

# DOCTOR OF PHILOSOPHY

Perception of risk, feelings of vulnerability  
and effects on driving behaviour in women  
drivers across the lifespan.

Holly Gwyther

2013

Aston University

**PERCEPTION OF RISK, FEELINGS OF  
VULNERABILITY AND EFFECTS ON DRIVING  
BEHAVIOUR IN WOMEN DRIVERS ACROSS THE  
LIFESPAN**

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May 2012

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# SUMMARY

Aston University

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Sustained driving in older age has implications for quality of life and mental health. Studies have shown that despite the recognised importance of driving in maintaining health and social engagement, many women give up driving prematurely or adopt self-imposed restrictive driving practices. Emotional responses to driving have been implicated in these decisions. This research examined the effect of risk perception and feelings of vulnerability on women's driving behaviour across the lifespan. It also developed and tested a modified theory of planned behaviour intervention to positively affect driving habits. The first two studies (N=395) used quantitative analysis to model driving behaviours affected by risk perception and feelings of vulnerability, and established that feelings of vulnerability do indeed affect women's driving behaviour, specifically resulting in increases in driving avoidance and the adoption of maladaptive driving styles. Further, that self-regulation, conceptualised as avoidance, is used by drivers across the lifespan. Qualitative analysis of focus group data (N=48) in the third study provided a deeper understanding of the variations in coping behaviours adopted by sub-groups of drivers and extended the definition of self-regulation to incorporate adaptive coping strategies. The next study (N=64) reported the construction and preliminary validation of the novel self-regulation index (SRI) to measure wider self-regulation behaviours using an objective measure of driving behaviour, a simulated driving task. The understanding gained from the formative research was used in the final study, an extended theory of planned behaviour intervention to promote wider self-regulation behaviour, measured using the previously validated self-regulation index. The intervention achieved moderate success with changes in affective attitude and normative beliefs as well as self-reported behaviour. The results offer promise for self-regulation, incorporating a spectrum of planning and coping behaviours, to be used as a mechanism to assist drivers in achieving their personal mobility goals whilst promoting safe driving.

Keywords: Driving behaviour. Ageing. Self-regulation. Self-regulation Index. Theory of planned behaviour.

## DEDICATION

I dedicate this thesis to my children, Isla and Rory.

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### *Statement of Collaboration*

The ‘DriveSafe’ Handypack (Appendix C) was initially authored by Fay Goodman and Mark Wolski in 2004. During the duration of this present research, the book was edited and significantly revised to a) incorporate evidence for the general statements made and b) include unique research findings from the present research. Copyright rests with Fay Goodman.

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# CHAPTER ONE

## **1. Introduction**

### **1.1. Rationale for the Research**

Older women are the fastest growing demographic category of motorists and yet, female drivers are an under-researched group (Siren & Hakamies-Blomqvist, 2005). This is because men, particularly younger men receive greater attention due to perceived problem behaviour and higher crash risks. In modern society, driving is fundamental to many people's existence; it facilitates independence and enables contact with a variety of social and economic activities, and often forms the basis for independent mobility in older age. Research has shown that older people are often reliant on their cars and that driving is important in maintaining autonomy and self-esteem (Adler & Rottunda, 2006). Loss of mobility due to premature driving cessation is known to be a precursor of, and to exacerbate significant health problems such as depression (Fonda & Herzog, 2001a).

Despite the many positive effects of driving, research has shown that women consistently give up driving earlier and in better health than men do (Hakamies-Blomqvist & Siren, 2003; Siren & Hakamies-Blomqvist, 2005) and yet women may be in most need of their cars, having both a greater life expectancy than men and a greater chance of experiencing chronic, mobility impairing diseases (Arber & Cooper, 1999; Orfila, Ferrer, Lamarca, Tebe, Domingo-Salvany & Alonso, 2006). This leaves them at risk of social isolation.

Studies have also demonstrated that women are more likely than men to self-regulate their behaviour, i.e. to reduce, restrict or limit their driving (Bauer, Adler, Kuskowski & Rottunda, 2003; Charlton, Oxley, Fildes, Oxley, Newstead, Koppel & O'Hare, 2006; Donorfio, D'Ambrosio, Coughlin & Mohyde, 2008). The reasons for these gender differences are unclear. Although confidence (Kostyniuk & Shope, 1998) and driving anxiety (Gwyther & Holland, 2012) have been suggested, information from the fear of crime literature and various models of

health psychology suggest that risk perceptions and feelings of vulnerability may also be implicated.

Risk perception is a psychosocial factor that can influence the relationship between cognitions and behaviours (Tuokko, McGee, Gabriel & Rhodes, 2007). Feelings of vulnerability go beyond simple worries or concerns. They reflect an individual's feelings about their susceptibility to potential harm (either physical or emotional) and as such can be thought of as an affective response to perceived risk (Klein, Harris, Ferrer & Zajac, 2011). Given that women consistently report greater feelings of vulnerability to fear of crime (e.g. Akers, Lagreca, Sellers & Cochran, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984) it may be that they will also report greater feelings of vulnerability to perceived driving risk. If so, then some women may be comparatively more sensitive to perceptions of risk and consequently feelings of vulnerability than men, in which case, this sensitivity may influence their driving habits and choices about driving cessation.

The purpose of this research is to examine whether driving behaviour in women is influenced by feelings of vulnerability and if so, to develop an intervention to positively affect driving habits. It may be that a successful intervention would give women greater driving autonomy, improve their social and economic engagement and promote independent mobility in later life.

## **1.2. Literature Review**

The purpose of this Chapter is to discuss the background and theoretical basis for the research, based on a review of the principle literature. The first section summarises the research context and explains the changing nature of the driving population, issues associated with women drivers and the health and social effects associated with driving cessation. The section then goes on to review two measures of driving behaviour, first an integrative multidimensional measure of driving style that incorporates both cognitive and emotion based decisions in driving and second, the process of self-regulation as a potential mechanism for extension of safe mobility in older adults.

The next section examines risk perception and feelings of vulnerability as probable causes of difference in driver behaviour, describing optimism bias and research findings from the wider literature. The final section of the literature review proposes a potential solution to the problem of premature driving cessation and over-regulation in female drivers. It identifies the need for behavioural interventions to improve independent mobility in later life and proposes the theory of planned behaviour (Ajzen, 1991) as a suitable model on which to build such an intervention. The chapter goes on to review the applications of the theory of planned behaviour in driving in order to identify potentially modifiable constructs associated with driving behaviour intentions and offer recommendations for a behavioural intervention programme designed to safely extend driving mobility.

The chapter concludes with the main aims and hypotheses of the research and a summary of the thesis structure.

### **1.3. The Changing Driving Population**

Driving behaviour has been widely studied, primarily with a view to reducing the human and economic losses associated with collisions. Therefore attention has focused on male, in particular younger male, driving behaviours due to higher crash risk and perceived problem behaviours (Bédard, Guyatt, Stones & Hirdes, 2002; Kweon & Kockelman, 2003; Lonczak, Neighbors & Donovan, 2007; Parker, D., West, R., Stradling, S. & Manstead, A., 1995b; Siren & Hakamies-Blomqvist, 2004). As such, factors affecting driving behaviour amongst women and in particular older women have been under-researched.

However, the driving population is changing. Since 1975, the number of British driving licence holders has almost doubled from 19.4 million to 35.3 million people (Department for Transport, 2010). Whilst population growth has led to an increase in the absolute numbers of drivers on the roads, changing demographics and cultural expectations mean that some groups of drivers, for example, older people and women are better represented now than in previous decades.

Sustained low fertility rates and improved longevity means that the general population and subsequently the driving population are ageing, with older people comprising the fastest growing sections. Older people are traditionally defined as 65 years and over with the 'oldest old' above 85 years of age. This means that the balance of the driving population is changing. Lower birth rates coupled with the high cost of lessons, insurance and buying a car, as well as the increasing difficulty of passing the theory and practical driving tests mean that fewer younger adults (aged between 17 and 29 years) are learning to drive in comparison with previous cohorts (Department for Transport, 2010).

In addition, the expectations of older people are changing. Older people are generally more active than previous generations and anticipate that they will continue to drive into their old age (Holland, 2001). In conjunction with reductions in mortality rates this means that drivers tend to retain their licences for longer. In 2008, the DVLA estimated that there were over two million people in the UK aged over 70 years who held a driving licence and this figure was estimated to

rise to 4.5 million by 2015 (Noble, 2000). Certainly, large increases in the proportion of older people holding a full driving licence are apparent in recently issued statistics. The Department for Transport (2010) reported that between 1975 and 2010, the proportion of adults aged over 70 years holding licences increased from 15% to 57% and that the changes in the proportion of female drivers in the same time frame from 4% to 41% was particularly notable. Further, a recent press release on behalf of the Institute of Advanced Motorists, suggested that there are now over one million drivers aged over 80 years in the UK who hold a driving licence (Institute of Advanced Motorists, 2012).

#### **1.4. Women Drivers**

Traditionally, driving has been considered a male domain and women, especially older women have been somewhat marginalized as drivers by virtue of societal and cultural expectations, driving imagery and transport behaviour (Siren & Hakamies-Blomqvist, 2005). Historical conceptions regarding gender appropriate ways of behaving meant that some cohorts of older women have never learnt to drive and instead relied on their partners to chauffeur them. Berger (1986) argues that this is because women have been negatively stereotyped as drivers and although this may have occurred for serious social reasons, i.e. to maintain the status quo of women as homemakers and carers after the First World War (Wachs, 1996), the consequences of these stereotypes can still be observed in modern life.

Jokes about “women drivers” commonly reflect the view that women are poor or deficient drivers (Ekehammer, Akrami & Araya, 2000). However, this is an unfairly laid charge for two reasons. Firstly, research focusing on female drivers is limited (Lonczak *et al.*, 2007) and secondly, the evidence that is available suggests that women are less crash prone than men and commit fewer driving offences. In their review of the contribution of individual factors as causes of road traffic collisions, Lancaster and Ward (2002) noted that men were consistently reported as being involved in a greater number of collisions than women which were often of a more severe nature than the types women experienced. Further that their first crash was

encountered earlier in their driving career than women's and was more likely to be their fault (Waller, Elliott, Shope, Raghunathan & Little, 2001). Similarly, men tend to commit driving offences earlier in their driving career (Lancaster & Ward, 2002) and are approximately twice as likely as women to commit driving offences in any given year (Lancaster & Ward, 2002; Waller *et al.*, 2001). However, the types of crashes experienced by the genders are different. Whilst male collisions are more likely to be brought about by risk taking behaviours including road and traffic violations such as speeding and drink driving (Lancaster & Ward, 2002), female collisions tend to be a result of perceptual or judgemental errors (Elander, West & French, 1993; Norris, Matthews & Riad, 2000).

Since women are the relatively 'safe' gender on the roads, why then are there imbalances in the proportions of male and female drivers? Recent government statistics report that fewer women than men drive at all ages, fewer women than men are the primary driver of the household car and fewer women own their own vehicle as compared with their male counterparts (Department for Transport, 2010; Polk, 1998; Rosenbloom, 2000).

Traditionally, driving imagery has excluded female involvement. "Masculine" images of speed, status and power have dominated (Berger, 1986; Scharff, 1991; Siren & Hakamies-Blomqvist, 2005) but historically these images did not fit well with societal expectations of women and in particular, older women (Siren & Hakamies-Blomqvist, 2005). Although such traditional views have altered, "masculine" imagery and language remains in driving, with emphasis given to vehicle performance and speed. One example can be found in vehicle marketing where campaigns for small cars are aimed at both genders, despite their primary consumers being women. The reason being that whilst male branding does not deter female car buyers, overtly feminine branding may estrange male consumers (Brownsell, 2008).

Although there are current disparities in the numbers of male and female licence holders by age, it may be that these are cohort related discrepancies rather than a persistent gender association. As cohorts of women with different expectations of driving mature, both in terms of firstly

becoming a driver and secondly driving well into old age, the absolute and relative numbers of women holding a driving licence is expected to increase (Burkhardt & McGavock, 1999). Certainly, the cohort effect on driver licensing appears to be diminishing over time since the difference in proportions of male and female licence holders is much smaller in younger sub-groups of drivers than in older sub-groups (Department for Transport, 2010). For example, the percentage of male and female full driving licence holders in 2010 was respectively, for drivers aged 17-20 years 35% male, 34% female; 21-29 years, 66% male, 60% female. The differences in proportions between the genders here are relatively small. However, in older sub-groups of men and women, for drivers aged 60-69 years and over 70 years, the difference in proportions are much greater, respectively 89% male, 69% female and 78% male and 41% female (Department for Transport, 2011).

Although the gender differences in older driver licensing statistics can be partially explained by social and cultural expectations, researchers have also demonstrated that practising female drivers tend to stop driving at an earlier age and while in better health than men (Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). Further, a number of studies have demonstrated that women are also more likely than men to 'self-regulate' their driving behaviour, i.e. to demonstrate behavioural precursors of driving cessation. Driving cessation is a gradual process (Hakamies-Blomqvist, 1998) during which older drivers perceive that they are increasingly more vulnerable to risky and difficult driving situations and consequently they reduce, restrict or limit their driving in such conditions in order to offset the risks whilst maintaining independent mobility (e.g. Bauer *et al.*, 2003; Charlton *et al.*, 2006; Donorfio *et al.*, 2008; Kostyniuk & Molnar, 2008).

Changes in driving patterns, specifically premature driving cessation and driving restrictions can be detrimental to older people's social engagement and wellbeing. Early driving cessation can produce negative social and psychological consequences. Older people are often reliant on their cars and driving is important in maintaining autonomy and self esteem (Adler & Rottunda, 2006). Conversely, driving cessation and loss of mobility have been associated with a sense of

lost independence (Yassuda, Wilson & von Mering, 1997), increased loneliness and social isolation (Marottoli, Mendes de Leon, Glass, Williams, Cooney & Berkman, 2000), clinically significant depression (Marottoli, Mendes de Leon & Glass, 1997) and increases in depressive symptoms (Fonda & Herzog, 2001a).

Paradoxically, it is older women who may be in most need of their vehicles since they have a greater chance of experiencing chronic health conditions, particularly those that impair mobility than men. For example, disability in women has been shown to be more frequently related to chronic but non-fatal health conditions such as arthritis, back problems or depression, whereas disability in men is more frequently related to potentially terminal cardiovascular conditions and lung diseases (Arber & Cooper, 1999; Leveille, Penninx, Melzer, Izmirlian & Guralnik, 2000; Orfila *et al.*, 2006). Such health conditions in women can make the use of public transport (e.g. climbing on buses and walking) difficult.

Given that women tend to live longer than men and are more likely to live on their own (Arber & Cooper, 1999; Rosenbloom & Winsten-Bartlett, 2002), when they stop driving, they may be at greater risk of the social isolation and negative health effects than men. Further, even female drivers who give up driving and still have a spouse available to chauffeur them may be at risk of aggravating depressive symptoms (Fonda & Herzog, 2001a) and so, it appears that it is not loss of access to essential services and social activities that results in negative health effects but loss of independent mobility.

