has also contributed towards research on problem behaviours and the Problem Behaviour Theory or PBT (Chapter Three). The PBT states that problem behaviours are linked by the same underlying factors and therefore individuals engaging in one form of problem behaviour

(such as risky driving) are highly likely to be engaging in another form of problem behaviour (such as smoking or excessive drinking). In this document two problem behaviours were significantly associated with each other, namely risky pre-driver road behaviour and risky driving behaviour. Adolescents, who reported engaging in frequent high-risk behaviour on the road as pre-drivers, reported engaging in significantly more risky driving behaviour as drivers.

8.5 Directions for Future Research

The results and discussions presented in this thesis have raised many questions regarding future avenues for pre-driver research. This section describes some of these ideas:

- Further research is required to identify the approximate age that adolescents' attitudes and intentions stabilise. This would highlight the age at which pre-driving interventions could be most effective.

- Longitudinal studies should be conducted to measure the long-term effects of pre-driver interventions. This would highlight the need for these interventions to be implemented in schools in order to help reduce young drivers' accident rates. It would be interesting to compare several different types of pre-driver interventions to see whether one intervention is in the long-term more effective than another. Another avenue for research could be to see whether the amounts of pre-driver training that individuals receive could improve their future driving performance and lower their collision rates. If skills can be gained and attitudes can be shaped among pre-drivers then perfecting training in these areas would ideally help towards reducing the number of risky drivers and ultimately reduce young driver involvement in road traffic accidents. These studies could also examine whether skills or attitudes training are both as important or whether one is more important than the other.

- To highlight the importance of pre-driver training, studies should be conducted to look at the impact of frequent, infrequent and no pre-driver interventions. For example, a school in South West England has an in-house driving instructor who teaches pupils about driving and the appropriate attitudes. A study could be conducted to compare this school (or a similar school where driver education is taught) against another local school where there is no pre-driver education to measure attitudes and look at accident rates during the first few years of driving.

- The studies presented in this manuscript found significant links between risky pre-driving road behaviour and self-reported engagement in violations during the first year of driving. It would be interesting for future studies to replicate the longitudinal study presented (Chapter Six) but conduct it over a longer period of time (i.e., over a period longer than a year) to see how long risky pre-driving behaviour influences driving behaviour. It is also recommended that accident data should be collected from participants at various stages during the longitudinal study.

- In this document one problem behaviour (risky pre-driving road behaviour) was linked to another form of problem behaviour (risky driving behaviour). It would be interesting for studies to be conducted to see if risky pre-driving road behaviour is linked to other forms of problem behaviours such as drinking, drug-taking, smoking which have been related to risky driving behaviour and then see if interventions designed to target specific problem behaviours reduce the occurrence of other problem behaviours.

- The fact that pre-driving road behaviour was significantly linked with driving behaviour in the second study (Chapter Six) suggests that adolescents' concepts of road safety need to be re-addressed. Future interventions should be designed to encourage adolescents to want to be safe on the roads whether they are on the roads as pedestrians, cyclists, passengers or drivers.

- Using the TPB in this thesis has highlighted the importance of subjective norms on intentions to engage in speeding behaviour (Chapters Five and Six). Regressions showed that subjective norms were influential on adolescents' intentions to speed and on their engagement in driving violations. Future studies should look at the effectiveness of parent-led and peer-led pre-driver interventions on adolescents' driving attitudes and behaviour.

SECTION C - CONCLUSIONS

From the research conducted in this thesis it can be concluded that pre-drivers' road behaviour is influential on their future driving. Through targeted pre-driving interventions it may be possible to create positive (low-risk) attitudes to both safe driving and safe road behaviour among pre-drivers. The fact that adolescents' attitudes and intentions towards driving had not stabilised in the third study (Chapter Seven) and that drivers' current attitudes and intentions were more predictive of their speeding intentions than their pre-driving attitudes and intentions in the second study (Chapter Six), it is important for road safety initiatives to run from pre- through to post-driver training. The effects of short-term (or one-off) interventions may only be temporary because teenagers' attitudes and intentions towards driving are still in a fluid state. It is recommended that regular pre-driving interventions that are implemented over a prolonged period of time may by more effective and lead to longer lasting attitude and behavioural changes. These effects could be even more pronounced if pre-driving interventions are executed around the time when fluctuations in adolescents' attitudes and intentions are beginning to decrease and become more stabilised.

To reduce young drivers' involvement in collisions more has to be done to encourage young people to want to be safer and more responsible on the roads (regardless of their road user type, e.g., pedestrians, cyclists, passengers or drivers). Therefore, from the findings documented in this thesis, the most promising solution to the young driver problem would be to focus primarily on the reduction of pre-drivers' risk-taking behaviour on the roads. The next step would be to create a standardised road safety curriculum that encourages individuals to become safety-conscious in all aspects of road behaviour, including driving.

APPENDIX

Appendix A

The 43-item Adolescent Road User Behaviour Questionnaire

– Elliott & Baughan (2004)

The following items were measured on a 5-point Likert scale

1	2	3	4	5
Never	Hardly ever	Sometimes	Fairly often	Very Often

How often do you….

1. **Forget to look properly because you are talking to friends who are with you [*]**
2. **Cross from between parked cars when there is a safer place to cross nearby [*]**
3. **Think it is ok to cross safely, but a car is coming faster than you thought [*]**
4. **Forget to look properly because you are thinking about something else [*]**
5. **See a small gap in traffic and "go for it" [*]**
6. **Run across a road without looking because you are in a hurry [*]**
7. **Cross whether traffic is coming or not, think the traffic should stop for you [*]**
8. **Get part way across the road and then have to run the rest of the way to avoid traffic [*]**
9. Cross from behind a stationary vehicle
10. Cross when you cannot see both ways very well (like on a bend or top of hill)
11. Not look because you cannot hear any traffic around
12. Use a mobile phone and forget to look properly
13. Not notice a car pulling out (say from a driveway) and walk in front of it
14. Cross without waiting for the "green man"
15. Climb over barriers or railings that separate the road from the pavement
16. Walk in the road rather than on the pavement
17. **Ride out into the road on a skateboard without thinking to check for traffic [*]**
18. **Hold on to a moving vehicle when riding a skateboard/roller-skates/roller-blades [*]**
19. **Play "chicken" by deliberately running out in front of traffic [*]**
20. **Play "chicken" by lying down in the road and waiting for cars to come along [*]**
21. **Hold on to a moving vehicle when riding a bike [*]**
22. **Deliberately run across the road without looking, for a dare [*]**
23. **Ride on a skateboard (or roller-skates/roller-blades) in the road [*]**
24. **Run into the road to get a ball, without checking for traffic [*]**
25. Hang around in the road talking to friends
26. Not notice an approaching car when playing games in the road
27. Run around in a road (e.g., when playing football or bull dog)
28. **Wear bright or reflective clothing when riding a bike in the dark [*] (—)**
29. **Wear bright or reflective clothing when out on foot in the dark [*] (—)**
30. **Wear reflective clothing [*] (—)**
31. **Wear a cycle helmet when riding a bike [*] (—)**
32. **Use lights on your bike when it is dark [*] (—)**
33. Keep looking and listening until you get all the way across the road **(—)**
34. Walk in single file on roads without pavements **(—)**
35. Cross less than an hour after drinking alcohol **(—)**
36. Have to stop quickly or turn back to avoid traffic **(—)**
37. Make traffic slow down or stop to let you cross **(—)**
38. Not bother walking to a nearby crossing to cross the road **(—)**
39. Look both ways before crossing **(—)**
40. Check to make sure traffic has stopped before using a pedestrian crossing **(—)**
41. Cross at a place that is well lit when it is dark **(—)**
42. Use a lollipop man/lady where there is one available **(—)**
43. Walk facing the traffic when on roads without pavements **(—)**

Questions 1-16 = Unsafe Road Crossing Behaviour
Questions 17-27 = Play and Social Activity on the Road
Questions 28-43 = Non-engagement in Planned Protective Behaviour

*Items in bold followed by [*] were selected for the reduced 21-item scale. For items followed by **(—)** scores should be reversed so higher scores = dangerous road users*

Appendix B

TPB Speeding Scale
– Adapted from Parker, Manstead & Stradling (1995)

The following items were measured on a 7-point Likert scale

1	2	3	4	5	6	7
*						*

* The *poles for the scales varied according to the question*

1. **It would be quite wrong for me to speed when driving** *(Moral Norm)*
   Strongly agree (1) – Strongly disagree (7)

2. **I would feel sorry if I drove over the speed limit** *(Anticipated Regret)*
   Very likely (1) – Very unlikely (7)

3. **I would feel good if I drove over the speed limit** *(Anticipated Regret)*
   Very likely (1) – Very unlikely (7)

4. **Speeding is** *(Direct Attitude)***:**
   Safe (1) – Unsafe (7) **(R)**
   Cautious (1) – Reckless (7) **(R)**
   Enjoyable (1) – Un-enjoyable (7) **(R)**
   Good (1) – Bad (7) **(R)**

5. **Most people who are important to me, for example my family and friends, would think that I should speed when I drive** *(Direct Subjective Norm)*
   Strongly agree (1) – Strongly disagree (7) **(R)**

6. **Most people I know would approve of my speeding whilst driving** *(Direct Subjective Norm)*
   Strongly agree (1) – Strongly disagree (7 **(R)***)*

7. **How easy or difficult is it to speed when driving?** *(Perceived Behavioural Control)*
   Very easy (1) – Very difficult (7) **(R)**

8. **How easy or difficult is it to refrain (stop yourself) from speeding when driving?**
   (Perceived Behavioural Control)
   Very easy (1) – Very difficult (7) **(R)**

9. **"It is mainly up to me whether or not I speed"** *(Perceived Behavioural Control)*
   Strongly Agree (1) – Strongly disagree (7) **(R)**

10. **How likely is it that you will exceed the speed limit when you drive?** *(Direct Intention)*
    Very likely (1) – Very unlikely (7) **(R)**

(R) = Items that should be reversed scored

Appendix C

The 40-item Driver Attitude Questionnaire – Parker, Manstead, Stradling & Senior (1998)

The following items were measured on a 5-point Likert scale

1	2	3	4	5
Strongly Agree				Strongly Disagree

1. On the whole people aren't aware of the dangers involved in close following *(CF)*
2. Even over-taking in a slightly risky situation makes you less safe as a driver *(OT)*
3. **It's hard to have a good time if everyone else is drinking but you have to limit yourself because you're driving [*]** *(DD)*
4. **I would be happier if the speed limits were more strictly enforced [*]** *(SP)*
5. **The aim of the police should be to stop as many drink-drivers as possible [*]** *(DD)*
6. Harsher penalties should be introduced for drivers who drive too close to the car in front *(CF)*
7. I think it is ok to overtake in risky situations as long as you drive within your own capabilities *(OT)*
8. **Stricter enforcement of speed limits on 30mph roads would be effective in reducing the occurrence of road accidents [*]** *(SP)*
9. **The law should be changed so that drivers aren't allowed to drink any alcohol [*]** *(DD)*
10. I think the stopping distances in the Highway Code are too great for people to take any notice of them *(CF)*
11. People stopped for risky overtaking are unlucky because lots of people do it *(OT)*
12. **Even one drink makes you drive less safely [*]** *(DD)*
13. It is quite acceptable to drive close to the car in front than is recommended *(CF)*
14. I think I know exactly how much I can drink and still be under the limit *(DD)*
15. I would be happier if close following regulations were more strictly enforced *(CF)*
16. **It's ok to drive faster than the speed limit as long as you drive carefully [*]** *(SP)*
17. I would welcome further use of double white lines to let me know when it is unsafe to overtake *(OT)*
18. Random breath testing of drivers should be introduced *(DD)*
19. Even driving slightly too close to the car in front makes you less safe as a driver *(CF)*
20. **People stopped for speeding are unlucky because lots of people do it [*]** *(SP)*
21. I know exactly what risks I can take when I overtake *(OT)*
22. **Some people can drive perfectly safely after drinking three or four pints of beer [*]** *(DD)*
23. Close following isn't really a serious problem at the moment *(CF)*
24. I think the police should start breathalysing a lot more drivers around pub closing times *(DD)*
25. It is quite acceptable to take a slight risk when overtaking *(OT)*
26. **Speed limits are often set too low, with the result that many drivers ignore them [*]** *(SP)*
27. Some drivers can be perfectly safe overtaking in situations which would be risky for others *(OT)*
28. I would favour a clamp down on drivers who drive too close to the vehicle in front *(CF)*
29. The aim of the police should be to stop as many people as possible overtaking in risky circumstances *(OT)*
30. **Speeding is one of the main causes of road accidents [*]** *(SP)*
31. Some people can drive perfectly safely even when they only leave a small gap behind the vehicle in front *(CF)*
32. I know exactly how fast I can drive and still drive safely *(SP)*
33. Risky overtaking isn't really a serious problem at the moment *(OT)*
34. **I would favour stricter enforcement of the speed limit on 30mph roads [*]** *(SP)*
35. People stopped for close following are unlucky because lots of people do it *(CF)*
36. **Sometimes you have to drive in excess of the speed limit in order to keep up with the flow of traffic [*]** *(SP)*
37. I would be happier if there were a clamp down on dangerous overtaking *(OT)*
38. **The amount of alcohol you're allowed to drink before driving is too high [*]** *(DD)*
39. **Even driving slightly faster than the speed limit makes you less safe as a driver [*]** *(SP)*
40. **It's quite acceptable to drive after only one or two drinks [*]** *(DD)*

Items in bold followed by [*] were selected for adaptation in this thesis.

(SP = Speeding, DD = Drink-driving, OT = Dangerous overtaking, CF = Close following)

Appendix D

The 20-item Arnett Inventory of Sensation Seeking (AISS) – Arnett (1994)

The following items were measured on a 4-point Likert scale

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me very well

1. I can see how it would be interesting to marry someone from a foreign country. ***(N)***

2. When the water is very cold, I prefer not to swim even if it is a hot day. ***(I)*** **(—)**

3. If I have to wait a long time, I'm usually patient about it. ***(N)*** **(—)**

4. When I listen to music, I like it to be loud. ***(I)***

5. When taking a trip, I think it is best to make as few plans as possible and just take it as it comes. ***(N)***

6. I stay away from movies which are said to be frightening or full of suspense. ***(I)*** **(—)**

7. I think its fun and exciting to perform or speak before a group. ***(N)***

8. If I were to go to an amusement park, I would prefer to ride the rollercoaster or other fast rides. ***(I)***

9. I would like to travel to places that are different and far away. ***(N)***

10. I would never like to gamble with money, even if I could afford it. ***(I)*** **(—)**

11. I would have enjoyed being one of the first explorers of an unknown land. ***(N)***

12. I like a movie where there are a lot of explosions and car chases. ***(I)***

13. I don't like extremely hot and spicy food. ***(N)*** **(—)**

14. In general, I work better when I am under pressure. ***(I)***

15. I often like to have the T.V on while I'm doing something else, such as reading or cleaning up. ***(N)***

16. It would be interesting to see a car accident happen. ***(I)***

17. I think it's best to order something familiar when eating in a restaurant. ***(N)*** **(—)**

18. I like the feeling of standing next to the edge on a high place and looking down. ***(I)***

19. If it were possible to visit another planet or the moon for free, I would be among the first to sign up. ***(N)***

20. I can see how it must be exciting to be in a battle during a war. ***(I)***

(N = 'Novelty', I = 'Intensity')

For items followed by ***(—)****, scoring should be reversed so that higher score = higher sensation seeker*

Appendix E

The Driver Behaviour Questionnaire (DBQ) – Parker, West, Stradling & Manstead (1995)

The following items were measured on a 6-point Likert scale

0	1	2	3	4	5
Never					All the time

1. Hit something when reversing that you had not previously seen ***(L)***
2. Intending to drive to destination A, you "wake up" to find yourself heading for destination B, maybe because the latter is a more usual destination. ***(L)***
3. Drive when you suspect you might be over the legal blood alcohol limit ***(HCV)***
4. Get into the wrong lane approaching a roundabout or an intersection ***(L)***
5. Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front ***(E)***
6. Fail to notice that pedestrians are crossing when turning into a side street from a main road ***(E)***
7. Sound your horn to indicate your annoyance at another road user ***(AV)***
8. Fail to check your rear-view mirror before pulling out, changing lanes, etc. ***(E)***
9. Brake too quickly on a slippery road, or steer the wrong way in a skid ***(E)***
10. Pull out of an intersection so far that the driver with right of way has to stop to let you out ***(HCV)***
11. Disregard the speed limit on a residential road ***(HCV)***
12. Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers ***(L)***
13. On turning left, nearly hit a cyclist who has come up on your inside ***(E)***
14. Miss "Give Way" signs and narrowly avoid colliding with traffic having right of way ***(E)***
15. Attempt to drive away from the traffic lights in third gear ***(L)***
16. Attempt to overtake someone that you hadn't noticed to be signalling a right turn ***(E)***
17. Become angered by another driver and give chase with the intention of giving him/her a piece of your mind ***(AV)***
18. Stay in a motorway lane that you know will be closed ahead until the last minute before forcing yourself into another lane ***(HCV)***
19. Forget where you left your car in a car park ***(L)***
20. Overtake a slow driver on the inside ***(HCV)***
21. Race away from traffic lights with the intention of beating the driver next to you ***(HCV)***
22. Misread the signs and exit from a roundabout on the wrong road ***(L)***
23. Drive so close to the car in front that it would be difficult to stop in an emergency ***(AV)***
24. Cross an intersection knowing that the traffic lights have already turned against you ***(HCV)***
25. Become angered by a certain type of driver and indicate your hostility by whatever means you can ***(AV)***
26. Realise that you have no clear recollection of the road along which you have just been travelling ***(L)***
27. Underestimate the speed of an oncoming vehicle when overtaking ***(E)***
28. Disregard the speed limit on the open road ***(HCV)***

(E) = Errors, *(L)* = Lapses, *(HCV)* = Highway Code Violations, *(AV)* = Aggressive Violations.

NB: Aggressive Violations's were not included in the questionnaire as studies have found them to be unrelated to accident involvement.

Appendix F

Questions asked at 'Time 1' and 'Time 2' in Scotland and New Zealand (and also at 'Time 3' in Scotland)

1) Speeding is:

1	2	3	4	5	6	7
Safe						Unsafe

1	2	3	4	5	6	7
Reckless						Cautious

1	2	3	4	5	6	7
Un-enjoyable						Enjoyable

1	2	3	4	5	6	7
Good						Bad

2) How likely is it that you will exceed the speed limit when you drive?

1	2	3	4	5	6	7
Very Unlikely						Likely

3. It's OK to:

a) Drive faster than the speed limit as long as you drive carefully

1	2	3	4	5
Strongly Disagree				Strongly Agree

b) Not wear seat belts as long as you drive carefully

1	2	3	4	5
Strongly Agree				Strongly Disagree

c) Drink and drive as long as you drive carefully

1	2	3	4	5
Strongly Disagree				Strongly Agree

- Questions 1 & 2 = Taken from the TPB Speeding Scale (Parker, Manstead & Stradling, 1995)
- Question 3 = Adapted from the 40-item Driver Attitude Questionnaire (Parker, Manstead, Stradling & Senior, 1998)

Appendix G

New Zealand Questionnaire 1 ('Time 1')

ROAD USER QUESTIONNAIRE 1.

INSTRUCTIONS

Please complete the following questionnaire on your own QUIETLY

Answer all the questions as honestly as you can.
All answers will be kept confidential.
Thank you!