It is clear that there is a requirement for research to focus on female drivers. Demographic changes in the population and expectations about driving in younger women have resulted in significant increases in the numbers of women drivers. However, women apparently choose to stop driving earlier in life than men, effectively putting themselves at risk of mental health problems and social isolation. Good mental health and social integration are important for general wellbeing and the prevention of dementia and other health problems associated with ageing (Fratiglioni, Paillard-Borg & Winblad, 2004). It is also apparent that research directed at

female drivers should promote strategies to prevent premature driving cessation and reduce restrictive driving practices while encouraging safe behaviour. An intervention targeting the concerns of women drivers may be successful in encouraging positive driving habits and reducing the negative health and social consequences associated with loss of independent mobility and could play a significant role in public health policy. To date, there have only been a few interventions targeted at older drivers and none have specifically been targeted at the concerns of women drivers. So far, intervention programmes have been primarily aimed at the promotion of older drivers' safety through behaviour adaptations, i.e. encouraging self-regulation. These interventions and associated safety campaigns will be described in greater detail later in this Chapter.

## **1.5. Driver Behaviour**

Driver behaviour is created by the interaction of a complex network of factors. Models of driver behaviour often emphasise the role of cognitive abilities (e.g. Anstey, Wood, Lord & Walker, 2005; Michon, 1985; Rasmussen, 1986) in driving including aspects such as motivation, risk assessment capabilities, hazard awareness, attention and workload. However, there are other relevant factors including driving experience, driver training and personality traits as well as more changeable issues such as personal health, stress, fatigue and mood.

Given the complex nature of the driving task, a variety of models have been proposed to account for driver behaviour and a variety of instruments have been developed to measure various demographic and behavioural aspects of interest. However, two areas of driver behaviour are of particular interest to this research. Driving style, which is an established and habitual pattern of behaviour, and self-regulation which encompasses a spectrum of behaviours assumed to assist older drivers in remaining mobile for longer. The following sections describe these behaviours in more detail.

There is a long tradition of the use of self-report questionnaires assessing personal risk factors, attitudes, cognitions and driving beliefs. Some examples are the Driver Behaviour Inventory (DBI: Gulian, Matthews, Glendon, Davies & Debney, 1989), the Driver Behaviour Questionnaire (DBQ: Reason, 1990), the Driving Style Questionnaire (DSQ: French, West, Elander & Wilding, 1993), the Driver Coping Questionnaire (DCQ: Matthews, 1996) and the Driver Stress Inventory (DSI: Matthews, Desmond, Joyner, Carcary & Gilliland, 1997). While these instruments are useful, they do not sufficiently capture the diversity of driving styles and the cognitive and emotional influences on behaviour in a single measurement scale. One instrument which purports to do that is the Multidimensional Driving Styles Inventory (MDSI: Taubman-Ben-Ari, Mikulincer & Gillath, 2004).

### **1.5.1. Multi-Dimensional Driving Styles Inventory (MDSI)**

The Multidimensional Driving Styles Inventory (MDSI: Taubman-Ben-Ari *et al.*, 2004) was created in an attempt to synthesise the existing measures of driving style into a single multidimensional measure. Driving style is influenced by attitudes and beliefs, as well as more general needs and values (Elander *et al.*, 1993) and refers to the way drivers habitually choose to drive and is an established pattern of behaviour encompassing risky decision making (e.g. speed choice, overtaking behaviours), habitual levels of attentiveness and attitudes to other road users (Elander *et al.*, 1993; Taubman-Ben-Ari *et al.*, 2004).

Following a review of the existing measures of driving styles, e.g. the DBI (DBI: Gulian *et al.*, 1989), the DBQ (DBQ: Reason, 1990), and the DSQ (DSQ: French *et al.*, 1993), Taubman-Ben-Ari *et al.*, (2004), noted that most driving-specific factors could be integrated into four broad domains (a) reckless and careless driving style which refers to deliberate violations of driving rules and sensation seeking while driving, (b) anxious driving style which relates to distress and tension in the driving task, (c) angry and hostile driving style which examines aggression and the prevalence of hostile acts (i.e. road rage) towards other road users, (d) patient and careful driving style which is considered an adaptive and safe style and incorporates patience, care, courtesy and traffic regulation obedience. A scale was constructed using existing items from validated measures and newly generated items. The scale was tested for validity and reliability using a mixed sample ( $N=328$ ) of Israeli drivers and the final instrument generated.

The validated MDSI (MDSI: Taubman-Ben-Ari *et al.*, 2004) consists of 44 statements relating to eight driving styles. These are (i) dissociative, which measures distractibility (ii) anxious driving, which reviews distress and lack of confidence (iii) risky driving which looks at sensation seeking and risky decisions (iv) angry driving which reviews aggression and hostility towards other drivers (v) high-velocity driving which looks at orientation towards high speed driving (vi) distress reduction which examines engagement in relaxing activities when driving (vii) patient driving which looks at courtesy toward other drivers and finally (viii) careful

driving style, which refers to planning and problem solving in the driving task. Given that each driver will display different dimensions of each style, driving style can be considered a continuous variable.

Reliability and validity studies and other work using the MDSI (e.g. Holland, Geraghty & Shah, 2010) have associated gender, age and personality differences with driving styles. Taubman-Ben-Ari *et al.*, (2004) found significant gender differences with women more likely to adopt dissociative and anxious driving styles while men were more likely to adopt careful driving styles. The findings were supported in women by Holland *et al.*, (2010) who noted in a sample of young drivers (N=222, range =18-29 years) that women were more likely to report higher scores for dissociative, anxious and patient driving styles than men. Holland *et al.*, (2010) also determined that young men were more likely to report risky, angry and high velocity driving styles which does not support Taubman-Ben-Ari *et al.*'s, (2004) gender related findings but may be explained by reference to age effects in driving style.

Given that maladaptive driving tends to diminish with age, it is not surprising that Holland *et al.*, (2010) noted significant statistical relationship between risky, angry and high velocity styles in younger men. Taubman-Ben-Ari *et al.*, (2004) found a similar effect in that age was inversely correlated with dissociative, angry, anxious, risky and high velocity driving styles and positively associated with careful and patient styles.

The MDSI styles have also been shown to be related to personality traits, weekly distance travelled (in km), crash history and driving violations (i.e. offences). For example, in their validation study (N=328), Taubman-Ben-Ari *et al.* (2004), noted that sensation seeking was associated with the maladaptive, risky and high velocity driving styles, as well as being linked with prior involvement in car crashes and associated with driving violations. High self-esteem was positively correlated with careful and patient driving styles reflecting adaptive and safer driving behaviour while low self-esteem was associated with dissociative and risky driving styles. Lower scores for extraversion were related to dissociative driving and an anxiety style.

Similarly, low weekly distances driven were associated with an anxious driving style. Further, in their follow-up validation study using 150 Israeli students, Taubman-Ben-Ari *et al.*, (2004) demonstrated that trait-anxiety measured using the state trait inventory (Spielberger, Vagg, Barker, Donham & Westberry, 1980) was linked with high scores for both anxious and dissociative driving styles while lower trait anxiety was associated with careful and patient styles. Finally, a need for control was associated with angry and careful driving styles.

In a more recent study, Taubman-Ben-Ari and Yehiel (2012) tested the relationships between driving styles and the Big-Five personality factors (John & Srivastava, 1999) as well as the perceived costs and benefits of driving in a study using 320 (150 men and 170 women) Israeli drivers. In this study, the eight driving styles were combined to create four domains of driving. Risky and high velocity styles were amalgamated to create the 'reckless' factor, a combination of careful and patient styles resulted in the 'careful' factor, dissociative driving, distress reduction and anxious driving styles were assembled into the 'anxious' factor while the 'angry' style remained alone. Confirming previous findings, men and younger drivers were more likely to adopt reckless and angry styles. The anxious style was adopted more by women and drivers lower in conscientiousness and higher in neuroticism. Further, this style was related to all four measured domains of perceived costs of driving – distress, damage to self-esteem, annoyance and life-endangerment and inversely related to pleasure in driving. Finally, women and older people were more likely to endorse the careful driving style. The authors suggest that given the links between a careful style and personality factors such as agreeableness, conscientiousness and openness, the people who adopt this style are “more aware of other people’s well being and less preoccupied with their own worries and anxieties” (Taubman - Ben-Ari & Yehiel, 2012 p421). The results from the various applications of the MDSI suggest that it can be successfully used to assess individual differences in driving styles. Its value to this present research lies in the fact that it is a short, valid and reliable instrument capable of discriminating between sub-groups of drivers in terms of age, gender and attitudes. This should assist in identifying any differences in style resulting from risk perceptions or feelings of vulnerability in women drivers

across the lifespan. Further, the MDSI is an appropriate measure for this present research in that it recognises cognitive and emotional influences on driving behaviour.

### **1.5.2. Self-Regulation**

Self-regulation has been widely researched in ‘older’ drivers (e.g. Adler & Rottunda, 2006; Baldock, Mathias, McLean & Berndt, 2006; Ball, Owsley, Stalvey, Roenker, Sloane & Graves, 1998; D’Ambrosio, Donorfio, Coughlin, Mohyde & Meyer, 2008; Kostyniuk & Shope, 1998) as a potential behavioural mechanism for safely extending driving mobility and independence in an ageing population.

There are substantial projected increases in the numbers of older drivers in the next twenty years (Bray, 2007; Burkhardt & McGavock, 1999) and this has implications for road safety and transport policy. Inevitably an increase in the number of older drivers raises questions about their road safety. However, there is only very limited evidence to suggest that older drivers are at risk on the roads. Older people have proportionately fewer crashes than most other age groups (Berry, 2011) and generally maintain low risk. However, once distance travelled is taken into account, older drivers aged over 75 years do have a greater crash rate per kilometre driven (Frith, 2002; Lyman, Ferguson, Braver & Williams, 2002) and are at greater risk of being killed or seriously injured in the event of a severe crash due to increased frailty (Gandolfi, 2010). Unusually, drivers who are aged over 80 years, or who drive less than 2000 miles a year are at a slightly greater risk of crashes and this is likely to be related to a lack of driving practice (Box, Gandolfi & Mitchell, 2011).

Since older drivers are not generally considered a ‘high risk’ subgroup of road users, why then is there interest in self-regulation as a method of safely extending independent mobility? Generally self-regulation has been viewed by researchers as a positive, coping strategy for ‘older’ people to compensate for some physical, cognitive or functional impairment by purposely reducing, restricting or limiting their driving in order to maintain independence but reduce their crash risk (e.g. Baldock *et al.*, 2006; Ball *et al.*, 1998; Hakamies-Blomqvist &

Wahlström, 1998). By reducing or restricting driving to self-identified circumstances where they feel safe and in control, the view is that older drivers can continue to drive for longer and thus defer the negative outcomes associated with driving cessation.

Although physiological and functional impairments can happen at any time, there is a general correlation with the ageing process. As people age, there are a number of changes that occur which can influence driving competency. These include reduced reaction times, changes in vision and hearing, and loss of muscle strength and flexibility. In addition, older drivers may have to manage chronic health conditions, such as arthritis and depression, and take medication which may be contraindicated in driving (Holland, Handley & Feetam, 2003). In order to manage and compensate for these changes, it has been suggested that older drivers deliberately alter their driving habits and adopt self-regulation strategies.

Generally, there is agreement that self-regulation is a precursor to driving cessation and customarily, it has been defined as a self-imposed, restrictive change in driving habits. Self-regulation can be thought of on a continuum (Lyman, McGwin & Sims, 2001). The spectrum runs from complete driving independence through voluntary reduction of driving exposure, e.g. fewer trips and reduced distances (Charlton *et al.*, 2006; Marottoli & Richardson, 1998), as well as avoidance of challenging driving circumstances in particular unfamiliar routes, poor weather conditions and heavy traffic; (Baldock *et al.*, 2006; Ball *et al.*, 1998; Charlton *et al.*, 2006). The spectrum ends with complete driving cessation.

In order to view self-regulation as a compensatory coping strategy, it must be assumed that the older driver has reduced competence in the driving task, that they are aware of their limitations and that the adjustments they make adequately match their reduced capacities. In these cases, the driver makes a conscious choice to reduce their risk by avoiding challenging driving situations. For example, a person with impaired vision may consciously choose to avoid driving at night because they are aware that this may compromise their safety.

Eberhard (1996) proposes that many older drivers do indeed self-regulate adequately, compensating for age-related declines by being cautious, reducing their driving and regulating where and when they drive. In support, Rabbitt *et al.*, (2002, p1) stated that “older drivers are sensitive to the effects of their ageing and their general health on driving competence, and that their perceptions of these effects do significantly alter their driving behaviour”. Other authors (e.g. Kostyniuk & Shope, 1998; Persson, 1993) have noted that drivers with visual difficulties recognise that they should reduce their driving at night or in poor weather. In terms of recognising impaired cognitive functions, Hakamies-Blomqvist and Wahlstrom (1998) and Ball *et al.*, (1998) both demonstrated that older drivers tended to avoid manoeuvres in complex traffic environments suggesting some compensatory mechanism.

Conversely, Holland and Rabbitt (1992) noted that some older drivers do not adequately compensate for age-related changes in vision when driving until they are made aware of their deficiencies. Further, Rabbitt *et al.*, (2002) found that decisions requiring perceptual judgements, such as judging gaps in traffic or the speed of oncoming traffic were not recognised by older people as being influenced by age-related decline. These findings suggest that some older drivers may not appropriately recognise age-related declines in functional abilities affecting driving and as such may not appropriately self-regulate. Moreover, Holland (2001) argues that in some instances, self-imposed restrictions are not sufficiently effective to compensate for age-related declines. Indeed both Owsley (1991) and Ball (1993) found that older drivers with visual and cognitive impairments were at greater crash risk than those without such impairments, despite the impaired group reporting that they self-regulated or avoided difficult driving situations. In some circumstances, by deliberately avoiding certain situations, drivers have less practice and become less effective which results in skill attenuation (Berry, 2011) and potentially, an increased crash risk.

Although self-regulation can be considered a positive coping strategy to reduce crash potential in impaired drivers, where a person is not impaired, such behavioural changes may be termed ‘over-regulation’ and could simply promote the negative health and social consequences

associated with driving reduction and cessation. In these instances, what has previously been considered an active and positive coping strategy may, in fact, be detrimental to personal wellbeing and could be considered a form of avoidance coping. In such cases, it is unlikely that self-regulation has been adopted in response to a loss of function and may instead be used as a sensible general risk reduction strategy (Charlton *et al.*, 2006) or a coping mechanism in response to feelings of vulnerability, e.g. following a traumatic experience such as a crash (Blanchard, Hickling, Taylor, Loos & Gerardi, 1994).

There are several reasons why measures of self-regulation provide a useful framework for examining female driver's behaviour. Firstly, it has been widely recognised as a useful compensatory coping mechanism and a means of reducing risk while maintaining mobility in older drivers. Secondly, it describes a range of techniques and potential strategies for drivers to adopt in driving which may assist in establishing individual and group differences in drivers' behaviour. Finally, it has been associated with behavioural changes after collisions and as such may reflect a potential source of over-regulation and premature driving cessation in older, female drivers.

The next sections review the demographic and personality factors implicated in self-regulation behaviours.

#### **1.5.2.1. Self-Regulation and Age**

Studies in 'older' drivers reveal that the extent of self-regulation varies between individuals and that complex interactions exist between age, gender, health status and driving confidence which influence self-regulatory driving practices. The definition of 'older' varies between studies with inclusion criteria ranging from 50 to over 70 years of age. As might be expected given an almost 30 year age range, with its incumbent diversity and likely differences in drivers' health status, driving habits and even social and working patterns, there is considerable variation in the manner and degree of reported self-regulation between studies.