General Information

1. **First Name**: _____ **Surname**: _____
2. **Date of Birth**: ____/____/19____ **Age**: _____Years
3. **Are you (*tick one box*)?** Male ☐ Female ☐
4. **Would you describe yourself as (*tick one box*)**:
   Maori ☐ European (Pakeha) ☐ Maori & Pakeha ☐
   Polynesian ☐ Asian ☐ Other (please specify) _____
5. **School:** _____
6. **Class/form/grade:**_____
7. **Do you live in (*please circle one*):** City / Small Town / Small Village / Country
8. **a) Do you have (*tick one box*)**:
   No License ☐ Learners License ☐ Restricted License ☐ Full License ☐

   b) If you have a license, for how long: _____Years _____Months

1.0 As pedestrians, how often do you….

Instructions:

Circle one answer per question on a scale 1-5 (Never-Very Often) see the example below!

EXAMPLE:
Question: Look left and right to check for traffic before you cross the road
Answer: If you do the behaviour very often, circle "Very Often"

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*(5)*

1. How often do you forget to look properly (both ways as you cross roads) because:

a) You are thinking about something else

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) You are talking to friends who are with you

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

c) You are using a mobile phone

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

2. How often do you cross the road…..

a) Whether traffic is coming or not, thinking the traffic should stop for you

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) From behind a stationary vehicle

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

c) When you can't see both ways very well (like on a bend or top of a hill)

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

d) Without waiting for the "green man" at the traffic lights

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

e) Less than an hour after drinking alcohol

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

f) At a place that is well lit when it is dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

3. How often do you not look because you can't hear any traffic coming

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

4. How often do you climb over barriers that separate the road from the pavement

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

5. How often do you walk on the road rather than on the pavement

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

6. How often do you think it is OK to cross the road safely, but a car is coming faster than you thought

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

7. How often do you get part way across the road and then have to run the rest of the way to avoid traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

8. How often do you have to stop quickly or turn back to avoid traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

9.How often do you see a small gap in the traffic and "go for it"

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

10. How often do you make traffic slow down or stop to let you cross

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

11. How often do you cross from between parked cars when there is a safer place to cross nearby

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

12. How often do you run across the road without looking, because you are in a hurry

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

13. How often do you not bother walking to a nearby pedestrian crossing to cross the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

14. How often do you not notice a car pulling out (e.g. from a driveway) and walk in front of it

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

15. How often do you:

a) play "chicken" by lying down on the road and wait for cars to come along

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) play "chicken" by deliberately running out in front of traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

c) deliberately run across the road without looking, for a dare

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

16. How often do you hold on to a moving vehicle:

a) when riding a skateboard, roller-skates or roller-blades

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) when riding a bike

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

17. How often do you ride a skateboard (or roller-skates/roller-blades) on the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

18. How often do you ride out on to the road on a skateboard (or roller-skates/roller-blades) without thinking to check for traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

19. How often do you run on to the road to get a ball without checking for traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

20. How often do you hang around on the road talking to friends

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

21. How often do you not notice an approaching car when playing games on the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

22. How often do you run around on a road (e.g. when playing soccer or cricket)

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

23. How often do you wear bright or reflective clothing when near the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

24. How often do you wear bright or reflective clothing when:

a) out walking in the dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) riding a bike in the dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

25. How often do you wear a cycle helmet when riding a bike

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

26. How often do you use lights on your bike when it is dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

27. How often do you walk in single file on roads without pavements

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

28. How often do you keep looking and listening (for traffic) until you get all the way across the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

29. How often do you look both ways before you cross the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

30. How often do you check to make sure traffic has stopped before using a pedestrian crossing

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

31. How often do you use a crossing monitor where there is one available

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

32. How often do you walk facing the traffic when on roads without pavements

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

2.0 Imagine you are a car driver…

Instructions:

In the following questions, "speed" means driving over the legal speed limit.

Circle one answer per question on a scale 1-7 see the example below!

EXAMPLE:

Question: A speed limit is the maximum speed allowed:

Answer: If you agree quite strongly circle 2

Strongly Agree						*Strongly Disagree*
1	*2*	*3*	*4*	*5*	*6*	*7*

1) It is wrong for me to speed (drive over the speed limit) when driving:

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

2) I would feel sorry if I drove over the speed limit:

Very Likely						Very Unlikely
1	2	3	4	5	6	7

3) I would feel good if I drove over the speed limit:

Very Likely						Very Unlikely
1	2	3	4	5	6	7

4) Speeding is:

Safe						Unsafe
1	2	3	4	5	6	7
Reckless						Cautious
1	2	3	4	5	6	7
Enjoyable						Un-enjoyable
1	2	3	4	5	6	7
Good						Bad
1	2	3	4	5	6	7

5) Most people who are important to me, for example my family and friends, would think that I should speed when I drive:

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

6) Most people I know would approve of my speeding whilst driving:

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

7) How easy or difficult is it to speed when driving?

Very Easy						Very Difficult
1	2	3	4	5	6	7

8) How easy or difficult is it to refrain (stop yourself) from speeding when driving?

Very Easy						Very Difficult
1	2	3	4	5	6	7

9) "It is mainly up to me whether or not I speed"

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

10) How likely is it that you will exceed the speed limit when you drive?

Very Likely						Very Unlikely
1	2	3	4	5	6	7

3.0 Do you agree or disagree with each of the following...

Instructions:

Circle one answer per question on a scale 1-5 (Strongly Agree – Strongly Disagree) see the example below!

EXAMPLE:

Question: Driving laws are necessary to save lives:
Answer: If you neither agree nor disagree circle 3

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

1. I would be happier if speed limits were more strictly enforced by the Police:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

2. People stopped for speeding by the Police are unlucky because lots of people do it:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

3. Stricter enforcement of speed limits on 50km/h roads would be effective in reducing accidents:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

4. It's OK to drive faster than the speed limit, as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

5. Speed limits are often set too low, resulting in many drivers ignoring them

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

6. Speeding is one of the main causes of road accidents

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

7. I would prefer stricter enforcement of the speed limit on 50km/h roads:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

8. Sometimes you have to drive over the speed limit to keep up with the flow of traffic:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

9. Even driving slightly faster than the speed limit makes you less safe as a driver:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

10. The aim of the Police should be to stop as many drink-drivers as possible

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

11. The law should be changed so that driver's aren't allowed to drink any alcohol

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

12. Even one drink makes you drive less safely

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

13. Some people can drive perfectly safely after drinking 3 or 4 pints of beer

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

14. The amount of alcohol people are allowed to drink and still be legally allowed to drive is too high

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

15. It's quite acceptable to drive after only 1 or 2 drinks

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

16. It would be hard to have a good time if everyone else was drinking but you have to limit yourself because you were driving

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

17. It's OK to drink and drive as long as you drive carefully

Strongly Disagree				*Strongly Agree*
1	*2*	*3*	*4*	*5*

18. I would be happier if making people wear seat belts in cars was more strictly enforced:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

19. Stricter enforcement of wearing seat belts in cars would be effective in reducing injuries and deaths:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

20. It's OK to not wear seat belts, as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

21. Not wearing seat belts is one of the main causes of road deaths and injuries

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

22. Everyone in a car must wear a seat belt:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

Thank you for answering this questionnaire!!

Appendix H

New Zealand Questionnaire 2 ('Time 2')

ROAD USER QUESTIONNAIRE (part 2)

INSTRUCTIONS

Please complete the following questionnaire on your own QUIETLY.
Answer **ALL** the questions as honestly as you can
All answers will be kept confidential

Thank you!

First Name: _____ **Surname:**_____

Date of Birth: ____/____/19____ **Age**: _____ Years

School: _____

Do you live (tick one box):

CITY	☐
TOWN	☐
VILLAGE	☐
COUNTRY	☐

Do you have (*tick one box*):

No License	☐
Learners License	☐
Restricted License	☐
Full License	☐

If you have a license, for how long have you had it

*(Round up to the nearest month e.g., 13 days = 1 month, 1 month 14 days = 2 months etc.)***:**

_____Years _____Months

Section 1.0 What do YOU think about driving?

Instructions: Circle your answer to each of the questions on the scales

1) Speeding is:

1	2	3	4	5	6	7
Safe						Unsafe

1	2	3	4	5	6	7
Reckless						Cautious

1	2	3	4	5	6	7
Un-enjoyable						Enjoyable

1	2	3	4	5	6	7
Good						Bad

2) How likely is it that you will exceed the speed limit when you drive?

1	2	3	4	5	6	7
Very Unlikely						Likely

3. It's OK to:

a) Drive faster than the speed limit as long as you drive carefully

1	2	3	4	5
Strongly Disagree				Strongly Agree

b) Not wear seat belts as long as you drive carefully

1	2	3	4	5
Strongly Agree				Strongly Disagree

c) Drink and drive as long as you drive carefully

1	2	3	4	5
Strongly Disagree				Strongly Agree

Section 2.0 How well do each of the following describe YOU ?

Instructions: Circle one answer per question on a scale 1-4 (Describes me well – does not describe me well)

EXAMPLE:

Question: I can see how it would be frustrating to lose at a game or sports game

Answer: If this accurately describes you, circle "Describes me very well"

1	2	3	4 (circled)
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

1. I can see how it would be interesting to marry someone from a foreign country.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

2. When the water is very cold, I prefer not to swim even if it is a hot day.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

3. If I have to wait a long time, I'm usually patient about it.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

4. When I listen to music, I like it to be loud.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

5. When taking a trip, I think it is best to make as few plans as possible and just take it as it comes

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

6. I stay away from movies which are said to be frightening or full of suspense.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

7. I think its fun and exciting to perform or speak before a group.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

8. If I were to go to an amusement park, I would prefer to ride the rollercoaster or other fast rides

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

9. I would like to travel to places that are different and far away.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

10. I would never like to gamble with money, even if I could afford it.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

11. I would have enjoyed being one of the first explorers of an unknown land.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

12. I like a movie where there are a lot of explosions and car chases.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

13. I don't like extremely hot and spicy food.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

14. In general, I work better when I am under pressure.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

15. I often like to have the T.V on while I'm doing something else, such as reading or cleaning up.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

16. It would be interesting to see a car accident happen.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

17. I think it's best to order something familiar when eating in a restaurant.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

18. I like the feeling of standing next to the edge on a high place and looking down.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

19. If it were possible to visit another planet or the moon for free, I would be among the first to sign up.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

20. I can see how it must be exciting to be in a battle during a war.

1	2	3	4
Does not describe me At all	Does not describe me very well	Describes me Somewhat	Describes me Very well

Section 3.0 As a driver how often do you do each of the following?

ONLY ANSWER IF YOU DRIVE

Instructions: Answer all the questions on the scale from 0-5
0 = **never** 1 = **hardly ever** 2 = **occasionally** 3 = **quite often** 4 = **frequently** 5 = **all the time**

Hit something when reversing that you had not previously seen	0 Never	1	2	3	4	5 All the time
Intending to drive to destination A, you "wake up" to find yourself heading for destination B, maybe because the latter is a more usual destination	0 Never	1	2	3	4	5 All the time
Drive when you suspect you might be over the legal blood alcohol limit	0 Never	1	2	3	4	5 All the time
Get into the wrong lane approaching a roundabout or an intersection	0 Never	1	2	3	4	5 All the time
Queuing to turn left onto a main road, you pay such close attention to the main stream of traffic that you nearly hit the car in front	0 Never	1	2	3	4	5 All the time
Fail to notice that pedestrians are crossing when turning into a side street from a main road	0 Never	1	2	3	4	5 All the time
Fail to check your rear-view mirror before pulling out, changing lanes, etc.	0 Never	1	2	3	4	5 All the time
Brake too quickly on a slippery road, or steer the wrong way in a skid	0 Never	1	2	3	4	5 All the time
Pull out of an intersection so far that the driver with right of way has to stop and let you out	0 Never	1	2	3	4	5 All the time
Disregard the speed limit on a residential road	0 Never	1	2	3	4	5 All the time
Switch on one thing, such as the headlights, when you meant to switch on something else, such as the wipers	0 Never	1	2	3	4	5 All the time
On turning left, nearly hit a cyclist who has come up on your inside	0 Never	1	2	3	4	5 All the time
Miss "Give Way" signs, and narrowly avoid colliding with traffic having right of way	0 Never	1	2	3	4	5 All the time
Attempt to drive away from the traffic lights in third gear	0 Never	1	2	3	4	5 All the time
Attempt to overtake someone that you hadn't noticed to be signalling a right turn	0 Never	1	2	3	4	5 All the time
Stay in a motorway lane that you know will be closed ahead until the last minute before forcing yourself into another lane	0 Never	1	2	3	4	5 All the time
Forget where you left your car in the car park	0 Never	1	2	3	4	5 All the time
Overtake a slow driver on the inside	0 Never	1	2	3	4	5 All the time
Race away from the traffic lights with the intention of beating the driver next to you	0 Never	1	2	3	4	5 All the time
Misread the signs and exit from a roundabout on the wrong road	0 Never	1	2	3	4	5 All the time
Drive so close to the car in front that it would be difficult to stop in an emergency	0 Never	1	2	3	4	5 All the time
Cross an intersection knowing that the traffic lights have already turned against you	0 Never	1	2	3	4	5 All the time
Realise that you have no clear recollection of the road along which you have just been travelling	0 Never	1	2	3	4	5 All the time
Underestimate the speed of an oncoming vehicle when overtaking	0 Never	1	2	3	4	5 All the time
Disregard the speed limit on the open road	0 Never	1	2	3	4	5 All the time

Appendix I

Scotland Questionnaire 1

(Sections 1-3 = 'Time 1'; Section 4 = 'Time 2')

ROAD USER QUESTIONNAIRE 1.

INSTRUCTIONS

Please complete the following questionnaire on your own QUIETLY

Fill in sections 1.0 - 3.0 at the start of your class
Fill in section 4.0 when instructed by your teacher.
Answer **all** the questions as honestly as you can.
All answers will be kept confidential

Thank you!

General Information

1. **First Name**: _____ **Surname:** _____
2. **Date of Birth**: ____/____/19____ **Age**: _____ Years
3. **Are you (*tick one box*)?** Male ☐ Female ☐
4. **What school are you from**:_____
5. **What class/form/grade are you in**: _____
6. **Do you live (please circle one)**:

   CITY / SMALL TOWN / SMALL VILLAGE / COUNTRY

1.0 As pedestrians, how often do you….

Instructions:
Circle one answer per question on a scale 1-5 (Never-Very Often) see the example below!

EXAMPLE:
Question: Look left and right to check for traffic before you cross the road
Answer: If you do the behaviour very often, circle "Very Often"

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

1. How often do you forget to look properly (both ways as you cross roads) because:

a) You are thinking about something else

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) You are talking to friends who are with you

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

2. How often do you cross the road whether traffic is coming or not, because traffic should stop for you

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

3. How often do you think it is OK to cross the road safely, but a car is coming faster than you thought

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

4. How often do you get part way across the road and then have to run the rest of the way to avoid traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

5. How often do you cross from between parked cars when there is a safer place to cross nearby

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

6. How often do you see a small gap in the traffic and "go for it"

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

7. How often do you run across the road without looking because you are in a hurry

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

8. How often do you:

a) play "chicken" by lying down in the road and wait for cars to come along

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) play "chicken" by deliberately running out in front of traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

c) deliberately run across the road without looking, for a dare

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

9. How often do you hold on to a moving vehicle:

a) when riding a skateboard or roller-skates or roller-blades

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) when riding a bike

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

10. How often do you ride a skateboard (or roller-skates/roller-blades) on the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

11. How often do you ride out on to the road on a skateboard (or roller-skates/ roller-blades) without thinking to check for traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

12. How often do you run on to the road to get a ball without checking for traffic

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

13. How often do you wear bright or reflective clothing when near the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

14. How often do you wear bright or reflective clothing when:

a) out walking in the dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

b) riding a bike in the dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

15. How often do you wear a cycle helmet when riding a bike

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

16. How often do you use lights on your bike when it is dark

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

17. How often do you walk in single file on roads without pavements

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

18. How often do you keep looking and listening (for traffic) until you get all the way across the road

Never	*Hardly ever*	*Sometimes*	*Fairly Often*	*Very Often*
1	*2*	*3*	*4*	*5*

2.0 Imagine you are a car driver…

Instructions:

In the following questions, "speed" means driving over the legal speed limit.
Circle one answer per question on a scale 1-7 see the example below!

EXAMPLE:

Question: A speed limit is the maximum speed allowed:
Answer: If you agree quite strongly circle 2

Strongly Agree						*Strongly Disagree*
1	*2*	*3*	*4*	*5*	*6*	*7*

1) It is wrong for me to speed when driving (drive over the speed limit):

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

2) I would feel sorry if I drove over the speed limit:

Very Likely						Very Unlikely
1	2	3	4	5	6	7

3) I would feel good if I drove over the speed limit:

Very Likely						Very Unlikely
1	2	3	4	5	6	7

4) Speeding is:

Safe						Unsafe
1	2	3	4	5	6	7
Reckless						Cautious
1	2	3	4	5	6	7
Enjoyable						Un-enjoyable
1	2	3	4	5	6	7
Good						Bad
1	2	3	4	5	6	7

5) Most people who are important to me, for example my family and friends, would think that I should speed when I drive:

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

6) Most people I know would approve of my speeding whilst driving

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

7) How easy or difficult is it to speed when driving?

Very Easy						Very Difficult
1	2	3	4	5	6	7

8) How easy or difficult is it to refrain (stop yourself) from speeding when driving?

Very Easy						Very Difficult
1	2	3	4	5	6	7

9) "It is mainly up to me whether or not I speed"

Strongly Agree						Strongly Disagree
1	2	3	4	5	6	7

10) How likely is it that you will exceed the speed limit when you drive?

Very Likely						Very Unlikely
1	2	3	4	5	6	7

3.0 Do you agree or disagree with each of the following….

Instructions:
Circle one answer per question on a scale 1-5 (Strongly Agree – Strongly Disagree) see the example below!

EXAMPLE:
Question: Driving laws are necessary to save lives:
Answer: If you neither strongly agree nor strongly disagree circle 3

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

1. I would be happier if speed limits were more strictly enforced by the Police:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

2. People stopped for speeding by the Police are unlucky because lots of people do it:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

3. Stricter enforcement of speed limits on 30mph roads would be effective in reducing accidents:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

4. It's OK to drive faster than the speed limit as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

5. Speed limits are often set too low, with the result that many drivers ignore them

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

6. Speeding is one of the main causes of road accidents

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

7. I would prefer stricter enforcement of the speed limit on 30mph roads:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

8. Sometimes you have to drive over the speed limit to keep up with the flow of traffic:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

9. Even driving slightly faster than the speed limit makes you less safe as a driver:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

10. The aim of the Police should be to stop as many drink-drivers as possible

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

11. The law should be changed so that driver's aren't allowed to drink any alcohol

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

12. Even one drink makes you drive less safely

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

13. Some people can drive perfectly safely after drinking 3 or 4 pints of beer

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

14. The amount of alcohol people are allowed to drink and still be legally allowed to drive is too high

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

15. It's quite acceptable to drive after only 1 or 2 drinks

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

16. It would be hard to have a good time if everyone else was drinking but you have to limit yourself because you are driving

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

17. It's OK to drink and drive as long as you drive carefully

Strongly Disagree				*Strongly Agree*
1	*2*	*3*	*4*	*5*

18. I would be happier if making people wear seat belts in cars was more strictly enforced:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

19. Stricter enforcement of wearing seat belts in cars would be effective in reducing accidents:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

20. It's OK to not wear seat belts as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

21. Not wearing seat belts is one of the main causes of road accidents and injuries

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

22. Everyone in a car must wear a seat belt:

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

DO NOT GO TO SECTION 4 UNTIL YOUR TEACHER INSTRUCTS YOU!!