It is generally perceived that self-regulation increases with age. Evidence for this *per se* is limited. However, there is evidence that self-regulation increases with age under certain challenging circumstances. For example, Bauer *et al.*, (2003), found that the odds of driving less under certain adverse circumstances (e.g. at night, in rush hour and on long trips) were associated with age in a U.S. sample of 300 drivers aged between 63 and 89 years. Although these findings may reflect self-regulation compensatory mechanisms, for example changes in visual acuity leading to reduced night time driving, they may also reflect lifestyle changes, i.e. a reduced need to travel to work during rush hour or make long commutes. Further, this sample, albeit large, was a relatively homogenous sample of well-educated older adults recruited through a driver education programme.

Similarly, Charlton *et al.*, (2006) in a review of 656 Australian drivers' views about self-regulation, noted that drivers aged over 75 years were significantly more likely than younger sub-groups (aged 55-64 years and 65-74 years) to adopt avoidance behaviours at night, when raining at night and when merging into traffic. Again these results show a compensatory theme in terms of visual function and decision making. The avoidance rates in this study were slightly lower than those reported previously by other authors. Between 6 and 26% of the sample reported that they intentionally avoided specific driving situations, the most commonly avoided being driving at night (25%), driving at night in the rain (26%) and in busy traffic (22%). Hakamies-Blomqvist and Wahlstrom (1998) reported that around 30% of men and around 35-40% of women aged over 70 years avoided driving at night and in busy traffic. Similarly, D'Ambrosio *et al.*, (2008) reported avoidance levels within their sample of drivers aged over 50 years of 32% at night and around 42% in heavy traffic. Although difficult to deduce from the histograms, Ball *et al.*'s (1998) findings in drivers aged over 55 years appear to show avoidance rates at night as high as 80% and during rush hour of up to 90%.

Donorfino *et al.*, (2008) determined that self-reported, expected self-regulation increased with age in a very large (N=3824) U.S. market research panel recruited sample of drivers aged between 50 and 85 years of age. Their results indicated that increases in age corresponded with

increases in self-regulation but that changes in driving habits were of most note in drivers aged 70 years or older. The authors also found that the degree of self-regulation differed based on health status and as would be expected, self-regulation decreased when people were in better health. Consequently, an 85-year-old woman in excellent health regulated her driving to the same extent as a 70 year old man in poor health. The findings here suggest that there are links between age and self-regulation avoidance but that these are tempered by health status.

#### **1.5.2.2. Self-Regulation and Gender**

Another demographic factor in self-regulation which has been explored and is perhaps the most salient and consistent predictor of self-regulation is gender. Undoubtedly, women adopt more restrictive driving habits than men (e.g. Bauer *et al.*, 2003; Charlton *et al.*, 2006; Hakamies-Blomqvist & Wahlström, 1998; Kostyniuk & Molnar, 2008) and are more likely to self-regulate by not driving than men (Kostyniuk & Molnar, 2008)

In an adequately sized sample, Bauer (2003), found that women drove less frequently than men, were 75% more likely to have reduced night driving than men, were twice as likely to have reduced motorway driving than men and were also significantly less likely to drive on long trips or in bad weather. Similarly, D'Ambrosio *et al.*, (2008) reported that women consistently reported higher levels of driving avoidance than men in seven challenging driving circumstances (at night, at dusk/dawn, on highways/freeways, in heavy traffic, in poor weather, on long distances and in unfamiliar areas). When scaled to create an index of self-regulation, there were significant differences in male and female mean scores with women self-regulating to a greater extent. Further Charlton *et al.*, (2006) determined, using regression modelling, that gender was a significant predictor of self-regulation behaviour, with women more likely to avoid driving than men. With the benefit of a large research sample of drivers aged over 55, Donorfino *et al.*, (2008, p559) reported that “even the youngest female respondents perceived themselves to be limiting their driving more than men do”. Finally, in a relatively recent study, following telephone interviews with more than 1000 drivers aged over 64 years, Kostyniuk and

Molnar (2008) reported that gender was a more significant determinant of self-regulation than either age or health status.

The reasons for the differences in male and female self-regulation behaviours have not been fully explained. To date, they have been described as a cohort effect, since the older generation of women have not traditionally been the main household driver, and so may have less experience than their male counterparts and therefore feel less confident when driving (Kostyniuk & Shope, 1998). If this is the case, then the gender differences in self-regulation should diminish as younger generations of female drivers mature.

Several studies have demonstrated that older cohorts of women have less driving experience than their male counterparts (e.g. Marottoli, Ostfield, Merrill, Perlman, Foley & Cooney, 1993; Rosenbloom, 1993), but the effects of experience on self-regulation behaviours have not been fully explored. This is not surprising given the population under scrutiny. Accurate assessments of duration of driving experience are difficult to obtain and are generally aggregate estimates of time since licensure by age (McCartt, Shabanova & Leaf, 2003). Consequently, older people of the same age tend to have relatively similar levels of experience. Some researchers have managed experience differences by recruiting only experienced participants (e.g. >10 years driving experience: Baldock *et al.*, 2006). This assumes that drivers achieve a level of competence after an elapsed period of time but does not account for differences in driving patterns (e.g. amount of driving).

Hakamies-Blomqvist and Siren (2003) reviewed driving habits in a sample of Finnish women drivers and recent ex-drivers aged over 70 years. They determined that the current drivers had been more active and driven greater distances throughout their driving career than those women who had chosen not to renew their licences. They concluded that women with an active driving history and “male like” habits (Hakamies-Blomqvist & Siren, 2003, p383) were more likely to continue driving later in life. However, since this research did not measure self-confidence, no links could be drawn between driving experience and self-confidence.

### **1.5.2.3. Self-Regulation and Confidence**

The effects of self-efficacy and confidence and on self-regulation have been found in a number of studies. Self-efficacy is defined as “beliefs in one’s capabilities to organise and execute the courses of actions required to produce goal attainment” (Bandura, 1997, p.3) and is measured by asking people how confident they are in achieving a specific behaviour (George, Clark & Crotty, 2007). In terms of the driving literature, the terms have to some extent been used interchangeably.

To date, self-efficacy has only been measured in older drivers. Stacey and Kendig (1997) revealed that low self-efficacy scores were associated with driving cessation in older drivers. While Rabbitt and Parker (2002) determined that low self-efficacy was associated with a reported high level of driving violations. The reliability and validity of driving self-efficacy measures used in these studies was not reported.

In a U.S. based study, Marottoli and Richardson (1998) found that low confidence, assessed using a specifically developed, ten point rating scale reviewing confidence in ten challenging driving conditions (at night, in bad weather, in rush hour or heavy traffic and parallel parking) was associated with reduced driving frequency and mileage in a sample of drivers aged over 77 years. Charlton *et al.*, (2006) reviewed self-regulatory driving practices, focusing on avoidance behaviours, in Australian drivers aged over 55 years, and although avoidance rates were low across the sample, they found that driving confidence (in a range of potentially difficult driving situations) was strongly predictive of avoidance behaviour in the same situations. Despite a moderately sized sample (N=68) of drivers aged over 65 years in a driver assessment programme and low levels of reported driving avoidance, Molnar and Eby (2008) also found evidence of gender effects in avoidance behaviours which they speculated may be related to reduced self-confidence in female drivers. Certainly there was evidence for a self-confidence hypothesis in the raw data which was not supported by statistical analyses.

Studies have also reviewed the effects of confidence and self-regulation on actual driving ability. Baldock *et al.*, (2006) investigated whether self-regulation was related to actual driving ability in a community sample of 90 older drivers, aged between 60 and 92 years . Self-regulation was measured using a questionnaire, which contained items about confidence in difficult driving situations (e.g. in the rain, during rush hour) as well as avoidance of the same situations; the ease of avoiding such situations and any barriers to driving (e.g. lifestyle, need to drive others, lack of public transport and lack of availability of family or friends). Driving ability was measured using an on-road assessment and involved undertaking increasingly difficult manoeuvres in increasingly challenging traffic conditions. They found that where self-reported driving confidence was low, there was a high avoidance of easily avoided but challenging driving tasks (e.g. parallel parking and driving at night in the rain). The authors also determined that poor performance in the driving test was not related to general avoidance of difficult driving situations. These findings suggest that older drivers may not appropriately self-regulate their driving since reduced competence does not result in higher avoidance. One limitation of this study was that although participants were asked to report their level of self-regulation in a variety of challenging driving situations, the driving test did not actually assess their ability in all of these circumstances. The authors acknowledge that this limitation may have resulted in an under-estimation of the true relationship between driving ability and avoidance.

Other studies have reviewed the relationship between self-regulation and perceived driving ability. In Canada, Blanchard and Myers (2010) examined the driving patterns of a moderate size sample (N=61) of older drivers (aged 67 to 92 years) using both self-reported (trip logs, daily diaries, questionnaires) and objective measures of actual behaviour. The triangulated results of the self-report measures and in-vehicle recording devices demonstrated that perceived poor driving ability was associated with self-imposed driving restrictions. However, the study did not test driving ability objectively. Interestingly, participants generally over-reported their mileage and level of self-regulation in comparison with their actual behaviour across a range of

20 challenging circumstances. For example the whole sample made turns across traffic, despite three participants noting that they usually avoided this manoeuvre. Actual and self-reported behaviour did correspond in three circumstances, night driving, night driving in bad weather and driving on highways with three or more lanes and at speeds of 100km/hr or greater. The authors noted that self-reported driving practices should not be taken at face value even though some driving patterns were consistent with self-reported practice.

#### **1.5.2.4. Existing Measures of Self-Regulation**

Self-regulation has often been conceptualised as driving avoidance. As such, existing measures focus on avoidance behaviours (e.g. Baldock *et al.*, 2006; Donorfio *et al.*, 2008) which tend to be based on adaptations of the difficulty scale of the Driving Habits Questionnaire (DHQ: Owsley, Stalvey, Wells & Sloane, 1999) or are derived from a cumulative measure of drivers' self-reported avoidance scores for a range of challenging circumstances. In the latter case, the origin of the challenging circumstances is not always apparent.

The DHQ scale was developed to assess the differences in driving habits between older drivers with cataracts and those without. The scale consists of 8 items assessing the level of difficulty drivers have had with certain challenging driving circumstances in the last three months, e.g. 'driving in rain', 'driving alone', 'parallel parking', 'making turns across oncoming traffic', 'driving on interstates or expressways', 'driving on high traffic roads', 'driving in rush-hour' and 'driving at night'.

In recent years, significant but inconsistent adaptations have been made to the scale, for example, Baldock *et al.*, (2006) added an additional item ('driving at night in the rain'), made changes to the time frame, e.g. extending it to one year, adapted the scale for a right-hand drive population and introduced a Likert scale from 1 "never" to 5 "always" rather than a yes/no response to the question "During the past year, have you avoided driving in...." to develop the Driver Mobility Questionnaire (DMQ). Other authors have removed items, e.g. 'parallel

parking' while supporting the use of a Likert type scale (Molnar, Eby, Scott Roberts, St.Louis & Langford, 2009; Ross, Clay, Edwards, Ball, Wadley, Vance, Cissell, Roenker & Joyce, 2009).

Sullivan, Smith, Horswill & Lurie-Beck (2011) used Baldock *et al.*'s (2006) modified DHQ in conjunction with the DBQ (Lawton, Parker, Manstead & Stradling, 1997) as a basis for reconsidering items used to measure driving avoidance in older Australian drivers (N=75). They suggested that the DHQ did not sufficiently represent all of the situations older drivers might choose to avoid and proposed a list of 24 items to measure driving avoidance, 9 of which were based on the modified DHQ.

For her MSc thesis, MacDonald (2007) significantly adapted and extended the DHQ scale to a 20 item measure of Situational Driving Avoidance which was to be used in conjunction with a Situational Driving Frequency (SDF: MacDonald, 2007; Myers, Paradis & Blanchard, 2008) questionnaire as a measure of older adults' driving confidence. The twenty items were 1) driving at night, 2) at dawn/dusk, 3) in bad weather (general), 4) in heavy rain, 5) fog, 6) at night in bad weather, 7) in winter, 8) in the first snow storm of the season, 9) trips lasting more than two hours, 10) unfamiliar routes/detours, 11) heavy traffic or rush hour in town, 12) rush hour on highways, 13) left hand turns with traffic lights, 14) left turn with no traffic lights/signs, 15) parking with lots of tight spaces, 16) on highways with more than 3 lanes or speeds over 100km/hr, 17) changing lanes on a highway with three or more lanes, 18) on 2 lane highways, 19) in rural areas at night and 20) driving with passengers who may distract you. The additional items were generated inductively from previous questionnaires although the specific derivation of items was not described. The intended audience of older adults was not involved in the scale development. Participants were asked to respond to questions on driving avoidance using a dichotomous (yes/no) scale. The scale reported very good levels of internal consistency (Cronbach's alpha = .89). Blanchard and Myers (2010) also used the same scale in their study reviewing the differences between self-reported self-regulation behaviours and actual driving behaviour using in-vehicle monitoring equipment.

Other self-regulation studies derive their measure of self-regulation from drivers' self-reported avoidance scores. D'Ambrosio (2008) asked drivers to rate their willingness to drive in a range of seven challenging circumstances (night, dusk or dawn, highways or freeways, heavy traffic, poor weather, long distances, unfamiliar areas) on a Likert type scale from 1 to 4, where 1 indicated that the participant was "absolutely never" willing to drive and 4 indicated that the participants' willingness to drive was not usually affected by the defined circumstances. The results from all items were scaled to create a score for self-regulation scale which was skewed towards the lower distribution but reliable (Cronbach's alpha = .91). Similarly, Donorfino *et al.*, (2008) used an identical measure of self-regulation in the same sample in their assessment of health, age and self-regulation behaviours.

Charlton *et al.*, (2006) also asked drivers to indicate whether they had intentionally avoided eleven specific driving situations (rain, merging, busy traffic, night, night when wet, changing lanes, intersection no [traffic] light, right turn no [traffic] light, right turn [traffic] light/no arrow, right turn [traffic] light/arrow and roundabouts) in the previous six months. However, no scale score for self-regulation was calculated, rather avoidance patterns were compared separately using summary (percentage) data and odds ratios by age and gender. In this study the authors also reviewed changes in travel patterns and driving habits in terms of distance, speed or quality.

While these studies focus exclusively on avoidance practices, three studies (Kostyniuk & Molnar, 2008; Molnar *et al.*, 2009; Stalvey & Owsley, 2000) have described self-regulation behaviours in a wider context. During a study on the efficacy of an intervention programme on older drivers' safety, Stalvey and Owsley (2000) reviewed self-regulatory practices in 365 older drivers, aged over 60 years. In this study, self-regulation was measured by asking participants how often they performed each of eight positive coping strategies (waiting until rain stops before driving, asking someone to travel with you, looking for a car park to avoid parallel parking, making right turns around the next block to avoid turning left across traffic, finding alternative routes to avoid motorways, choosing locations with the least amount of traffic,

driving at times other than rush hour, rescheduling activities to avoid driving at night). However, they also measured avoidance directly using the DHQ (Owsley *et al.*, 1999).

Kostyniuk and Molnar (2008), enquired about self-regulation in 961 older drivers using scenario based questions related to driving to an important appointment under three adverse conditions (rainy stormy day, having to use a freeway rather than a two lane road and driving a distance of over 200 miles to an unfamiliar area). Responses were measured in terms of a) cancelling the appointment, b) taking a bus, van or taxi, c) try to get someone else to drive you, d) try to get someone to ride with you, e) drive yourself but start earlier or f) drive yourself as usual. The first three responses are avoidance related while (d) and (e) constitute potential for wider self-regulation behaviours such as planning and having the social support of a passenger. The final option indicates a lack of driving modification.