4.0 And finally….

Instructions:
Circle one answer per question on a scale 1-7

1. Speeding is:

Unsafe 1	2	3	4	5	6	Safe 7
Cautious 1	2	3	4	5	6	Reckless 7
Un-enjoyable 1	2	3	4	5	6	Enjoyable 7
Bad 1	2	3	4	5	6	Good 7

2. How likely is it that you will exceed the speed limit when you drive?

Very unlikely						Very likely
1	2	3	4	5	6	7

3. It's OK to:

a) Drive faster than the speed limit as long as you drive carefully

Strongly Disagree				*Strongly Agree*
1	*2*	*3*	*4*	*5*

b) Not wear seat belts as long as you drive carefully

Strongly Disagree				*Strongly Agree*
1	*2*	*3*	*4*	*5*

c) Drink and drive as long as you drive carefully

Strongly Disagree				*Strongly Agree*
1	*2*	*3*	*4*	*5*

Thank you for answering this questionnaire!

Appendix J

Scotland Questionnaire 2 ('Time 3')

ROAD USER QUESTIONNAIRE 2.

INSTRUCTIONS

Please complete the following questionnaire on your own QUIETLY
Answer all the questions as honestly as you can
All answers will be kept confidential
Thank you!

---

1. **First Name**: _____ **Surname:**_____

2. **Date of Birth**: ____/____/19____ **Age**: _____ Years

3. **School:** _____

4. **Do you live (please circle one)**:

CITY / TOWN / VILLAGE / COUNTRY

Section 1.0 Driving questions

Instructions: Circle your answer to each of the questions on the scales

1) Speeding is:

Safe						Unsafe
1	2	3	4	5	6	7

Reckless						Cautious
1	2	3	4	5	6	7

Enjoyable						Un-enjoyable
1	2	3	4	5	6	7

Good						Bad
1	2	3	4	5	6	7

2) How likely is it that you will exceed the speed limit when you drive?

Very Likely						Very Unlikely
1	2	3	4	5	6	7

3. It's OK to:

a) Drive faster than the speed limit as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

b) Not wear seat belts as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

c) Drink and drive as long as you drive carefully

Strongly Agree				*Strongly Disagree*
1	*2*	*3*	*4*	*5*

Section 2.0

Instructions: Circle one answer per question on a scale 1-4 (Describes me well – does not describe me well)

EXAMPLE:
Question: I can see how it would be frustrating to lose at a game or sports game
Answer: If this accurately describes you, circle "Describes me very well"

1	2	3	(4)
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

1. I can see how it would be interesting to marry someone from a foreign country.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

2. When the water is very cold, I prefer not to swim even if it is a hot day.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

3. **If I have to wait a long time, I'm usually patient about it.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

4. **When I listen to music, I like it to be loud.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

5. **When taking a trip, I think it is best to make as few plans as possible and just take it as it comes**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

6. **I stay away from movies which are said to be frightening or full of suspense.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

7. **I think its fun and exciting to perform or speak before a group.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

8. **If I were to go to an amusement park, I would prefer to ride the rollercoaster or other fast rides**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

9. **I would like to travel to places that are different and far away.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

10. **I would never like to gamble with money, even if I could afford it.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

11. **I would have enjoyed being one of the first explorers of an unknown land.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

12. **I like a movie where there are a lot of explosions and car chases.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

13. **I don't like extremely hot and spicy food.**

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

14. In general, I work better when I am under pressure.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

15. I often like to have the T.V on while I'm doing something else, such as reading or cleaning up.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

16. It would be interesting to see a car accident happen.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

17. I think it's best to order something familiar when eating in a restaurant.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

18. I like the feeling of standing next to the edge on a high place and looking down.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

19. If it were possible to visit another planet or the moon for free, I would be among the first to sign up.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me somewhat	Describes me Very well

20. I can see how it must be exciting to be in a battle during a war.

1	2	3	4
Does not describe me at all	Does not describe me very well	Describes me Somewhat	Describes me Very well

Thank you for answering this questionnaire!

Appendix K

"Crash Magnets" Class Activities

Activity 1 –
Describe a good driver, underline behaviours (on the list provided) you observe regularly in people who drive them about, use the behaviours (on the list provided) to write a profile of the type of driver you think you'll become.

Activity 2 –
Answer ten questions and total up the scores to see how safe a driver you will become.

Activity 3 –
Discuss with your class the reasons why passengers do not wear seat belts. Work in groups of two or three to invent a 30-second in-car safety message and discuss the message with the class.

Activity 4 –
Discuss with your class the things drivers do whilst driving. Work in groups of two or three to come up with two short sentences, one about driving and another about a distraction to be put on a flyer (for example, "in a hurry, driving the kids from school, you're running late" and "having a row with your son for dropping crisps on the floor") and discuss the sentences with the class

Activity 5 –
Using the situation cards provided (there are 56 cards which have either a situation or a statement on them), your teacher will ask your class to discuss the following: 1.) If you have been in any of these situations and what you did 2.) Whether the media should be responsible for promoting road safety? 3.) Whether stories about crashes sell better than stories about road safety?

Activity 6 –
Design a news story and a catchy headline using news headline cards (20 cards were provided). Each card outlines a driving story with a serious point to it (for example, "A 23-year-old man has been banned from driving for 12 months after he was caught reading a newspaper while driving at 60 miles per hour. He admitted dangerous driving"). Discuss the headlines with the class.

Activity 7 –
Using a picture of a car, design a slogan to be put on it as a warning message that would make drivers think about driving and make them change their behaviour (for example, "Causing death by dangerous driving – 10 years in prison"). Discuss the slogans with the class: 1.) Consider how you would feel about getting into a car that had that slogan on it 2.) Discuss whether powerful cars should carry health warnings 3.) Discuss whether warning on cars would reduce crashes and road casualties.

Activity 8 –
Using the penalty table (a table of driving offences and their penalties are provided) look at ten case studies and decide what penalties the drivers in the case studies would be given.

Activity 9 –
Look back at the case studies in activity 8 and write down and discuss the consequences for all individuals involved (offenders and victims) in terms of their jobs, relationships and families.

Activity 10 –
Using the list of statements provided, in groups of two or three identify whether the situations listed that you may have experienced out and about and also the driving situations are 'Errors', 'Lapses' or 'Violations'. Three points in the room have been labelled as 'Errors', 'Lapses' and 'Violations' by your teacher. Your teacher will then hand each student a card. Using your card (red on one side and yellow on the other) turn the card to the red side (which has a situation you may have experienced out and about). Position yourself at one of the points in the room according to whether you think the situation is an 'Error', 'Lapse' or 'Violation'. Your teacher will read out the situations that are 'Errors', 'Lapses' and 'Violations' so that you can see if you are standing in the correct place. Turn the card to the yellow side (situations that drivers' experience) and do the same as before in order to identify whether you think the situation is an 'Error', 'Lapse' or 'Violation'. Your teacher will read out which driving situations are 'Errors', 'Lapses' and 'Violations' so that you can see if you are standing in the correct place. Discuss why rules are important with your class.

Appendix L

Journal article – "Pre-driving adolescent attitudes: Can they change?"

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Pre-driving adolescent attitudes: Can they change?

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Intentions

ABSTRACT

The problem of reducing young drivers' high accident rates has been approached from many different angles but a primary focus has been to try and find ways of changing the attitudes and behaviours of young people who are already drivers. It is hypothesised that there is a link between pre-driver attitudes, intentions and their future driving behaviour. By changing pre-driver attitudes and/or intentions, individuals may mature into safer drivers. This study approaches this young driver problem by looking at pre-drivers' attitudes to driving to see how they change over time. The results from two questionnaires indicated significant gender differences and changes in responses (both long-term and short-term) over a 6-month period. It is concluded that adolescent attitudes and intentions towards driving remain fluid such that they may be positively influenced through pre-driver interventions, even if only temporarily. Regular pre-driver interventions could thus reinforce safe driving messages and create safety-conscious driving attitudes in the next generation of drivers.

1. Introduction

Globally road accidents and injuries are the eighth leading cause of death among under 25s (WHO, 2007). According to the UK Department for Transportation (DfT, 2007) 16% more drivers aged between 16 and 19 years are killed today compared to 15 years ago. Young people however not only have very high rates of involvement in road traffic accidents as drivers or motor-cyclists, they have very high mortality rates in all road related accidents (Chliaoutakis, Darviri, & Demakakos, 1999; Gregersen & Berg, 1994; Mayhew & Simpson, 1989; Williams, 2003). As adolescents are known for their engagement in risky behaviours (Arnett, 1992; Bina, Graziano, & Bonino, 2006; Bingham, 2005; Bingham & Shope, 2004; Evans & Norman, 2003; Gulliver & Begg, 2004; Harre, Brandt, & Dawe, 2000; Jessor, 1987a, 1987b; Jessor, 1998) this could partially account for their over-representation in road traffic accidents.

In Great Britain 1431 people were killed in road traffic collisions during 2007, of these fatalities 296 were young car drivers aged from 17 to 24 years (DfT, 2008). To stress the alarming nature of these statistics and to put them into perspective, 17–24 year olds cover lower than average mileage compared to other driver sub-groups (Carcary, Power, & Murray, 2001). They make up only 7% of British driving licence holders but are involved in over 13% of all injury traffic accidents (DETR, 2000). The majority of collisions involving 17–21 year olds occur during the first year of driving (Achara et al., 2001).

These high accident figures for teen and young adult car drivers are not specific to Great Britain; they are mirrored throughout the world, which demonstrates that this phenomenon is very widespread (Wilde, 1994). In New Zealand, where the minimum driving age is 15 years, in 2006 38% of fatal motor vehicle collisions involved drivers aged 15–24 year olds, yet they represent only 7% of licence holders (MOT, 2007).

Drivers who regularly commit traffic violations tend to endorse the associated driving behaviour (Lancaster & Ward, 2002). In a study by Stradling and Meadows (2001) young drivers reported driving faster than other drivers and wanted

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to drive even faster. They also rated telematic speed control as less acceptable, committed more violations, sought more thrill from driving, reported themselves as less safe but not less skilled and had more crashes than other drivers. Interestingly, whilst females in this study reported driving as fast as young males, this trend among females decreased with age. This study therefore provides evidence to suggest that more effort may need to be put into targeting young male attitudes.