More significantly for the present research, in a U.S. study, (Molnar *et al.*, 2009), piloted a new self-regulation questionnaire in a sample of 137 older drivers aged between 70 and 88 years. This questionnaire conceptualised self-regulation as a method of reducing and modifying driving exposure using a four level model of driver behaviour which focused on operational, tactical, strategic and life goals. Wider self-regulation behaviours were considered including: 1) Life changes such as moving home to be closer to destinations, giving up work and buying a new vehicle (Item  $N = 6$ ). 2) Reductions in driving exposure such as reduced trip frequency, mileage and length (Item  $N = 4$ ). 3) Driving avoidance which was measured using the modified DHQ (Baldock *et al.*, 2006) with additional amendments. The amendments included substituting 'bad weather' for 'rain', the removal of 'parallel parking' and the generation of two additional challenging circumstances - driving in unfamiliar areas and backing up [reversing], thus creating a 10 item avoidance scale. 4) Avoidance of in-vehicle distraction such as conversations, eating and talking on a mobile phone (Item  $N = 6$ ). 5) Planning and way finding strategies such as route planning, practice runs, trip combining and having a passenger assist with navigation (Item  $N = 5$ ). 6) Vehicle modifications such as the addition of mirrors, steering

knobs, hand controls, seating modification and satellite navigation (Item  $N = 5$ ). Items were generated inductively based on a literature review.

To explore self-regulation further, participants were also required to respond to scenario based questions about how often they had modified their driving behaviours in the past year under a specific set of thirteen circumstances, not all of which were challenging. For example in snowy conditions, in wet conditions, in heavy traffic, when they wanted to save fuel and when they wanted to save wear and tear on the vehicle. No gender differences were found but younger participants (aged 70-79) were more likely than older participants (80-88) to modify their behaviours to save fuel. The scientific basis for the generation of these scenarios was not apparent in the study methods.

The findings of this study do not demonstrate the usual gender differences in self-regulation behaviours and only find small variations in two individual items by age group. The authors suggest that this was to do with the generally high level of functioning within the sample and this was supported by the weekly mileage rates (around 90 miles per week).

Although this study extends the definition of self-regulation, the findings were somewhat limited due to the exploratory nature of the pilot study. Some data, notably self-regulation practices and driving avoidance statistics were collected using nominal/ordinal categories. That is, questions were answered by participants with a simple yes/no response, i.e. do you try to avoid driving at night? This resulted in limitations on the types of statistical analysis that could be legitimately conducted. The authors acknowledge the need for multivariate analysis in future studies. Further, the questionnaire was not assessed for measures of reliability (e.g. internal consistency or test-retest reliability) or validity. The questionnaire was long, taking approximately 30-45 minutes to complete and the authors note that factor analysis would assist in reducing the number of variables and simplifying the questionnaire. In conclusion, Molnar *et al's* (2009) study is seminal in that it extends the definition of self-regulation but the limitations described mean that there is scope for improvement and development.

### **1.5.2.5. Conclusions regarding self-regulation**

Clearly there are significant variations between self-regulation studies in terms of the definition of self-regulation, the measurement of self-regulation, the characteristics of self-regulation study participants, e.g. the definition of 'older', the gender balance and functional status, and the inclusion of potentially influential variables (e.g. confidence) which make it difficult to determine the true extent of self-regulation in this sub-group of drivers. However, what is apparent is that the reasons why people self-regulate are diverse. Although gender, age and health status are important, authors have noted that driving cessation, self-imposed driving restrictions and avoidance behaviours may be related to feelings about driving, for example self-perceptions of confidence in challenging driving circumstances and so perhaps it is differences in affective attitudes (emotions) that prompt gender trends in driving cessation.

Having explored driving style and self-regulation behaviour, the following sections describe how instrumental attitudes (cognitions) and affective attitudes (emotions) may be implicated in the decisions of older female drivers to regulate or stop driving, with an emphasis on risk perception and feelings of vulnerability.

## **1.6. Perception of Risk**

Risk perception is a complex psychosocial factor. It is considered as being conceptually close to the subjective probability of a negative event occurring. That is, individuals' decisions about risk are thought to be based on the cognitive process of evaluating the likelihood and severity of a negative outcome or event (e.g. Van der Pligt, 1996). Risk perceptions can influence the relationship between attitudes and behaviours (Loewenstein, Weber, Hsee & Welch, 2001; Tuokko *et al.*, 2007) and are believed to be an important determinant of preventative health behaviour.

There has been a substantial amount of research on perception of risk and the literature demonstrates that it is multifaceted. Estimates of risk perception tend to vary dependent on the

measure used, personal and cultural norms, subjective probability, the risk target, i.e. whether the risk is general or personal, and the degree of personal control over the risk (Sjoberg, 2000).

Risk perceptions vary considerably and are prone to bias (Van der Pligt, 1996). Although estimates of actual or objective risk are often strongly related to statistical data (Lichtenstein, Slovic, Fischhoff, Layman & Combs, 1978), when these are put into a personal context there is a tendency for people to underestimate high probability events such as traffic collisions and overestimate low probability events such as aeroplane crashes (Lichtenstein *et al.*, 1978; Sjoberg, 2000; Van der Pligt, 1996). Earlier authors (Van der Pligt, 1996) suggested that this could be related to the influence of subjective probability bias and heuristics, specifically the availability heuristic (Tversky & Kahneman, 1974). There was a view among the risk research community that ‘availability’ was important in reconciling the differences between actual and perceived risks. The suggestion was that risk exposure through media coverage resulted in a greater ‘availability’ or ability to picture a specific risk and consequently readily available risks would be overestimated (Sjoberg, 2000). Although the influence of the media on risk perception is still under scrutiny, the role of subjective probability has diminished and it is now considered only one of a number of factors affecting public perception of risk.

Public risk judgements are also affected by the risk target. For example, Sjoberg *et al.*, (1994) examined the relative risk judgements of a large Swedish sample. Participants were asked to rate the risk of 15 hazards (including AIDS, alcohol, radon, melanoma, smoking, traffic accident) to three risk targets – to themselves, to their family and to people in general. In all instances, personal risk was ranked lower than family risk which in turn ranked lower than general risk. This suggests that although people are aware of the relative risks of specific hazards, they tend to change their risk judgements when hazards are personalised (Van der Pligt, 1996). Sjoberg (1994) believes that this is an expression of risk denial also commonly referred to as unrealistic optimism, optimism bias, self-enhancement bias and illusory bias.

Various studies have shown that there is a tendency for people to underestimate their personal risk and this is also true in the field of driving research. Risk perception and driving risk have been widely researched, particularly in relation to individual differences in risk-taking behaviours and crash potential. Generally, drivers make overly optimistic judgements about risk and underestimate the likelihood of their potential for involvement in crashes (Matthews & Moran, 1986). However, personal experience of a specific risk, e.g. a car crash tends to reduce unrealistic optimism (Van der Pligt, 1996).

Many studies on risk perception in driving have used perceived relative crash-risk to a reference group as their dependent variable, i.e. a measure of comparative optimism. One issue with this is that the reference group varies considerably between studies and consequently direct comparisons are difficult. For example, studies have defined the comparison group as the 'average driver' (Guppy, 1993), 'average others' (Holland, 1993), the 'average UK driver' (Horswill, Waylen & Tofield, 2004), 'other people your age' (Harré & Sibley, 2007) and 'an average motorist of the same sex and age' (Gosselin, Gagnon, Stinchcombe & Joanisse, 2010). These differences have resulted in slightly differing views on the nature and prevalence of optimism bias (Weinstein, 1980), i.e. the tendency to believe that one is more skilled as a driver and less likely to experience a negative event (e.g. crash) than one's peers.

Despite acknowledging that their sub-group is high risk (Finn & Bragg, 1986), studies have shown that younger people believe that they are less at risk than others in their peer group (DeJoy, 1989). In a study of 158 New Zealand undergraduates, Harre and Sibley (2007), found both explicit (measured using questionnaire items) and implicit (measured using a computer based reaction time task) self-enhancement biases in driver ability which predicted crash risk optimism. Horswill *et al.*, (2004) also found an illusory bias in 181 UK based drivers with a mean age of 35.79. However, Glendon *et al.*, (1996), failed to demonstrate crash-risk optimism bias in a specific age-related subgroup of men aged between 45 and 60 years.

Spitzenstetter and Moessinger (2008) demonstrated that an optimism bias existed in older drivers although this finding was to some extent compromised by recruitment methods and affiliation with an insurance company. However, Gosselin *et al.*, (2010) independently repeated their study using a non-biased sample (N=394) divided by age into three groups (17-26, 27-64 and over 65 years) which supported the original findings. The results indicated that all three age groups exhibited comparative optimism but that the level of optimism was greatest when comparing themselves to older drivers. Consistent with other reports of gender effects in optimism bias, Gosselin *et al.*, (2010) reported that younger men reported greater levels of optimism than women in the same group.

Holland (1993) examined the extent of positive self-bias in 80 drivers aged between 50 and 79 and determined that people in their 50's showed no self-bias in terms of comparison with an average others of their own age but that they demonstrated significant self-bias when comparing themselves with younger (30s) and older (70s) reference groups. The author also found that self-bias decreased with age but increased with mileage.

Tuokko *et al.*, (2007) surveyed 86 Canadian citizens who had volunteered to attend a driving education class. None believed that they were any more crash prone than other drivers. Further, Freund *et al.*, (2005) found that 65% of drivers aged over 65 years (N=165) who had been referred for driving evaluation in the United States expected to perform better than other people of their own age on an objective driving test. In fact, 38% were deemed as unsafe. Drivers who rated themselves "a little better" than their peers were four times more likely to be judged as unsafe, relative to those who rated their ability as comparable to their peers. No participant suggested that they were worse than their peers.

In terms of gender, Guppy (1993) found crash-risk optimism bias in male drivers of all ages and in other studies, higher proportions of men than women consistently report that they have superior driving skills (e.g. DeJoy, 1992; Harré & Sibley, 2007). However, DeJoy (1989) found

an optimism bias for crash risk in college students but could not support significant age or gender differences.

While optimism bias is believed to have positive consequences for self-esteem in terms of giving individuals an illusion of control (McKenna, 1993) some researchers (e.g. McKenna, 1993; Svenson, 1981) have argued that it also fosters a sense of invulnerability in drivers which may mean that they are less likely to engage in self-protective behaviours. Van der Pligt (1996) suggests that this is due to the effect of denial on coping behaviours. Adopting an optimism bias is a form of avoidance coping in that individuals are in denial about the risks of their behaviour. Under high stress situations, denial can reduce feelings of fear, anxiety or worry. However, by denying or underestimating their risk, individuals fail to provoke the emotional response that would cause them to alter or reduce risky behaviours.

Risk perception is often measured in terms of comparative empirical risk and is generally considered a cognitive process with emotions deemed to be insignificant in the decision making process (Loewenstein *et al.*, 2001). However, some authors have suggested an alternative ‘risk as feelings’ hypothesis (Loewenstein *et al.*, 2001) which highlights the role of intuition and affect at the point of decision making. This view suggests an experiential system for risk perception that is linked by emotion and affect and results in fast, mostly automatic decisions about risk and behaviour (Slovic, Finucane, Peters & MacGregor, 2004). This theory allows for the fact that reactions to risk may differ from cognitive assessments of the risk and that risk reactions result “from emotional influences including feelings such as worry, fear, dread or anxiety” (Loewenstein *et al.*, 2001 p270).

The ‘risk as feelings’ hypothesis suggests that feelings or anticipatory emotions, i.e. visceral and immediate reactions to risk have a direct effect on behavioural choice (Loewenstein *et al.*, 2001). However, experimental evidence for this to date is limited. Sjöberg (1998) measured a range of risk judgements in a large sample (N=1224) of Swedish participants and examined these in relation to a general measure of worry which the author considered an emotional

reaction to risk. However, only a weak-modest correlation between the two constructs was determined. The author argued that more specific measures of risk related worry may have improved results. Kobbeltved *et al.*, (2005) also assessed general feelings of worry (using 2 items) and emotional distress using the impact of event scale (Horowitz, Wilner & Alvarez, 1979) in 156 military sailors whilst on an International operation. Although they did not include a direct behavioural measure, they noted that risk perception and feelings were related. Their results suggested that risk perceptions over time gave rise to feelings of worry but that perceived risk did not influence emotional distress.

The role of emotion in predicting driving behaviour has been explored to some extent within the field of fear of driving research. Fear of driving is common in the general population (Ehlers, Hofmann, Herda & Roth, 1994; Ehlers, Taylor, Ehring, Hofmann, Deane, Roth & Podd, 2007; Taylor, Deane & Podd, 2002) and is frequently acquired after a traumatic event such as a crash (Blanchard & Hickling, 1997).

Following interviews with fifty crash survivors, Blanchard *et al.*, (1994) found that almost all of them had changed their driving behaviour post-collision and although most were still driving on necessary business, they avoided travelling for leisure purposes due to fear for their personal safety. Thus it seems that emotion (i.e. fear) was directly contributing to behavioural choice. However, the longitudinal effects of these changes cannot be established from this study since these participants were recruited very soon after their crash (between one to four months) and were only interviewed once. Further, the participants had been medically treated as a result of the incident and so it may be that fear responses and emotions were heightened due to the severity of their experience and therefore not representative of a general population.

Similarly, in a self-report survey reviewing drivers' psychological and physical reactions following vehicle collisions, Lucas (2003) determined that the participants who had experienced a collision, reported greater personal safety concerns, worries about driving, stress and negative physical symptoms than non-collision involved drivers. A gender effect was also seen with

crash involved women reporting greater personal safety concerns than men. However, these emotional responses were not translated into behavioural choices about driving. Significantly for this research, the findings suggest that women have a greater affective response after an incident than men. The author concluded that these results “could be due to gender-specific perceptions and interpretations of safety issues” , Lucas (2003 p142). Implicit in this statement is the suggestion that women and men think and feel differently about risk.

Emotional responses to risk have not generally been considered in the driving literature in terms of their impact on driving behaviour and cessation. However, application of work from the fear of crime literature may assist in developing hypotheses for this thesis. The role of risk related feelings (i.e. fear) to crime has been widely reviewed as ‘feelings of vulnerability’. Feelings of vulnerability have a significant effect on certain socio-demographic groups such as women, older people, non-white ethnic groups and those with lower socio-economic status in that they tend towards a greater fear of crime (Joseph, 1997) and as a result of their feelings, these groups may change their everyday activities and alter their routines (Ferraro, 1995; Liska, Sanchirico & Reed, 1988). Since emotional responses to perceived risk of crime can negatively affect normal activity and restrict behaviour in a general population, it can be postulated that emotional responses to perceived risks in driving could similarly result in behavioural constraints such as self-regulation or early driving cessation. Further, demographic differences in feelings of vulnerability to crime may be applicable to driving behaviour and help to explain the gender differences in driving restriction and cessation patterns. Therefore, salient findings from the fear of crime literature are described in the next section.

### **1.7. Feelings of Vulnerability**

Feelings of vulnerability go beyond simple worries or concerns. They reflect an individual’s feelings about their susceptibility to potential harm (either physical or emotional) and as such can be thought of as an affective response to perceived risk (Klein *et al.*, 2011).

Although fear of crime, i.e. the emotional response to a risk of victimisation, varies across a number of individual characteristics; the most reliable predictor is gender (e.g. Akers *et al.*, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984) with women the most fearful.

One suggested explanation for this gender effect is that fear is determined by the actual risk of victimisation. However, there are discrepancies between women's reported fear and their patterns of victimisation (Pain, 1997) in that women consistently report high levels of fear but are generally less likely to be victimised. Conversely those most likely to be victimised (young men) have the lowest levels of fear of crime (Garofalo & Laub, 1978). Home Office statistics demonstrate that men are twice as likely to be victims of violent crime than women with the exception of sexual violence, e.g. rape and sexual assault (Kershaw, Nicholas & Walker, 2008) but that women commonly rate themselves as higher risk (Reid & Konrad, 2004). Thus, it appears that women have disproportionately high emotional responses in relation to their actual risk. This has been termed the "fear-victimisation" paradox (Lindquist & Duke, 1982; Skogan & Maxfield, 1981).

The reasons for these discrepancies in risk perception and affect have been explained primarily in terms of physical characteristics. Women are generally smaller and therefore more vulnerable to physical attack (Riger, Gordon & Bailey, 1978). Further, a gender-neutral crime such as theft or burglary can escalate into a violent assault perhaps even a sexual assault or rape (Ferraro, 1996) which are not usually a threat to men (Riger *et al.*, 1978; Warr, 1984). However, a rationale involving physical differences would only apply to crimes involving personal harm since the implication is that women are less able to defend themselves than men. In terms of driving behaviour, the physical characteristics of women may mean that they feel more vulnerable than men to vehicle related crimes such as carjacking or personal attack, i.e. crimes that have the potential to escalate.

So, is the type of crime important in determining a fear response? Some authors have noted that women are more fearful than men of crimes involving personal harm but that they are no more

fearful of crimes involving property loss or damage (MacCallum, Widaman, Zhang & Hong, 1999; Moore, 2006; Pain, 1997). Reid and Konrad (2004) examined gendered responses to crimes which disproportionately victimised one gender in a random telephone survey of 269 New Orleans residents. They determined that women and men did not differ significantly in their fear of gender-neutral crimes such as burglary (in the home) but that women reported a much higher level of fear of sexual assault, where they are commonly victimised. However, women also reported a higher level of fear for robbery (outside the home), a crime in which men are most commonly victimised.

Similarly, Warr (1984) reviewed the results of a postal survey distributed to Seattle residents (N=339) to obtain data on the perceived risk of victimisation and fear of victimisation for 16 offences ranging in severity (e.g. being conned, being sold contaminated food, murder, assault, rape etc) and nature (e.g. personal, property and public order offences). He showed that women's perceived risk of assault was greater than men's and subsequently their fear was higher. In general, women were more fearful of crime than men even when their perception of risk for a specific crime was lower. These findings suggest that women may have a greater emotional response to risk perceptions in driving, irrespective of the potential risk, e.g. crash or vehicle related criminal event.

Since women are inclined towards a greater fear of crime than men, despite their generally lower risk of victimisation, it may be that perceptions of vulnerability lead to fear of crime. The vulnerability hypothesis was proposed to account for the fact that certain socio-demographic groups tend towards a greater fear of crime (Joseph, 1997). The theory suggests that these groups (e.g. women, older people, non-white ethnic groups) perceive themselves as more vulnerable and are therefore more afraid of becoming a victim of crime and consequently report exaggerated levels of emotion.

However, the support for this theory is tentative, particularly when considering older people as one of the socio-demographic groups it is said to apply to. Whilst early research suggested that

older people were indeed more fearful than their younger counterparts (Clarke & Lewis, 1982; Clemente & Kleinman, 1977; Stafford & Galle, 1984) recent evidence for increasing fearfulness with age is inconclusive.

Research that concludes that older people are more fearful tends to concentrate on urban populations and these results may be confounded by factors such as lower socio-economic status and non-white ethnic groups, which have also been shown to be highly correlated with fear of crime (Joseph, 1997). Other studies have shown that there is little difference in fearfulness by age in rural and small communities (Carter & Beaulieu, 1984) and so it may be the type of community which is confounding. Some studies have even found that older people experience or report lower levels of fear than younger people (Akers *et al.*, 1987; Ferraro & Lagrange, 1992; Lagrange & Ferraro, 1989; Lagrange, Ferraro & Supancic, 1992). A recent study by DeLone (2008) in Nebraska could not support a relationship between age and fear of crime in an urban public housing population, despite a suitably sized population (N=462).

Researchers cite methodological differences between studies as the rationale for these inconsistencies in particular, the way fear of crime and age are measured and reported (Farrall, Bannister, Ditton & Gilchrist, 1997; Ferraro & Lagrange, 1988). Definitions of 'older' vary greatly between studies. Further, age is often measured in categorical terms rather than as a straightforward numeric (Moore & Shepherd, 2007) which adds to the conflicting results. Despite inconsistencies, there appear to be two findings of importance relating to age and fear of crime. Firstly that levels of fear differ by age, dependent on the type of crime (Moore & Shepherd, 2007; Warr, 1984) and secondly that levels of fear differ by age dependent on perceived risk (Rountree, 1998). These findings suggest that in terms of driving behaviour, similar inconsistencies in the relationships between age and vehicle related crime and risk perception may be found.

Moore and Shepherd (2007) utilised data from the British Crime Survey to determine the relationship between fear of crime and age. They suggested that fear was divisible into two

constructs, fear of personal loss (FoPL) and fear of personal harm (FoPH) and that age was a factor in fear for each of these. The authors plotted FoPL and FoPH by age from equations generated in regression models and found an inverted u-shaped relationship in both cases. They noted that property crime was feared most by those aged between 40 and 60 years (maximum fear at 45 years) and least by those above 60 years. Whilst violent crime was most feared by those aged 16 to 25 years (maximum fear at 23 years), which conforms with actual risk patterns (Kershaw *et al.*, 2008) and decreased with age, with the oldest participants reporting the lowest levels. It may be therefore that feelings of vulnerability in driving can also be associated with actual risk patterns.

In his survey of Seattle residents, Warr (1984) found that for the most serious criminal offences, e.g. murder or being threatened or assaulted by a stranger, there were no differences by age at all. However, differences by age were found for 5 offences (car theft, rape, being conned, being a victim of a drunk driver and having a group of juveniles disturbing the peace near your home). Two of these offences are vehicle related and could be considered relevant to this research. With the exception of rape, these relationships were not straightforward and were confounded by gender. In general, women were more fearful of crime than men, and older women were the most fearful, even when their specific perception of risk was lower. However, in the cases of car theft and being a victim of a drunk driver, older (51 to 65 years) men's fear and perceived risk matched that of women. In the case of rape, older women were less fearful than younger women and reported a lower perceived risk. These findings suggest that drivers may feel most vulnerable where they are at risk of personal harm and that emotional responses may differ based on risk perception.

In a survey of 5090 Seattle residents, Rountree (1998) compared the differences between a general cognitive fear of crime which they termed "perceived risk" and a specific fear of burglary. They determined that previous victimisation was positively related to both the general and specific measures of risk perception and fear of burglary. Further that younger people perceived themselves to be at greater risk of general crime than older people but were also more

fearful of the specific crime of burglary, a view that matched their actual risk patterns. Critically, this study suggests that drivers with previous experience of traumatic events or vehicle related victimisations may perceive themselves as being at greater risk of future events and also experience greater feelings of vulnerability.

However, other studies on links between previous victimisation and fear of crime have found disparate results. Early hypotheses suggested that those who had experienced or been a victim of previous crime would feel more vulnerable and thus more fearful and this is the hypothesis proposed in this research. Whilst some studies have found a relationship between being a victim of crime and fear (Skogan & Maxfield, 1981), most have determined that the relationship is weak (Akers *et al.*, 1987; Skogan & Maxfield, 1981; Stafford & Galle, 1984) and indeed others have not found a relationship at all (Acierno, Rheingold, Resnick & Kilpatrick, 2004; Lagrange *et al.*, 1992).

In summary, the link between age and fear of crime is not a straightforward linear relationship. It is confounded by other demographic factors and emotions. In fact, people's emotional response, i.e. feelings of vulnerability vary dependent on how they perceive specific risks. However, it would appear that views about risk (in this case related to crime) generally affect a greater emotional response (fear) in women than they do in men and that this occurs almost irrespective of actual or perceived risk. Conceivably then, if these findings are applied to driving behaviour, then views about driving risk could also affect a greater emotional response in women than they do in men and potentially affect driving behaviour.

To determine whether an emotional response to risk perception has the capacity to affect driving behaviour, inferences can again be drawn from the fear of crime literature. This literature has demonstrated that emotional responses to risk perception, i.e. fear of crime can result in 'constrained behaviour' such that people's lifestyle and behaviours are significantly affected. For example, fearful people may change the way they dress, alter their daily routines and restrict their out-of-home activities (Ferraro, 1995; Liska *et al.*, 1988). Significantly, these changes are

often of greater magnitude in women (Gordon & Riger, 1989; Scott, 2003). Since emotional responses to perceived risk of crime can negatively affect normal activity and restrict behaviour, it can be postulated that emotional responses to perceived risks in driving might similarly result in behavioural constraints such as driving restriction, avoidance and ultimately premature driving cessation.

### **1.8. Changing Driver Behaviour using Interventions**

Research suggests that continued driving in older age has wide ranging implications for mental health (Fonda & Herzog, 2001a) and general wellbeing (e.g. Marottoli *et al.*, 1997) including greater autonomy and independence (Yassuda *et al.*, 1997), greater social engagement (Marottoli *et al.*, 2000), reduced likelihood of significant depression (Marottoli *et al.*, 1997) and depressive symptoms (Fonda & Herzog, 2001a) and even greater life expectancy (Marottoli *et al.*, 2000).

A number of studies have shown that despite the recognised importance of driving in maintaining health and engagement, many women give up driving prematurely or adopt self-imposed restrictive driving practices (Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). To date, there have only been a few campaigns aimed at improving safe mobility in older drivers and these are examined in some detail in the following section.

The '55 Alive-Mature' driver refresher programme is a classroom based intervention that gives older drivers information on the effects of ageing on driving, advice about road signage and legislation and provides strategies for risk reduction and plans for driving cessation. It has been attended by more than nine million people across the United States (Nasvadi, 2007) and has been adapted for Canadian drivers. It aims to improve participants' confidence by raising awareness of age-related issues in driving, improving awareness of hazards, giving advice on traffic laws and correcting bad habits. It also promotes safety through the avoidance of challenging driving circumstances.

In a randomized trial of older drivers (aged 65 to 87), who had attended the modified Canadian course given in two sessions (3.5 hours each) delivered a week apart by professional driving safety experts and who had also received two 40-minute on road driver training sessions, Bedard, Porter, Marshall and Polgar (2005) found a 20% increase in road knowledge immediately after the classroom component of the course as demonstrated by increased mean knowledge quiz scores. Further, Nasvadi (2007) demonstrated using a retrospective cohort design study of 367 '55 Alive-Mature' participants that three quarters had changed their driving practices after attending. Most commonly reported changes were in self-reported alertness and visual awareness. However, less than a third of drivers reported that they had changed or adopted self-regulation (avoidance) practices as a result of the course. Although of those who had, women were more likely than men to adopt self-regulation behaviours.

Reviewing the effects of a different campaign, Strain (2003) evaluated 179 participants' behavioural changes following the 'Wiser Driver course', an Australian intervention, devised by older people for older people. It is based on education through group discussion and facilitated by mature educators. The course comprises weekly sessions of two-hours for four weeks and includes refresher training in hazard awareness, road rules, trip planning and planning for driving cessation. Three months post-course, Strain (2003) found that 80% of participants had altered their self-reported habits. The most commonly reported were improved driving skills (48%), increased awareness of the driving task (39%) and improved confidence and caution (38%). Planning improved in 7% of participants. Although these two programmes (Wiser driver and '55 Alive-Mature') facilitated positive change in drivers, there was no theoretical basis for the work.

However, the Knowledge Enhances Your Safety (KEYS) campaign does possess a theoretical basis and this is an amalgamation of social cognitive theory (Bandura, 1977), the health belief model (Rosenstock, 1974) and the transtheoretical model (Prochaska, DiClemente & Norcross, 1992). The KEYS programme was devised for drivers with visual limitations and promotes the use of self-regulation (avoidance) behaviours through one-to-one education. Participants

participate in two sessions first, to raise awareness of their visual difficulties through the discussion of the results of their eye examination and secondly to build driving skills and confidence. To build driving skills, participants are shown photographs of seven challenging driving circumstances (e.g. driving at night, driving in the rain, across intersections, motorways, in rush hour, in heavy traffic, alone) and are asked to evaluate the dangers and identify suitable self-regulation strategies (i.e. avoidance behaviours). Participants are also asked to identify barriers to performing those strategies. Finally, participants are exposed to verbal persuasion from the education and vicarious experiences of self-regulation using a taped peer testimony during which the benefits of self-regulation and barrier removal are described. As goal setting is critical in self-regulation (Mischel, Cantor & Feldman, 1996) participants are also asked to state a self-regulation goal using a formally signed contract.

An evaluation of this programme was conducted using a randomised trial of 365 ( $N$  Intervention = 194,  $N$  control = 171) predominantly white, male drivers aged between 60 and 91 years (Owsley, McGwin, Phillips, McNeal & Stalvey, 2004; Owsley, Stalvey & Phillips, 2003; Stalvey & Owsley, 2003). Theoretical constructs were measured at baseline and after six months. The results revealed that the intervention benefited older drivers by improving self-perceptions of visual difficulties and increasing the perceived benefits of self-regulation avoidance behaviours in challenging circumstances. Drivers in the intervention group were also slightly more likely to adopt self-regulatory and avoidance practices (Owsley *et al.*, 2004; Owsley *et al.*, 2003; Stalvey & Owsley, 2003) post intervention.

There are a number of criticisms to be made of these programmes. With the exception of the KEYS programme, they lack a theoretical basis. Although an intervention based on theory does not guarantee success, it provides a useful framework with which to provide participants information and evaluate its effectiveness (Kohler, Grimley & Reynolds, 1999). Further, although driver education has conventionally incorporated mastery of the traffic situation and hazard awareness, Hatakka *et al.*, (2002) proposes that they are not sufficient for safe driver behaviour and that behavioural, motivational and attitudinal factors are also important.

Promoting safety primarily through driving avoidance fails to acknowledge an older driver's goals and motivations for driving, i.e. to maintain mobility and independence, and therefore it is not surprising that some of the interventions described above fail to report significant changes in 'self-regulatory', i.e. avoidance behaviour. In order to address these gaps, the present research seeks to test the efficacy of a theory based intervention aimed at modifying women drivers' behaviour by establishing positive driving habits.

The literature relating to female drivers is scarce and although some explanations have been offered as to why women consistently stop driving earlier and restrict their driving more than men, these studies largely support what is already known about demographic differences in driver behaviour. In order to produce behavioural change, it is critical to identify the social cognitive determinants of behaviour (Armitage, Norman & Conner, 2002) which are generally more amenable to change than sociodemographic factors (Armitage & Conner, 2000).

Social cognition models have been designed to explain individual differences in behaviour and have been used, with varying degrees of success, as a method of predicting behaviours, more specifically health behaviours. A variety of motivational behaviour models exist. Some examples are the Health Belief Model (HBM: Rosenstock, 1974), protection motivation theory (PMT: Rogers, 1975) social cognitive theory (SCT: Bandura, 1976) and the theories of reasoned action (TRA: Ajzen & Fishbein, 1980) and planned behaviour (TPB: Ajzen, 1991).