The attitude to speeding held by most drivers is that it is one of the least serious of all traffic offences (Brown & Copeman, 1975; Rothengatter, 1991). It is commonly believed that if only attitudes could be changed, appropriate behaviour would follow (Lonero & Clinton, 1997). Therefore the first approach directed towards speed reduction used by road safety professionals should be through targeted education, aimed at changing driver's attitudes to speeding behaviour. For example, one method of changing attitudes could be to highlight the inherent risks involved in engaging in speeding behaviour.

Studies have shown that adolescents who report positive attitudes towards traffic safety are less likely to report risky driving behaviour (Iversen, 2004; Ulleberg & Rundmo, 2003). Developing and maintaining positive attitudes to all aspects of traffic safety in both adolescents and pre-adolescents would therefore seem to be a priority. Particularly so, as research has shown that when young drivers perceive the risks related to traffic accidents as being high, they are less likely to engage in these risks (Ulleberg & Rundmo, 2003).

According to Harre et al. (2000), the age at which young people are developing a strong interest in driving and formulating attitudes about appropriate driving behaviour continues to decrease. Therefore, it is important for measures to be taken prior to adolescence to help aid the development and maintenance of positive traffic safety attitudes (Harre et al., 2000). In adolescents as young as 11 years old, significant differences have been found between males and females and what they expect from driving (Stradling, 1991). Waylen and McKenna (2002) carried out a study on pre-drivers aged 11–16 years and found that from 14 years old upwards, boys report that learning to drive will be significantly easier than girls. In their study there was a tendency for boys to report perceiving a greater increase in popularity as a result of driving than girls. This difference in perception between the sexes has been found to increase significantly with age, with the perception that driving increases popularity becoming less plausible the older girls get. The study also reported that boys seemed to accept violations to a significantly greater extent than girls.

Attempting to influence changes in drivers' attitudes and behaviour towards fast driving is a challenging task. Researchers have thus tried to identify those drivers who are at high-risk and targeted interventions directly at them. It is believed that with studies such as Stradling (1991) and Waylen and McKenna (2002) showing that adolescents as young as 11 years old have attitudes towards driving, pre-driving education maybe the way forward. This study explores adolescent attitudes towards driving to see whether their attitudes remain stable or fluctuate over time. Fluctuations in adolescents' attitudes towards driving could provide an opportunity for pre-driving initiatives such as "Crash Magnets" (a pre-driver intervention designed by Road Safety Scotland) to reduce high-risk attitudes and stabilise them.

2. Method

2.1. Participants

Road Safety Scotland (RSS) recruited schools from across Scotland to take part in the study. Hundred and fifty-five participants from 12 schools (72 males, 83 females) aged 12–16 years (mean age = 14.1 years, SD = 1.13) participated in both parts of this longitudinal study.

2.2. Procedure

Road Safety Scotland (RSS) designed a pre-driver awareness campaign called "Crash Magnets" aimed at Scottish secondary school students in classes S3–S6 (corresponding to the final 3 years of secondary or high-school education). Schools across Scotland were contacted by RSS to see whether or not they would be prepared to take part in the study. The participating schools selected classes randomly containing between 10 and 21 students.

Participating schools were sent a copy of the "Crash Magnets" DVD for use during two or three lessons on issues regarding young people and driving. Teachers were provided with a learning resource pack that consisted of ten optional class activities and situation cards to aid class discussion.

The DVD was 58 min long and was divided into five sections. The topics covered on the DVD included passenger behaviour, the importance of wearing seat belts, dangerous driving behaviours such as drink-driving, using mobile phones, driving under the influence of drugs or alcohol and the consequences of car crashes. The DVD featured primarily adolescents who shared their attitudes and experiences of driving. The emergency services were also featured in the presentation with contributions from Strathclyde Police, the Ambulance service and the Fire service. There were also people speaking who had been involved in crashes, were severely injured in crashes, had been sent to a young offender's prison for reckless driving and a mother who had lost her two children to a 23 year old drink-driver.

Ten optional class activities and four sheets of quotes (from the DVD) were designed to be used to reinforce the messages presented in the "Crash Magnets" DVD and to encourage students to think about driving and the consequences of dangerous driving (such as using mobile phones whilst driving, drink-driving, drug-driving and speeding). A set of questionnaires ('Questionnaire 1') was also included in the "Crash Magnets" pack along with teachers' instructions. The instructions asked

the teachers to hand out the questionnaires to their students and informed them that the questionnaire had to be completed in two parts: part one to be completed before the lesson and part two to be completed after the DVD and lessons.

Six months after completing 'Questionnaire 1', RSS contacted the schools again by letter. The letter thanked the schools and teachers for taking part in the "Crash Magnets" intervention and for encouraging students to complete 'Questionnaire 1'. The letter also informed them about the final part of the study and asked them to get the same students to complete 'Questionnaire 2' (a set of questionnaires was enclosed). The letter informed the teachers and schools that unlike 'Questionnaire 1', 'Questionnaire 2' was not divided into parts and could be completed without interruption. A list of the classes that had completed 'Questionnaire 1' was included to facilitate the schools and teachers in remembering which classes had completed 'Questionnaire 1'.

3. Measures

The two questionnaires were designed to measure adolescent attitudes towards driving and were administered before, during and after the classroom-based pre-driver intervention (Road Safety Scotland's "Crash Magnets"). 'Questionnaire 1' consisted of two parts: part one – questions to be answered pre-intervention ('Time 1'); and part two – a selection of questions repeated from part one to be answered post-intervention ('Time 2'). In 'Questionnaire 2' the same questions that were asked immediately post-intervention ('Time 2') were asked again for a third time, 6 months post-intervention ('Time 3').

3.1. Questionnaire 1: part one ('Time 1')

Part one of the questionnaire ('Time 1') was divided into two sections and used five and seven-point Likert scales. The scales measured adolescent attitudes and intentions to engage in speeding behaviour (questions were extracted from the 'extended theory of planned behaviour' and included measures of moral norm; Parker, Manstead, & Stradling, 1995), and attitudes to 'speeding'/'drink-driving' and 'not wearing seat belts' (questions adapted from Parker, Manstead, Stradling, and Senior (1998) Driver Attitude Questionnaire).

The extended 'theory of planned behaviour' (TPB) scale (Parker et al., 1995) was used to measure the pre-drivers' attitudes and intentions to speed (referred to as the TPB Speeding Scale), which included measures of personal norm (moral norm and anticipated regret). As Parker et al. (1995) designed the extended TPB scale for their study on licensed drivers, only those questions which were deemed to be relevant to pre-drivers were included in this study. There were eleven items in total (one regarding moral norms, two on anticipated regrets, four referring to attitudes to speeding, two on subjective norms, one on perceived behavioural control and one measure of intention) taken from Parker et al. (1995) original questionnaire and the wording slightly modified to apply to pre-drivers. Some of the TPB components were measured using more than one item (for example, attitudes to speeding were measured using four items), and responses to each of these facets were added together and averaged. All items were measured using a seven-point Likert scale with end points appropriate to the question (for example: 1 = strongly agree, 7 = strongly disagree; 1 = very likely, 7 = very unlikely; 1 = very easy, 7 = very difficult). A derived Cronbach's alpha value of 0.779 was calculated for all items.

The Driver Attitude Questionnaire (DAQ) was used to assess attitudes towards driving violations such as 'speeding', 'drink-driving' and 'not wearing seat belts'. There were 22 questions (nine speeding items, eight drink-driving items and five 'attitudes to not wearing seat belts' items). 16 items were taken from Parker et al. (1998) 40-item driver attitude questionnaire (DAQ). The DAQ consisted of four subsections (10 items in each section) measuring attitudes towards: 'drink-driving', 'speeding', 'over-taking' and 'close following'. The 16 items only addressed attitudes to 'speeding' and 'drink-driving' as it was felt that some pre-drivers might not have any knowledge about over-taking and close following. For the purposes of this study some items were removed that were felt to be irrelevant to pre-drivers and several new items were added. A new item was added to attitudes to 'drink-driving' ("its ok to drink and drive") and a third subscale 'attitudes to not wearing seat belts' was created. All 22 items were measured using a five-point Likert scale (1 = strongly agree, 5 = strongly disagree), the Cronbach's alpha for this scale was 0.851.

3.2. Questionnaire 1: part two ('Time 2')

Part two of the questionnaire ('Time 2') consisted of a selection of questions from part one, that were repeated in order to re-assess participants' attitudes and intentions. Four of the items that measured attitudes to speeding were included (responses to the four items were averaged), and one item on intentions regarding speeding. Three items from the DAQ measuring attitude towards 'speeding', 'drink-driving' and 'not wearing seat belts' were also included. In order to encourage the students to think about the questions and to not necessarily put down the same answer as before, the Likert scales were reversed.

3.3. Questionnaire 2 ('Time 3')

This questionnaire was completed 6 months after the previous questionnaire (i.e., post-intervention at 'Time 3'). It was designed to establish whether attitudes and intentions had changed during the intervening 6-month period.

Eight items from parts one and two of 'Questionnaire 1' were replicated in this section. As in part two of 'Questionnaire 1', four of the extended TPB items that measured attitudes to speeding were included in 'Questionnaire 2', one item on speeding intention and three items from the DAQ measuring attitude towards 'speeding', 'drink-driving' and 'not wearing seat belts' were included. This was the third time participants had answered these questions.

4. Results

Three sets of mean scores were calculated for the eight questionnaire items asked at each time period in Questionnaires 1 and 2 ('Time 1', 'Time 2' and 6 months later 'Time 3'), and for total mean speeding attitude (calculated by averaging the four TPB speeding attitude items at each time period). The means showed that participants' responses decreased over the three sampling points with one exception, responses to the TPB item 'attitude to speeding being un-enjoyable or enjoyable' increased (see Table 1). The results from a Wilcoxon's signed ranks test revealed that five items out of the 8 that were measured showed significant increases or decreases between 'Time 1', 'Time 2' or 'Time 3'.