The theoretical basis for the driving intervention in this research is the theory of planned behaviour (TPB: Ajzen, 1991) which is an extension of the earlier theory of reasoned action (TRA: Ajzen & Fishbein, 1980). The TPB was chosen to explore the social cognitive determinants of women's driving behaviour for a number of reasons. Firstly, the HBM, PMT and SCT, although widely used, were specifically designed to explore health protective behaviours while the TPB model has been applied to both health (e.g. exercise, dieting, binge drinking) and non-health related behaviours (e.g. travel choices and driving behaviour). While

driving behaviours have health implications, they are not exclusively health related and so a more general model was deemed more appropriate.

Secondly, the TPB constructs provide a clear framework by which driving behaviour can be communicated to participants and evaluated (Kohler *et al.*, 1999). It also incorporates elements of both social influence (i.e. norms) and affect (through attitudes). The alternative models do not effectively represent these constructs. Thirdly, meta-analytic reviews of a broad range of different behaviours (Armitage & Conner, 2001; Cheung & Chan, 2000; Ravis & Sheeran, 2003; Schulze & Wittmann, 2003) have demonstrated its capacity to reliably predict moderate-high correlations between the theory's constructs, sometimes despite methodological differences in TPB construct measures (Ajzen, 2011). It has been suggested that the alternative methods either lack (PM) or have lower (HBM and SCT) predictive power (Armitage & Conner, 2000). Finally, the TPB is now one of the most common and influential social cognition models used in health psychology (Ajzen, 2011; Godin, Conner & Sheeran, 2005). As such it could be a useful theory on which to base interventions designed to safely extend mobility and reduce feelings of vulnerability.

## **1.9. The Theory of Planned Behaviour**

### **1.9.1. The Model**

The theory of planned behaviour model (Ajzen, 1991) has been used extensively to understand and predict people's attitudes towards their health (e.g. exercise, dieting, binge drinking) as well as travel choices and driving behaviour (e.g. seat belt usage, drink driving and intention to violate traffic laws). The TPB model was developed to improve the predictive power of, and address limitations in its predecessor the theory of reasoned action (TRA: Ajzen & Fishbein, 1980).

According to the TPB an individual's decision about whether or not to perform a given behaviour is determined through behavioural intention which in turn is shaped through a combination of three variables – attitudes, subjective norms and perceived behavioural control (PBC). According to the model, individuals are more motivated (i.e. have a stronger behavioural intention) to carry out a behaviour if they have a positive attitude towards that behaviour, they believe that significant others would want them to perform that behaviour (subjective norm) and they believe that they have the resources or capacity to carry it out (PBC).

Attitudes are important in determining the individual's overall assessment of the desire to perform a particular behaviour. A person's attitude towards a behaviour will reflect their assessment and evaluation of the likely positive and negative consequences. Although the initial TPB model proposed a single measure of attitude, the extension of the theory of planned behaviour TPB (Ajzen, 2002b), to incorporate two subcomponents of attitude, affective as well as instrumental, has received wide empirical support, given that it increases the predictive power of the model (Ajzen, 1991; Ajzen & Driver, 1992; Ajzen & Timko, 1986; Conner & Armitage, 1998; Trafimow, Clayton, Sheeran, Darwish & Brown, 2010). Thus, attitudes towards a behaviour are deemed to be composed of affective (e.g. like/dislike) and instrumental (e.g. beneficial/harmful) appraisals (Ajzen, 1991).

Subjective norm is determined by the individuals' perceptions about whether they are expected to perform the behaviour by their family, friends or society. This is an important and unique component of the model as other health behaviour models fail to account for social influences on behaviour.

Perceived behavioural control (PBC) refers to a person's beliefs about their level of resources and ability to perform a behaviour. PBC was not included as a factor in the TRA (Ajzen & Fishbein, 1980) as this model only measured behaviours that were under total volitional control, i.e. simple behaviours where performance only requires the formation of intention. However, Ajzen (1988) argued that much behaviour is not under complete volitional control and while people may have a positive attitude toward the behaviour, they may lack the resources to carry it out. Thus, the issue of personal control was incorporated into the TPB (Ajzen, 1991) as PBC and refers to the perception of ease or difficulty in performing the behaviour. PBC is closely related to Bandura's (1986) concept of self-efficacy and is critical in the success of behavioural predictions, in that, the easier a behaviour is to perform, the more likely it will be performed (Armitage & Conner, 2001). A direct relationship has also been proposed between PBC and behaviour which dominates under conditions of low volitional control (Ajzen, 1991).

According to the TPB, it should be possible to influence behavioural intentions and subsequently behaviour by designing an intervention that has an effect on one of the three underlying constructs, i.e. attitudes, norms and control beliefs.

Developing effective interventions depends upon the identification of suitable psychological constructs for modification. Despite a growing literature on mobility in older age, driving cessation and self-regulation, recommendations for interventions targeting specific TPB constructs are not available. Therefore, the next section describes a review of the literature designed to identify potentially modifiable constructs associated with driving behaviour intentions, examine the strength of the relationships between each of the TPB constructs and

offer recommendations for a behavioural intervention programme designed to safely extend driving mobility.

### **1.9.2. Application to Driving**

TPB studies within the field of driving research have without exception, focused on aspects of risky driving behaviour or driver compliance, e.g. observation of speeding limits, compliance with drink-driving laws, seat belt and mobile phone use. The main aim of such studies is to quantify how well the TPB model predicts intentions to commit the types of risky and/or illegal driving behaviours associated with collisions and law breaking, and in doing so, find a method to reduce the human and economic losses associated with such events. Individually these studies have demonstrated that attitude, subjective norm and perceived behavioural control all successfully predict, to varying degrees, intention to perform risky or unlawful driving behaviours.

Although an intervention designed to safely extend mobility may ultimately prove to rely on slightly different constructs from interventions designed to address risky driving behaviours, it may be that the relationships between the components of the TPB model and intention are comparable in these two domains of driving behaviour and as such the antecedents of risky driving behaviour form a useful theoretical basis for an intervention.

A comprehensive search for references was conducted during the period between September 2010 and November 2011, 22 studies were found examining the ability to predict intention (and/or behaviour) for 36 risky driving behaviours using the TPB constructs. Psychology, health and transportation databases (ScienceDirect; Web of Science; Medline; Health Reference Center Academic (GALE); American Psychological Association (APA); Cambridge Journals Online; Ingenta Connect; PubMed Central (NLM); Oxford Journals; BioMed Central; Elsevier (Cross Ref); ERIC; Oxford University Press; TRIS Online) were searched for theory of planned behaviour studies with a driving behaviour outcome measure expressed as a correlation between TPB constructs, e.g. intention and behaviour. Search terms were the theory of planned

behaviour, TPB, Ajzen, behavioural interventions and driv\*. Studies selected for further inspection were: (a) published (b) after 1991 (c) in English (d) in full text format (e) in peer reviewed sources. This resulted in 112 publications. Obviously irrelevant references were excluded by screening titles and abstracts. Qualitative studies and those involving motorcycle, moped, bicycle and pedestrian samples were immediately excluded. After elimination, 32 studies remained. The reference lists of these studies were searched manually for new citations which generated a further 4 papers. Detailed examination of the remaining papers excluded 14 papers including multiple papers reporting the same dataset (e.g. Elliott, Armitage & Baughan, 2005), studies involving novice or pre-drivers (e.g. Desrichard, Roché & Bègue, 2007; Poulter & McKenna, 2010), and studies which failed to report the necessary TPB constructs or correlations between TPB constructs (e.g. Paris & Van den Broucke, 2008; Stead, Tagg, MacKintosh & Eadie, 2005).

A complete list of studies can be found in Table 1. The studies targeted a range of populations. Thirteen recruited participants from the general public, four used entirely student populations, one used a mixed public and student population, three studies examined behaviours in professional drivers and one used a population of civil servants. Although some study populations were balanced by gender, half of the data sets over-represented male participants and one (Nemme & White, 2010) was slightly skewed towards female driver participation. One study did not categorise participants by gender (Stead *et al.*, 2005). Most studies reviewed driving intentions in working age populations. However, two studies focused on younger drivers (Chan, Wu & Hung, 2010; Marcil, Bergeron & Audet, 2001) while seven studies included participants aged over 65 years.

Generally the studies used a cross-sectional measure of self-reported intention to comply with the target behaviour. However, two studies used a prospective study design to measure self-reported intention to comply with speeding regulations and actual speeding behaviour. Both of these studies used a simulator to measure actual driving behaviour. One of these studies (Conner, Lawton, Parker, Chorlton, Manstead & Stradling, 2007) also examined on-road

driving behaviour. One study (Stead *et al.*, 2005) employed a 4-year longitudinal cohort method to predict self-reported intentions to speed and speeding behaviour.

Intentions were measured in relation to speeding in eleven studies, to drink driving in six studies, to seat belt use in two studies, to mobile phone use in three studies, to risky overtaking in two studies and close following in one study. Intention to comply with truck driving regulations was measured in one study. Two studies (Forward, 2009; Parker, Manstead, Stradling & Reason, 1992) measured intentions to commit multiple risky or illegal driving behaviours. Intentions were correlated with either self-reported (past or current) behaviour or observed behaviour in ten studies.

The TPB constructs (attitude, subjective norm and PBC) predicted between 10% and 72% of the variance in intention to commit risky driving behaviours in the selected studies. See Table 2. The studies predicting seat belt use (37.9-38%), mobile phone use (31-45.4%) and risky overtaking (31.7-33%) reported reasonably consistent predictions of variance in intention. However studies relating to drink-driving (10-72%) and speeding (13-64%) reported predicted a wider range of variance in intention.

Individually the studies demonstrated using regression models that attitude, subjective norm and perceived behavioural control individually all successfully predict intention to perform risky or unlawful driving behaviours.

In the two studies reviewing intention to use a seat belt, all three constructs were significant predictors of intention. However, subjective norm (Ali *et al.*, 2011) and attitude (Tavafian *et al.*, 2011a) were the strongest predictors. Similarly, intention to use a mobile phone whilst driving was also most strongly predicted by attitude in one study (Nemme & White, 2010). In the other study, although PBC was the strongest predictor of intention to use the phone when alone, subjective norm was more important when travelling with friends and under high urgency circumstances, the relationships between attitude, subjective norm, PBC and intention were of equal importance (Rozario *et al.*, 2010).

**Table 1: Characteristics of driving behaviour studies using the theory of planned behaviour.**

Study	Country	Population	Sample Description						Outcome measure	Target behaviour	Design
			N	N male	N female	M age (years)	S.D.	Age range			
Ali <i>et al.</i> , (2011)	Iran	Public	340	244	96	30.52	10.2	18-60	Intention Behaviour (SR)	Seat belt use	Cross-sectional
Armitage <i>et al.</i> , (2002)	UK	Students	124	58	63	26.35	8.78	18-62	Intention	Drink driving	Cross-sectional
Chan <i>et al.</i> , (2010)	China	Public	124	66	58	21.99	2.32	19-35	Intention	Drink driving	Cross-sectional
Conner <i>et al.</i> , (2003)	UK	Public & students	162	79	83	20.9	1.69	-	Intention Behaviour (SR)	Speeding	Cross-sectional
Conner <i>et al.</i> , (2007)	UK	Public	128	78	50	37.0	13.5	19-78	Intention Behaviour (SIM/OR)	Speeding	Prospective
Elliott <i>et al.</i> , (2003)	UK	Public	598	341	257	51	-	18-85	Intention	Speeding	Prospective
Elliott <i>et al.</i> , (2007)	UK	Public	150	77	73	36.7	-	17-75	Intention Behaviour (SIM)	Speeding	Prospective
Forward (2009)	Sweden	Public	275	143	132	44	14.72	20-75	Intention Behaviour (SR)	Speeding Risky overtaking	Cross-sectional
Forward (2010)	Sweden	Public	1798	1195	603			18-70	Intention	Speeding	Cross-sectional
Marcil <i>et al.</i> , (2001)	France	Students	113	113	0	20.5	1.28	18-24	Intention	Drink driving	Cross-sectional
Moan (2011)	Norway	Public	879	410	439	43.9	13.5	18-70	Intention	Drink driving	Cross-sectional
Nemme and White (2010)	Australia	Students	169	56	113	19.26	2.05	17-24	Intention Behaviour (SR)	Texting	Prospective
Newnam <i>et al.</i> , (2004)	Australia	Fleet drivers	204	163	41	-	-	-	Intention	Speeding	Cross-sectional
Paris & Van den Broucke (2008)	Belgium	Civil servants	116	82	34	38.6	-	-	Intention	Speeding	Cross-sectional
Parker <i>et al.</i> , (1992)	UK	Public	800	400	400	-	-	17-55+	Intention	Drink driving Speeding Close following Risky overtaking	Cross-sectional Stratified
Poulter <i>et al.</i> , (2008)	UK	Truck drivers	232	225	4	46.8	9.4	-	Intention Behaviour (SR)	Compliance	Cross-sectional
Rivis <i>et al.</i> , (2011)	UK	Public	200	200	0	-	-	17-60	Intention	Drink driving	Cross-sectional Stratified
Rozario <i>et al.</i> , (2010)	Australia	Students	160	75	85	21.94	5.52	17-47	Intention	Mobile use	Cross-sectional
Stead <i>et al.</i> , (2005)	Scotland	Public	287					17-54	Intention	Speeding	Longitudinal
Tavafian <i>et al.</i> , (2011a)	Iran	Public	251	183	68	31.6	8.7	18-60	Intention Behaviour (SR)	Seat belt use	Cross-sectional
Tavafian <i>et al.</i> , (2011b)	Iran	Commercial drivers	246	179	67	32.2	6.7	19-54	Intention Behaviour (SR)	Speeding	Cross-sectional
Walsh <i>et al.</i> , (2008)	Australia	Public	796	443	351	36.80	14.33	17-76	Intention	Mobile use	Cross-sectional

*Nb: Outcome measures: SR = self report, SIM = simulated measure, OR = on road measure of behaviour*

Risky overtaking was most strongly predicted by PBC, i.e. perceived ease (Forward, 2009) and subjective norm (Parker *et al.*, 1992). Drink driving intention was also independently predicted by PBC in three studies (Moan & Rise, 2011; Parker *et al.*, 1992; Ravis *et al.*, 2011) and by subjective norm (Armitage *et al.*, 2002) and attitude (Marcil *et al.*, 2001).

The strongest predictors of intention to speed were PBC (Elliott *et al.*, 2003; Parker *et al.*, 1992; Tavafian *et al.*, 2011b). Conner (2003) reported that PBC and subjective norm were of equal strength in predicting intention in regression models while Forward (2009) demonstrated that attitude and subjective norm were the most critical TPB constructs in speeding intention.

Two studies, Conner (2007) and Elliott (2007) used actual measures of driving behaviour to model the intention-behaviour relationship. Elliott (2007) reported that intention was a strong predictor of observed measures of speeding behaviour in urban distributor roads and village through roads. However, PBC did not make a statistically significant contribution to predicting behaviour. Conner (2007) reported that while intention was a strong predictor of observed measures of speeding behaviour during an on road test, intention and PBC predicted observed driving behaviour in a simulator (shown in Table 2).