Over the course of the study attitudes towards speeding became more favourable with participants believing speeding to be enjoyable. There were significant increases in 'attitudes to speeding being un-enjoyable or enjoyable' from 'Time 1' to 'Time 2' ($p < 0.05$) and between 'Time 1' and 'Time 3' ($p < 0.05$).

Attitudes towards driving faster than the speed limit decreased over the course of the study. Mean scores for differences in 'attitudes to driving faster than the speed limit' decreased significantly from 'Time 1' through to 'Time 3' ($p < 0.05$).

Attitudes towards travelling in a car without wearing seat belts decreased over the course of the study. Mean scores for differences in 'attitudes to not wearing seatbelts' decreased significantly from 'Time 1' to 'Time 2' ($p < 0.001$), from 'Time 2' to 'Time 3' ($p < 0.001$) and from 'Time 1' through to 'Time 3' ($p < 0.001$).

Attitudes towards drink-driving decreased over the course of the study. Mean scores for differences in 'attitudes to drinking and driving' decreased from 'Time 1' to 'Time 2' ($p < 0.001$), from 'Time 2' to 'Time 3' ($p < 0.05$) and from 'Time 1' to 'Time 3' ($p < 0.001$).

Intentions to engage in speeding in the future were also found to decrease from 'Time 1' to 'Time 2' ($p < 0.05$) and from 'Time 1' to 'Time 3' ($p < 0.05$).

4.1. Gender differences

Female's attitudes towards speeding being 'un-enjoyable' or 'enjoyable' increased significantly and moved towards the undesirable (risky) end of the scale over the three sampling periods (see Table 2). A Wilcoxon's signed ranks test revealed that females' attitudes increased significantly from 'Time 1' to 'Time 2' ($p < 0.001$) and from 'Time 1' to 'Time 3' ($p < 0.001$).

Males' attitudes towards driving faster than the speed limit decreased significantly and moved towards the desirable (less risky) end of the scale over the course of the study (see Table 2). A Wilcoxon's signed ranks test revealed that males' attitudes decreased significantly from 'Time 1' to 'Time 2' ($p < 0.001$) and from 'Time 1' to 'Time 3' ($p < 0.05$).

Both males' and females' attitudes towards travelling without wearing seat belts decreased significantly towards the desirable (less risky) end of the scale (see Table 2). A Wilcoxon's signed ranks test revealed that males' attitudes decreased significantly from 'Time 1' to 'Time 2' ($p < 0.001$) and from 'Time 1' to 'Time 3' ($p < 0.05$); females' attitudes decreased significantly from 'Time 1' to 'Time 3' ($p < 0.001$) and from 'Time 2' to 'Time 3' ($p < 0.05$).

Both males' and females' attitudes towards drink-driving decreased and moved towards the desirable (less risky) end of the scale from 'Time 1' to 'Time 3' (see Table 2). A Wilcoxon's signed ranks test revealed that males' attitudes decreased sig-

Table 1
Means and differences in mean scores.

	Time 1	Time 2	Time 3	Mean difference			Sig change
	Pre-intervention	Immediately post-intervention	6 Months post-intervention	T2-T1	T3-T1	T3-T2	
Scale 1–7							
Safe/unsafe	2.05	1.99	2.24	−0.06	0.19	0.25	–
Reckless/cautious	3.10	2.89	2.86	−0.21	−0.24	−0.03	–
Un-enjoyable/enjoyable	3.78	4.32	4.44	0.54*	0.66*	0.12	Increase
Bad/good	2.60	2.59	2.68	−0.01	0.08	0.09	–
Total mean speeding attitude	2.88	2.95	3.05	0.07	0.17	0.1	–
Intention unlikely/likely	4.48	4.11	4.21	−0.37*	−0.27*	0.1	Decrease
Scale 1–5							
Ok to drive over speed limit	2.72	2.58	2.48	−0.14	−0.24*	−0.1	Decrease
Ok to not wear seat belts	1.84	1.56	1.48	−0.28**	−0.36**	−0.08**	Decrease
Ok to drink-drive	3.36	1.36	1.20	−2.0**	−2.16**	−0.16*	Decrease

** Significant difference ($p < 0.001$).
* Significant difference ($p < 0.05$).

Table 2
Means and differences in mean scores by gender.

	Males (n = 72)	Time 1	Time 2	Time 3	Mean difference			Sig. change
	Females (n = 83)	Pre-intervention	Immediately post-intervention	6 Months post-intervention	T2-T1	T3-T1	T3-T2	
Scale 1–7								
Safe/unsafe	Males	2.40	2.30	2.74	−0.10	0.34	0.44	–
	Females	1.75	1.72	1.80	−0.03	0.05	0.08	–
Reckless/cautious	Males	2.99	2.96	2.79	−0.03	−0.20	−0.17	–
	Females	3.21	2.82	2.93	−0.39	−0.28	0.11	–
Un-enjoyable/enjoyable	Males	4.42	4.79	4.88	0.37	0.46	0.09	–
	Females	3.23	3.92	4.06	0.69**	0.83**	0.14	Increase
Bad/good	Males	3.09	3.02	3.00	−0.07	−0.09	−0.02	–
	Females	2.17	2.22	2.39	0.05	0.22	0.17	–
Total mean speeding attitude	Males	3.22	3.27	3.35	0.05	0.13	0.08	–
	Females	2.59	2.67	2.79	0.08	0.20	0.12	–
Intention unlikely/likely	Males	4.96	4.57	4.63	−0.39*	−0.33*	0.06	Decrease
	Females	4.06	3.72	3.84	−0.34	−0.22	0.12	–
Scale 1–5								
Ok to drive over speed limit	Males	3.22	2.78	2.82	−0.44**	−0.40*	0.04	Decrease
	Females	2.28	2.40	2.18	0.12	−0.10	−0.22	–
Ok to not use seat belts	Males	2.03	1.64	1.71	−0.39**	−0.32*	0.07	Decrease
	Females	1.67	1.50	1.29	−0.17	−0.38**	−0.21*	Decrease
Ok to drink-drive	Males	3.14	1.42	1.31	−1.72**	−1.83**	−0.11	Decrease
	Females	3.55	1.31	1.11	−2.24**	−2.44**	−0.20**	Decrease

** Significant difference ($p < 0.001$).
* Significant difference ($p < 0.05$).

nificantly from 'Time 1' to 'Time 2' ($p < 0.001$) and from 'Time 1' to 'Time 3' ($p < 0.001$); females' attitudes decreased significantly from 'Time 1' to 'Time 2' ($p < 0.001$), from 'Time 2' to 'Time 3' ($p < 0.001$) and from 'Time 1' to 'Time 3' ($p < 0.001$).

Males' intentions towards engaging in speeding behaviour decreased significantly towards the desirable (less risky) end of the scale (see Table 2). A Wilcoxon's signed ranks test showed that males' intentions to speed decreased significantly from 'Time 1' to 'Time 2' ($p < 0.05$) and from 'Time 1' to 'Time 3' ($p < 0.05$).

Differences in males' and females' mean scores were calculated from 'Time 1' to 'Time 3' (see Table 3). Independent t-tests revealed that there were significant gender differences on TPB attitudes to speeding, with males reporting riskier attitudes towards speeding than females. Over the course of the study males consistently scored significantly higher than females on attitudes towards speeding being safe rather than unsafe, enjoyable rather than un-enjoyable, good rather than bad and on total mean speeding attitude.

Males reported consistently greater intentions to speed in the future over the three sampling points. Males scored higher than females on TPB speeding intention at 'Time 1' ($p < 0.001$, $d = 0.54$), 'Time 2' ($p < 0.001$, $d = 0.57$) and 'Time 3' ($p < 0.05$, $d = 0.49$; see Fig. 1).

Table 3
Gender differences in mean scores Time 1–Time 3.

	Time 1		Mean difference	Time 2		Mean difference	Time 3		Mean difference
	Pre-intervention			Immediately post-intervention			6 Months post-intervention		
	Males (n = 72)	Females (n = 83)		Males (n = 72)	Females (n = 83)		Males (n = 72)	Females (n = 83)	
Scale 1–7									
Safe/unsafe	2.40	1.75	0.65**	2.30	1.72	0.58*	2.74	1.80	0.94**
Reckless/cautious	2.99	3.21	−0.22	2.96	2.82	0.14	2.79	2.93	−0.14
Un-enjoyable/enjoyable	4.42	3.23	1.19**	4.79	3.92	0.87**	4.88	4.06	0.82*
Bad/good	3.09	2.17	0.92**	3.02	2.22	0.80**	3.00	2.39	0.61*
Total mean speeding attitude	3.22	2.59	0.63**	3.27	2.67	0.60**	3.35	2.79	0.56**
Intention unlikely/likely	4.96	4.06	0.90**	4.57	3.72	0.85**	4.63	3.84	0.79*
Scale 1–5									
Ok to drive over speed limit	3.22	2.28	0.94**	2.78	2.40	0.38*	2.82	2.18	0.64**
Ok to not use seat belts	2.03	1.67	0.36*	1.64	1.50	0.14	1.71	1.29	0.42*
Ok to drink-drive	3.14	3.55	−0.41	1.42	1.31	0.11	1.31	1.11	0.20

** Significant difference ($p < 0.001$).
* Significant difference ($p < 0.05$).

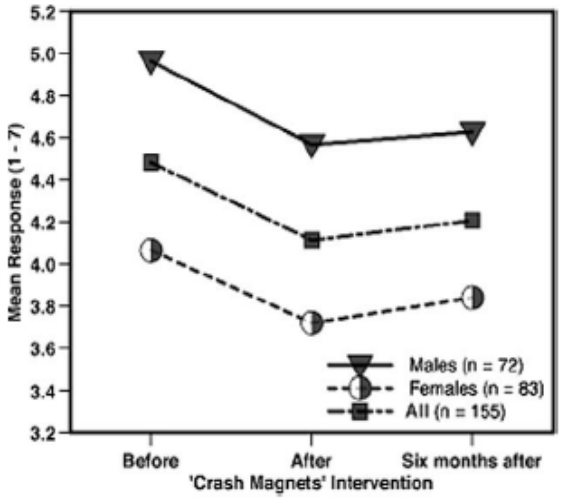

Fig. 1. Changes in adolescents' intensions to speed.