**Table 2: TPB driving studies showing correlation coefficients between TPB variables and intention.**

Study	Behaviour	Attitude Intention	SN Intention	PBC Intention	Intention Behaviour	Variance in intention (%)
Ali <i>et al.</i> , 2011	Seat belt use	.43**	.49**	.46**	-	37.9
Armitage <i>et al.</i> , 2002	Drink driving	.71**	.71**	.64**	-	72
Chan <i>et al.</i> , 2010	Drink driving	.85**	.64**	.70**	-	-
Conner <i>et al.</i> , 2003	Speeding	.39***	.33***	.43***	-	-
Conner <i>et al.</i> , 2007	Speeding					64
Conner <i>et al.</i> , 2007	Speeding (Sim)	.36***	.67***	.59***	.48**	31*B
Conner <i>et al.</i> , 2007	Speeding					63
Conner <i>et al.</i> , 2007	Speeding (On road)	.70***	.17**	.57**	.41**	19*B
Elliott <i>et al.</i> , 2003	Speeding	.51***	.57***	.79***	-	63
Elliott <i>et al.</i> , 2007	Speeding					54
Elliott <i>et al.</i> , 2007	Speeding (Urban)	.66***	.45***	.52***	.69***	35*B
Elliott <i>et al.</i> , 2007	Speeding (Village)	.71***	.39**	.34**	.76***	39*B
Forward 2009	Speeding	.54**	.52**	.51** <sup>1</sup>	-	47
Forward 2009	Risky overtaking	.49**	.33**	.49** <sup>1</sup>	-	33
Forward 2010	Speeding	.61**	.59**	.44**	-	53
Marcil <i>et al.</i> , 2001	Drink driving	.76**	.61**	.63**	-	64
Moan 2011	Drink driving	.13***	.14***	.29***	-	10
Nemme <i>et al.</i> , 2010	Texting (Sending)	.59**	.44**	-.11	-	45.4
Nemme <i>et al.</i> , 2010	Texting (Reading)	.59***	.46***	-.10	-	43.2
Newnam <i>et al.</i> , 2004	Speeding (Personal)	.26**	.10	.27**	-	21
Newnam <i>et al.</i> , 2004	Speeding (Work)	.26**	.10	.27**	-	13
Parker <i>et al.</i> , 1992	Drink driving	.29*	.44*	-.58* <sup>3</sup>	-	42.3
Parker <i>et al.</i> , 1992	Speeding	.36*	.55*	-.59* <sup>3</sup>	-	47.2
Parker <i>et al.</i> , 1992	Close following	.09*	.45**	-.22* <sup>3</sup>	-	23.4
Parker <i>et al.</i> , 1992	Risky overtaking	.28**	.47**	-.38* <sup>3</sup>	-	31.7
Poulter <i>et al.</i> , 2008	Truck behaviour	.54**	.37**	.32**	-	28
Poulter <i>et al.</i> , 2008	Truck compliance	.34**	.41**	.33**	-	38
Rivis <i>et al.</i> , 2011	Drink driving (Young)	.52***	-.34***	-.70*** <sup>4</sup>	-	65
Rivis <i>et al.</i> , 2011	Drink driving (Older)	.27**	-.24**	-.47*** <sup>5</sup>	-	47
Rozario <i>et al.</i> , 2010	Mobile use (Alone/low urgency)	.46***	.24*	.58***	-	37
Rozario <i>et al.</i> , 2010	Mobile use (With friends/low urgency)	.38***	.44***	.42***	-	31
Rozario <i>et al.</i> , 2010	Mobile use (Alone/high urgency)	.48***	.20*	.50***	-	34
Rozario <i>et al.</i> , 2010	Mobile use (With friends/high urgency)	.41***	.40***	.42***	-	31
Tavafian <i>et al.</i> , 2011a	Speeding	.29*	.40*	.46*	-	-
Tavafian <i>et al.</i> , 2011b	Seat belt use	.51**	.41**	.37**	-	38
Walsh <i>et al.</i> , 2008	Mobile use	.67***	.54***	.29***	-	32

$p < 0.05$  \*\* $p < 0.01$  \*\*\* $p < 0.001$  Notes: <sup>1</sup> = Perceived ease <sup>2</sup> = Perceived control <sup>3</sup> = Control belief <sup>4</sup> = PBC1 i.e. risk perception <sup>5</sup> = PBC2 i.e. control over driving after any amount of alcohol, \*B= variance in behaviour

There are a number of methodological considerations within these studies. Firstly, some studies use alternative measures of PBC (e.g. perceived ease, Forward, 2009) which do not assist the process of direct comparison. The studies also differ in their design, population demographics and methods of analysis.

Elliott *et al.*, (2004) suggest that cross-sectional or retrospective study designs have limitations in that they only obtain measures of past behaviour and therefore do not reflect the causal nature of the TPB (i.e. the relationship between intention and behaviour is cause and effect). Further, cross-sectional designs are vulnerable to consistency bias which may inflate relationships between TPB constructs. The majority of the studies use self-report data which is prone to social desirability responding (Anastasia & Urbina, 1997) and recall. Studies suggest that drivers may not accurately estimate their driving patterns, e.g. distances travelled (Blanchard & Henle, 2008; Blanchard & Myers, 2010; Huebner, Porter & Marshall, 2006) either because they want to present themselves in a positive light or simply because people forget where they have been.

In summary, the reviewed studies of risky driving behaviours have consistently reported positive relationships between the TPB constructs and intention, and intention and behaviour. This review provides strong empirical support for the use of the TPB as the theoretical construct of a driving intervention for women. However, given the variability in the strongest predictor of intention and/or behaviour between studies, no single TPB construct could be identified as a sole candidate for modification in the intervention programme.

## **1.10. The Present Research**

The aim of this research is to examine whether driving behaviour in women is influenced by risk perception and feelings of vulnerability and to develop a theory based intervention to positively affect driving habits, specifically self-regulation behaviours.

The research is split into two phases. Firstly the model-building phase examines how risk perception and feelings of vulnerability affect driver behaviour. Studies pertaining to the model building phase are described in Chapters 2 to 5. The understanding gained from the model-building phase is used in the second phase of the research, the intervention phase (Chapter 6) to design and evaluate the behaviour change package.

### **Model Building**

The first study involved developing a quantitative instrument to assess how perceptions of risk and feelings of vulnerability affected women's driving behaviour.

#### ***Chapter 2: Establishing a measure of vulnerability and coping.***

**Aim:** To investigate whether perception of risk and feelings of vulnerability affect driving behaviour in female drivers across the lifespan. Two aspects of driving behaviour were considered, habitual driving behaviour (driving style) and avoidance behaviours (self-regulation). In order to achieve the aim, the following hypotheses were tested:

- 1:** Female drivers will report greater perceived levels of risk than male drivers.
- 2:** Female drivers will report greater feelings of vulnerability than male drivers.
- 3:** Perception of risk will increase with age.
- 4:** Feelings of vulnerability will increase with age.
- 5:** Perception of risk will influence habitual driving behaviours (driving style).
- 6:** Feelings of vulnerability will influence habitual driving behaviours (driving style).
- 7:** Perception of risk will influence the adoption of coping behaviours.

- 8:** Feelings of vulnerability will influence the adoption of coping behaviours.
- 9:** There will be an association between perceived level of risk and feelings of vulnerability.

***Chapter 3: The effects of age, gender and attitudes on self-regulation in driving.***

**Aim:** To examine self-regulation as a risk management strategy in drivers across the lifespan and to determine whether age, gender, duration of experience, driving patterns (weekly mileage), style or attitude affect self-regulation behaviours. Further to examine whether self-regulation behaviours would provide an appropriate basis for a behavioural change intervention. The following hypotheses were tested.

- 10:** Female drivers will self-regulate more than male drivers.
- 11:** Self-regulation behaviours will increase with age.
- 12:** Duration of driving experience (time since licensure) and amount of driving experience (weekly mileage) will influence self-regulation behaviour such that self-regulation will increase with experience duration and decrease with increased mileage.
- 13:** Driving style will influence the level of reported self-regulation. No directional hypotheses are proposed.
- 14:** Instrumental and affective attitudes towards driving will mediate the relationship between age and self-regulation.

***Chapter 4: Feelings of vulnerability and effects on driving behaviour – a qualitative study.***

**Aim:** The effects of risk perception and feelings of vulnerability on driving behaviour have not been widely explored and so, the purpose of this qualitative study was to investigate feelings of vulnerability in driving. There were two research aims (1) to examine the prevalence of feelings of vulnerability in drivers across the lifespan, and (2) to delineate the types of coping strategies adopted in response to those feelings.

**Given the nature of this qualitative study, no hypotheses were proposed.**

*Chapter 5: Development and preliminary validation of a novel self-regulation index using an objective, simulated measure of driving behaviour.*

**Aims:**

(1) To construct and undertake preliminary reliability and validity testing on a short self-report index designed to assess self-regulation behaviours in drivers across the lifespan, establishing a) internal consistency, b) construct validity and c) concurrent criterion validity using an objective measure of driving behaviour in a simulator environment.

(2) To use the index to explore some of the complex relationships between self-regulation, perception of risk, feelings of vulnerability and self-efficacy (driving confidence/anxiety) and to determine the effects of those same variables on social and economic engagement. The following hypotheses were tested.

- 15:** The index should be able to differentiate between genders, with women displaying higher mean scores for self-regulation than men.
- 16:** The index should be able to differentiate between age groups such that a quadratic effect of age will be seen on avoidance behaviour. Given the lack of suitable evidence, no directional hypothesis is proposed for planning behaviour.
- 17:** The index should be able to differentiate between anxious and non-anxious drivers, with anxious drivers displaying higher scores for self-regulation than others.
- 18:** Drivers with high scores for self-regulation will engage in fewer risky driving manoeuvres than other drivers during the simulated driving task.
- 19:** Drivers with high scores for self-regulation will regulate their behaviour to a greater extent during challenging driving circumstances in the driving simulator task.
- 20:** Risk perception and feelings of vulnerability will influence self-regulation behaviour such that self-regulation will increase with increasing perception of risk and feelings of vulnerability.
- 21:** Low self-efficacy (confidence) will be associated with self-regulation.
- 22:** Self-regulation will influence the reported level of social and economic engagement such that engagement will decrease with increasing self-regulation.

## **Behavioural Intervention**

A theory based intervention was designed based on the model building research, to promote positive changes in driver coping strategies.

### ***Chapter 6: Behavioural Intervention***

**Aim:** To determine whether established driving behaviours and beliefs relating to risk perception and feelings of vulnerability can be positively influenced by planning and preparation coping strategies. In line with Ajzen (1991), the hypotheses were:

- 23:** That the intervention will result in an increase in behavioural beliefs towards self-regulation.
- 24:** That the intervention will result in an increase in control beliefs towards self-regulation.
- 25:** That the intervention will result in an increase in positive attitudes towards self-regulation.
- 26:** That the intervention will result in an increase in perceived behavioural control.
- 27:** That the intervention will result in an increase in intention to self-regulate, mediated by the TPB constructs (attitude, subjective norm, PBC).
- 28:** That the intervention will lead to a change in self-regulation behaviours (as measured using the self-regulation index – SRI, see Chapter 5) mediated by a change in intention or in PBC.

### **1.11. Structure of the Thesis**

This thesis investigates the effects of risk perception and feelings of vulnerability on female driving behaviour across the lifespan, specifically on a spectrum of driver coping behaviours known as self-regulation.

**Chapter 1** begins by providing a rationale for the study. It goes on to explore the existing research on risk perception, feelings of vulnerability and driver coping behaviours, specifically self-regulation. It identifies the need for behavioural interventions to improve independent mobility in later life and proposes the theory of planned behaviour (Ajzen, 1991) as a suitable model on which to build such an intervention. It continues with a description of the theory and issues relating to that model. It concludes with the main aims and hypotheses of the research and a summary of the thesis structure.

**Chapter 2** reports the results of the first stage of the model building phase of the research to establish through the administration of a novel questionnaire, those driving behaviours affected by risk perception and feelings of vulnerability. This study investigated how comparative perception of risk and feelings of vulnerability affect driving behaviours across the lifespan and determined that driving avoidance (i.e. 'self-regulation') is significantly related to feelings of vulnerability in drivers below 65 years of age (but not above) and as such could be used as the basis of a behavioural change intervention.

**Chapter 3.** Given the potential for self-regulation to be used as the basis of a behavioural change intervention, self-regulation avoidance was explored further in Chapter 3. This study revealed that self-regulation was used by drivers across the lifespan and determined a link between anxiety and over-regulation. These findings suggested that interventions designed to reduce anxiety and feelings of vulnerability could be successful in reducing over-regulation and extending safe mobility, and consequently provided a framework for follow-on studies to explore self-regulation further. This study comprises an original paper (Gwyther & Holland, 2012).

**Chapter 4** describes the process of generating a range of wider self-regulation coping strategies to manage feelings of vulnerability to risk. It reports the results of a qualitative study of 48 drivers across 9 focus groups. Thematic analysis was used to generate themes surrounding feelings of vulnerability and resultant coping behaviours were extracted. These themes were reflected in the 'DriveSafe' handy pack and incorporated into a novel self-regulation index.

**Chapter 5** reports on the development and preliminary validation of a novel self-regulation index. It compares self-report data using the index with objective measures of simulated driving behaviour. Further, it establishes associations between perception of risk, feelings of vulnerability and self-efficacy and determines the effects of those variables on social and economic engagement.

**Chapter 6** reports on the second phase of the research, the design and evaluation of an education and behaviour change package for female drivers based on the promotion of positive coping strategies (identified in Chapter 4) through a group intervention (N=81) using an extended theory of planned behaviour (TPB) intervention incorporating action planning and goal setting methods. The intervention achieved moderate success and the results suggest that wider self-regulation interventions (incorporating planning behaviours) could be successful in reducing over-regulation and extending safe mobility in drivers.

**Chapter 7** summarises the research and outlines the limitations. It discusses the general findings and conclusions as well as making suggestions for future research. It describes the potential applications of the 'DriveSafe' Handy pack, a short, printed book designed to offer motorists practical advice on driving and suggests strategies for enabling safe mobility in the ageing population.

## CHAPTER TWO

## **2. Perception of risk and feelings of vulnerability in driving as a function of gender**

Chapter 2 reports the results of the first stage of the model building phase of the research. The aim was to determine through the administration of a novel questionnaire, those driving behaviours affected by beliefs about risk and feelings of vulnerability, and to establish whether any of those behaviours or beliefs would be a suitable target for a behavioural change intervention. This study investigated how comparative perceptions of risk and feelings of vulnerability affect driving style and behaviours across the lifespan and determined that driving avoidance is significantly related to feelings of vulnerability in drivers below 65 years of age but not in older drivers. Given the potential for driving avoidance (within a spectrum of self-regulation behaviours) to be used as the basis of a behavioural change intervention, avoidance was explored further in Chapter 3.

## 2.1. Introduction

Driving is a skill, which facilitates independence and mobility and enables contact with a wide variety of important social and economic activities. Research has shown that older people are often reliant on their cars and that driving is important in maintaining autonomy and self-esteem (Adler & Rottunda, 2006). Conversely, driving cessation and loss of mobility are associated with increased loneliness, poor health and depression (Fonda & Herzog, 2001b), as well as a loss of independence and decreased out of home activities (Marottoli *et al.*, 2000).

Demographic changes in the population and expectations about driving in younger women have resulted in significant increases in the numbers of women drivers (Department for Transport, 2011). However, women often stop driving at an earlier age and in better health than their male counterparts (Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). Paradoxically, it is women who may be in most need of their cars, having both a greater life expectancy and a greater chance of experiencing long term diseases which impair mobility than men (Arber & Cooper, 1999; Orfila *et al.*, 2006). Studies have also demonstrated that women are more likely than men to self-regulate their behaviour in later years, i.e. to reduce, restrict or limit their driving (Bauer *et al.*, 2003; Charlton *et al.*, 2006; Donorfio *et al.*, 2008). Given that women tend to live longer than men and are more likely to live on their own (Arber & Cooper, 1999; Rosenbloom & Winsten-Bartlett, 2002), their choices about driving may effectively be putting them at greater risk of mental health problems and social isolation.