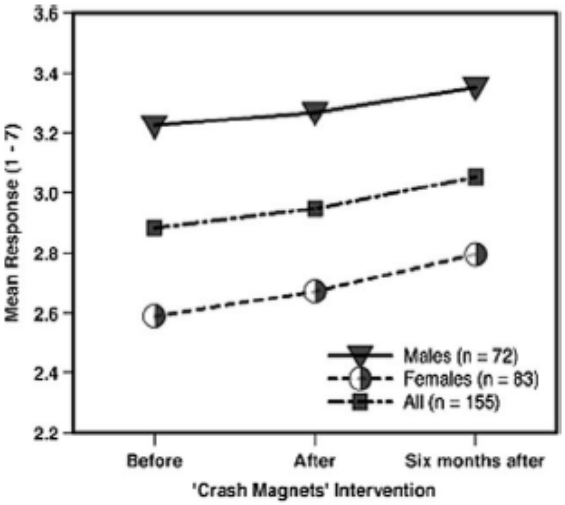

Fig. 2. Changes in adolescents' total mean attitudes to speed.

Males scored higher and had more positive attitudes towards speeding being safe rather than unsafe compared to females at 'Time 1' ($p < 0.001$, $d = 0.54$), 'Time 2' ($p < 0.05$, $d = 0.52$) and 'Time 3' ($p < 0.001$, $d = 0.73$). They scored significantly higher than females and had positive attitudes to speeding being enjoyable rather than un-enjoyable at 'Time 1' ($p < 0.001$, $d = 0.72$), 'Time 2' ($p < 0.001$, $d = 0.54$) and 'Time 3' ($p < 0.05$, $d = 0.48$). Males scored significantly higher than females and had more positive attitudes to speeding being good rather than bad at 'Time 1' ($p < 0.001$, $d = 0.64$), 'Time 2' ($p < 0.001$, $d = 0.64$) and 'Time 3' ($p < 0.05$, $d = 0.40$). They also scored higher than females on total mean speeding attitude at 'Time 1' ($p < 0.001$, $d = 0.65$), 'Time 2' ($p < 0.001$, $d = 0.59$) and at 'Time 3' ($p < 0.001$, $d = 0.54$; see Fig. 2).

Males had consistently riskier attitudes to both speeding and travelling without wearing seat belts compared to females. Females scored significantly lower on DAQ 'attitude to speeding' at 'Time 1' ($p < 0.001$, $d = 0.89$), 'Time 2' ($p < 0.05$, $d = 0.41$) and 'Time 3' ($p < 0.001$, $d = 0.65$). They also scored significantly lower than males on DAQ 'attitude to not wearing seat belts' at 'Time 1' ($p < 0.05$, $d = 0.36$) and at 'Time 3' ($p < 0.05$, $d = 0.52$).

5. Discussion

The results from this study have confirmed that pre-driving males hold more undesirable (risky) attitudes towards driving violations such as 'speeding' and 'not wearing seat belts' compared to females. The results showed that they also reported being more likely to engage in speeding behaviour in the future compared to females. It was not surprising to see that males'

attitudes were riskier than females as literature in the driving domain has consistently shown that males are riskier than females in both their attitudes and their driving behaviour (Laapotti, Keskinen, Hatakka, & Katila, 2001; Parker, Manstead, Stradling, & Reason, 1992). Therefore, it would appear that more attention needs to be paid to lowering the undesirable driving attitudes and intentions of adolescent males in particular.

Having identified males as being high scorers on the questionnaire items and classed them as 'higher risks' on the roads compared to females, it was encouraging to see that their attitudes towards the acceptability of driving faster than the speed limit, drink-driving and travelling without wearing seat belts had reduced (and had thus become less risky) over the course of the study. Over the 6-month period from 'Time 1' to 'Time 3' their attitudes towards driving faster than the speed limit, drink-driving and their intentions to engage in speeding behaviour had reduced significantly (females' attitudes towards drink-driving had also reduced over the 6 months). Males' attitudes towards travelling without wearing seat belts also decreased significantly from 'Time 1' to 'Time 3', however, between 'Time 2' and 'Time 3' their scores begun to increase. Although this increase was not found to be significant in this study it may warrant further investigation to determine whether the original decrease from 'Time 1' to 'Time 3' was due to the effects of the pre-driver intervention.

Scores for both genders tended to be on or under the mid-point of the scale (which was 4), although males scored higher than females on TPB items. Mean responses to the speeding intention item were nearer '5' on the scale, whereas self-reported attitudes and intentions were neutral or towards the desirable (less risky) end of the scale. Males also scored higher than females on attitudes towards driving violations items (DAQ) but again their mean scores for both genders on these items tended to be below the mid-point of the scale. Therefore, along with the TPB items, DAQ attitude responses tended to be neutral or towards the desirable end of the scale. These results were very encouraging as they showed that the adolescents in this study did not hold very risky attitudes to driving violations and other components of the theory of planned behaviour when applied to speeding.

Regardless of gender, there were significant attitude changes over the three time sampling periods (from 'Time 1' to 'Time 3' 6 months later) and also changes in intentions to speed in the future. Attitudes towards driving violations ('speeding', 'not wearing seat belts' and 'drink-driving') decreased over the course of the study. Intentions to speed in the future decreased from 'Time 1' to 'Time 3', with adolescents reporting less intentions to speed.

Attitudes towards speeding being 'un-enjoyable or enjoyable' increased significantly over the three sampling periods (and thus became riskier) for both males and females. These results indicated that attitudes towards speeding had become more favourable, with participants believing speeding to be enjoyable. In contrast to this increase, attitudes towards speeding being 'unsafe or safe', 'reckless or cautious' and 'bad or good' decreased from 'Time 1' to 'Time 2' (thus becoming less risky). By 'Time 3', scores for attitudes towards speeding being 'unsafe or safe' and 'bad or good' had increased (thus becoming riskier) and were above scores at 'Time 1'. Although these decreases and increases in attitude scores were not significant it was felt necessary to report them as they may warrant further investigation. These fluctuations could simply be characteristic of adolescence, which is often regarded as a time when adolescents are trying to stabilise their attitudes, but they may also be reflecting temporary attitude changes that have been induced by the "Crash Magnets" pre-driver intervention.

The fact that adolescents' attitudes towards speeding being enjoyable increased over the course of this study whilst the other attitudes towards speeding temporarily decreased could simply show that this particular attitude towards speeding is impervious to changes by interventions. Further investigation is needed to examine whether this pre-driver attitude towards speeding is more predictive of future risky driving behaviour than other attitudes towards speeding.

The theory of planned behaviour (Ajzen, 1991) postulates a link between attitudes, intentions and behaviour. It is important to address adolescents' positive pre-driving attitudes towards driving violations and intentions to engage in speeding (and other driving violations), if their engagement in future risky driving behaviour is to be reduced. By intervening before adolescents become drivers it may be possible to prevent them from habitually carrying out the behaviours they already have sympathy with as pre-drivers.

This study has shown that attitudes towards driving among adolescents are in a state of fluctuation. Pre-driver education initiatives could therefore be used to create desirable attitudes towards driving among adolescents before their attitudes become established and less malleable. Further investigation is required to determine the approximate age at which driving attitudes begin to form and the age at which driving attitudes become permanent. This information could then be used to help road safety professionals develop a successful pre-driver curriculum.

The practical nature of this study resulted in several limitations. Methodologically, it was not possible to include a control group. RSS, who sponsored the "Crash Magnets" intervention, pragmatically could not justify the non-provision of the intervention to those who were offered it. It is therefore difficult to conclude whether or not the changes in attitudes and intentions were due to developmental/maturational changes or influenced by the "Crash Magnets" intervention they received. However, findings relating to 'Time 2' data collection immediately after the intervention, cannot reasonably be dismissed in terms of potential developmental or maturation effects. The reduction in scores that were recorded provides some evidence that the "Crash Magnets" pre-driver intervention was successful at reducing pre-driving adolescents' attitudes and intentions that would thus emphasise the potential need for pre-driver education in schools. Future replications of this study should incorporate a control group to circumvent this limitation in the design. Within the road safety domain, particularly in local government, there are substantial opportunities to learn from interventions undertaken at schools and local communities. However, it is rare for road safety professionals to be able to incorporate scientific evaluations into their interventions at present. Currently within the UK road safety community there is a move towards evidence-based practice in the work culture, supporting the transfer of knowledge to and from the workplace through partnerships with universities.

It was also not known whether any previous pre-driver interventions had taken place at the schools that participated in this study. Also, as the use of the class activities included in the teachers' "Crash Magnets" pack were optional it is not known which of the activities, if any, the teachers used in their lessons to accompany the DVD. The number or type of activities chosen may have had more or less of an effect on the attitude changes that were recorded. Future replications of this study should not only incorporate a control group but also ask teachers to report back which activities they chose and whether their students had received school-based pre-driver interventions in the past.

This study has revealed variance in pre-driving adolescents' attitudes and intentions towards driving over a 6-month period. It may be possible for pre-driving interventions to stabilise pre-driver attitudes and reduce risky attitudes and intentions. However, further research into the effects of pre-driving interventions is needed to see whether this is possible. Further research is also needed in order to validate identified links between pre-driving attitudes, behaviour, intentions and post-driving attitudes and behaviours. Establishing these would provide further objective evidence of the need for pre-driver initiatives, such as RSS's "Crash Magnets", and the potential value of regular implementation, so that they can have a real safety impact on the next generation of drivers.

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