The reasons for the differences in driving cessation trends between the genders are unclear. Although confidence (Kostyniuk & Shope, 1998) and driving anxiety (Gwyther & Holland, 2012) have been suggested, information from the fear of crime literature and various models of health psychology suggest that driving habits, as well as beliefs about, and emotional responses to risk may also be implicated.

Authors have suggested that driving cessation may be related to driving habits (Hakamies-Blomqvist & Siren, 2003). In their research, Hakamies-Blomqvist and Siren (2003, p.383) noted that female drivers with “male like” habits, i.e. those with active driving histories, were more likely to continue driving later in life. In this case, perhaps the difference in driving cessation patterns is a primarily a cohort effect, since the older generation of women have not traditionally been the main household driver and so may have less experience (Marottoli *et al.*, 1993; Rosenbloom, 1993) and be less habituated as drivers than their male counterparts. If so, gender differences in driving cessation patterns will diminish in time as younger cohorts of women with comparable experience to men age. Although this may be true, middle-aged and older generations of women may still be at risk of the negative health and social effects of premature driving cessation and driving restriction and so, interventions to alter their driving behaviours and prevent over-regulation or premature driving restriction could be of benefit.

Other authors (Blanchard & Myers, 2010; Molnar & Eby, 2008; Stacey & Kendig, 1997) have noted that driving cessation or self-imposed driving restrictions may be related to feelings about driving and so perhaps it is differences in affect (emotion) that prompt gender trends in driving cessation. Affective components in driving may include feelings of worry, concern or vulnerability and application of findings from the fear of crime literature suggests that these feelings may stem from beliefs about driving risk.

Risk perception is often considered a purely cognitive process (Loewenstein *et al.*, 2001), that is, decisions about risk related behaviour are based on rational and objective notions. However some authors (Loewenstein *et al.*, 2001) have proposed an alternative hypothesis, ‘risk as feelings’, which highlights the role of affect at the point of decision making. This view suggests that risk perception is linked to emotion, resulting in fast, mostly automatic decisions about behaviour (Slovic *et al.*, 2004). This theory allows for the fact that reactions to risk may differ from cognitive assessments of the risk and that reactions result “from emotional influences including feelings such as worry, fear, dread or anxiety” (Loewenstein *et al.*, 2001 p270). If this hypothesis is applied to decisions about driving, it suggests that although drivers may

understand that their actual risk of a collision is low, their emotional response to the risk of a potential crash, has a direct effect on their behaviour and it is this which determines their driving behaviours (cf. Loewenstein *et al.*, 2001).

The role of emotion in predicting driver behaviour has been explored to some extent within the field of fear of driving research. Fear of driving is common in the general population (Ehlers *et al.*, 1994; Ehlers *et al.*, 2007; Taylor *et al.*, 2002) and is frequently acquired after a traumatic event such as a crash (Blanchard & Hickling, 1997).

Following interviews with fifty crash survivors, Blanchard *et al.*, (1994) found that almost all of them had changed their driving behaviour post-collision and although most were still driving on necessary business, they avoided travelling for leisure purposes due to fear for their personal safety. Thus it seems that emotions (i.e. fear) are directly contributing to behavioural choice, in effect, participants in this study were self-regulating where they felt that they had the option and control to do so.

Although findings relating to affect and their contribution to behavioural choice in driving are limited, application of work from the fear of crime literature may assist in developing hypotheses for this study. The role of risk related feelings (i.e. fear) to crime has been widely reviewed as 'feelings of vulnerability'. Feelings of vulnerability to fear of crime vary across a number of individual characteristics. However the most salient predictor is gender (e.g. Akers *et al.*, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984) with women the most fearful. Authors have noted that fear is often disproportionate to actual risk and that despite the fact that their actual risk of being a victim of crime is often lower than men's, women commonly rate themselves as higher risk (Reid & Konrad, 2004). It would therefore appear that views about risk (in this case related to crime) effect a greater emotional (fear) response in women than they do in men and that this occurs almost irrespective of actual or perceived risk. Conceivably then, if these findings are applied to driving behaviour, then beliefs about driving risk could affect a greater emotional response in women than they do in men and subsequently affect behavioural

choices about driving, and ultimately be implicated in decisions about driving restriction or premature cessation.

To determine whether an emotional response to risk perception has the capacity to affect behaviour, in this case driving behaviour, inferences can again be drawn from the fear of crime literature. This literature has demonstrated that emotional responses to risk perception, i.e. fear of crime can result in 'constrained behaviour' such that people's lifestyle and behaviours are significantly affected. For example, fearful people may change the way they dress, alter their daily routines and restrict their out-of-home activities (Ferraro, 1995; Liska *et al.*, 1988). Significantly, these changes are often of greater magnitude in women (Gordon & Riger, 1989; Scott, 2003). Since emotional responses to perceived risk of crime can negatively affect normal activity and restrict behaviour, it can be postulated that emotional responses to perceived risks in driving could similarly result in behavioural constraints such as driving restriction, avoidance and ultimately premature driving cessation. Therefore, one of the aims of this study is to explore the influence of views about driving risk on driver behaviour.

Risk perception and driving risk have been widely researched, particularly in relation to individual differences in risk-taking behaviours and crash potential. Generally, drivers make overly optimistic judgements about risk and underestimate the likelihood of their potential for involvement in crashes (Matthews & Moran, 1986). This finding does not wholly support the application of the 'risk as feelings' hypothesis which suggests that drivers who feel vulnerable would understand and accurately assess their driving risk but be influenced by their emotions when making behavioural choices.

However, studies on optimism bias (Weinstein, 1980) in driving, i.e. the tendency to believe that one is more skilled as a driver and less likely to experience a negative event (e.g. crash) than one's peers, report mixed results with regard to age and gender differences. Many studies on risk perception in driving have used perceived relative crash-risk as their dependent variable, i.e. a measure of comparative optimism. However, the reference group varies somewhat

between studies. For example, some studies have used the ‘average driver’ (Guppy, 1993), ‘average others’ Holland (1993), the ‘average UK driver’ (Horswill *et al.*, 2004), ‘other people your age’ (Harré & Sibley, 2007) and ‘an average motorist of the same sex and age’ (Gosselin *et al.*, 2010) as a basis for comparison.

In terms of gender differences in optimism bias, Guppy (1993) found crash-risk optimism bias in male drivers of all ages and in other studies, higher proportions of men than women reported that they had superior driving skills (DeJoy, 1992; Harré & Sibley, 2007). These findings are of interest, in that they go some way to supporting gender differences in risk perception. Since women report less optimism bias than men in these studies, perhaps they are more accurately assessing their risk in line with the ‘risk as feelings’ hypothesis. However, DeJoy (1989) found an optimism bias for crash risk in college students but could not support significant age or gender differences. Given the variety in these findings and the variety in comparative risk measures, there are still a number of questions to be answered about gender differences in risk perception.

In terms of age differences in optimism bias, some studies have shown that younger people believe that they are less at risk than others in their peer group (e.g. DeJoy, 1992; Harré & Sibley, 2007) despite acknowledging that their subgroup is high risk (Finn & Bragg, 1986), whilst others have failed to demonstrate crash-risk optimism bias in specific age-related subgroups, e.g. men aged between 45 and 60 years (Glendon *et al.*, 1996). The evidence relating to optimism bias in older drivers (aged over 65 years) is somewhat limited. Spitzenstetter and Moessinger (2008) demonstrated that an optimism bias exists in older drivers although this finding was to some extent compromised by recruitment methods and affiliation with an insurance company. However, Gosselin *et al.*, (2010) independently repeated their study using a non-biased sample which supported the original findings. Holland (1993) examined the extent of positive self-bias in 80 drivers aged between 50 and 79 and determined that people in their 50s showed no self-bias in terms of comparison with an average other of their own age but that they demonstrated significant self-bias when comparing themselves with younger (30s) and

older (70s) reference groups. The author also found that self-bias decreased with age but increased with mileage.

While optimism bias is believed to have positive consequences for self-esteem, researchers (e.g. McKenna, 1993; Svenson, 1981) have argued that it also fosters a sense of invulnerability in drivers which may mean that they are less likely to engage in self-protective behaviours. If this is the case, then the converse may also be true, that drivers who report a higher than average risk of crash, i.e. a pessimism bias, may be more likely to engage in self-protective behaviours. Of course, the ultimate in self-protection in driving would involve the introduction of restrictive driving practices and eventually driving cessation. Thus exploring comparative risk biases may be of use in determining the cause of gender differences in early driving cessation and restrictive driving practices.

While the notion of risk perception is of theoretical interest in this study, in terms of examining demographic differences in optimism bias, feelings of vulnerability are of more applied interest in that they are the affective link between risk perception and behavioural choices in driving and could potentially establish the 'risk as feelings' hypothesis in driving behaviour.

Feelings of vulnerability go beyond simple worries or concerns about driving. They reflect an individual's feelings about their susceptibility to potential harm (either physical or emotional) and as such can be thought of as an emotional response to perceived risk (Klein *et al.*, 2011). To date, there is a lack of studies investigating feelings of vulnerability in driving and their effects on driving behaviour. However, application of evidence from the fear of crime literature suggests that feelings of vulnerability may affect driving behaviour and may vary depending on driving circumstances. For example, authors (e.g. Jackson, 2009; Killias, 1990) have suggested that the time of day (e.g. night time versus daytime) and location (deserted areas over populated areas) may be instrumental in exacerbating feelings of vulnerability. Given that feelings of vulnerability may alter dependent on the specific circumstances of driving, feelings of vulnerability should be assessed in a range of conditions.

Authors investigating driving cessation and self-regulation frequently cite a range of risky or challenging driving conditions such as unfamiliar routes, night driving, poor weather conditions and heavy traffic (Baldock *et al.*, 2006; Ball *et al.*, 1998; Charlton *et al.*, 2006), as circumstances that may prompt safety concerns in older drivers. As such, it is considered that these circumstances may also prompt a personal risk assessment and subsequent emotional response. Therefore, feelings of vulnerability are assessed in a range of challenging driving circumstances in this study in order to determine their true effects on driving behaviour.

Driving behaviour can be measured in numerous ways. For this study, two aspects will be considered, firstly driving avoidance and secondly, habitual driving behaviour (driving style). Driving avoidance provides a simple, direct measure of constrained behaviour and is a form of coping behaviour. If affect is important in behavioural choices about driving, then this may be reflected in driver's avoidance scores. Driving style refers to the way drivers habitually choose to drive and is an established pattern of behaviour encompassing speed choice, overtaking behaviours and attitudes to other road users (Elander *et al.*, 1993; Taubman-Ben-Ari *et al.*, 2004).

The Multidimensional Driving Styles Inventory (MDSI: Taubman-Ben-Ari *et al.*, 2004) is a reliable and validated scale which consists of 44 statements relating to eight driving styles. These are (i) dissociative, which measures distractibility (ii) anxious driving, which reviews distress and lack of confidence (iii) risky driving which looks at sensation seeking and risky decisions (iv) angry driving which reviews aggression and hostility towards other drivers (v) high-velocity driving which looks at orientation towards high speed driving (vi) distress reduction which examines engagement in relaxing activities when driving (vii) patient driving which looks at courtesy toward other drivers and finally (viii) careful driving style, which refers to planning and problem solving in the driving task.

To summarise, the aim of this study was to investigate whether perception of risk and feelings of vulnerability affect driving behaviour in female drivers across the lifespan. Two aspects of

driving behaviour were considered, habitual driving behaviour (driving style) and avoidance behaviours (self-regulation). In order to achieve the aim, the following hypotheses were tested:

**Hypothesis 1:** Female drivers will report greater perceived levels of risk than male drivers.

**Hypothesis 2:** Female drivers will report greater feelings of vulnerability than male drivers.

**Hypothesis 3:** Perception of risk will increase with age.

**Hypothesis 4:** Feelings of vulnerability will increase with age.

**Hypothesis 5:** Perception of risk will influence habitual driving behaviours (style).

**Hypothesis 6:** Feelings of vulnerability will influence habitual driving behaviours (style).

**Hypothesis 7:** Perception of risk will be positively associated with driving avoidance.

**Hypothesis 8:** Feelings of vulnerability will be positively associated with driving avoidance.

**Hypothesis 9:** There will be an association between perceived level of risk and feelings of vulnerability.

## **2.2. Methods**

### **2.2.1. Pilot Study**

Prior to the main study, the questionnaire was pre-piloted by five lay people and two academic staff members to test for comprehensibility, ease of navigation and to remove question ambiguities. Items that were considered ambiguous were amended or discarded. The readability was tested using the Flesch Reading Ease Index (Flesch, 1948) and a score of 74.5 was achieved indicating that the questionnaire could be understood by literate adults.

After ethics committee approval and informed consent were obtained, the questionnaire was piloted online, using a small sample of drivers. Participants were 32 men and 32 women, aged between 19 and 67 years (*Mean* =39.28 years, *S.D.* =12.09) all of whom were drawn from non-probabilistic, opportunity sampling in the Midlands. The only pre-determined criteria for inclusion were that participants had to be over 17 years of age and hold a full driving licence.

Participants drove between 0 and 20,000 (*Mean* = 6242.46 miles, *S.D.* = 4345.51) miles per annum. Four participants who did not actually drive (i.e. recorded zero mileage) were included in the analysis since it was useful to the study to determine why someone with a full driving licence elected not to drive. Where participants recorded zero mileage, they were asked their reasons for not driving. Two participants said that they either did not have a car or access to a car whilst one stated their reason as fear of cars and their safety in cars. One participant chose not to report their reasons for not driving.

The findings of the pilot study were first of all subject to missing data analysis in order to establish whether the questions or navigational instructions should be made more specific. Items were considered for review and elimination if they were had a high non-response level (>10% missing values). Subsequently tests of normality were carried out to review the range of answers, skew and kurtosis. Responses were analysed to determine whether any items had a limited range, i.e. not all points on the scale were used. Analysis of distributions was conducted

in order to eliminate items with highly skewed distributions. Values greater than 2.00 were reviewed with a view to elimination. The scale was also tested for reliability (internal consistency) and construct validity by comparison with the MDSI (MDSI: Taubman-Ben-Ari *et al.*, 2004).

High levels of missing and skewed data were found in the sections relating to feelings of vulnerability and risk perception. Since these sections were essential to the integrity of the instrument, they were significantly revised and shortened to facilitate responses. Analyses revealed that the ten point Likert type scale initially used for the feelings of vulnerability questions was not well utilised. Although the range of responses varied by question, generally values were low and only points 0 (not at all vulnerable), 1 and 2 were actually used. Therefore a dichotomous scale (i.e. yes/no answers) was adopted in the larger main study.

In the pilot questionnaire, participants were asked to numerically rate their personal risk of various driving related incidents, e.g. crashes, road rage events and other vehicle related criminal events, e.g. vehicle theft, carjacking, to evaluate possible biases in risk perception. More than 30% of participants failed to respond to these questions and commented in open text boxes that they were too difficult to answer. Only one question relating to risk perception solicited a response within the 10% framework and this question was retained. This question asked people to rate their comparative personal risk for six separate driving related incidents. The comparison group used was the 'average' person of the same age and gender.

Reliability analysis (internal consistency) was undertaken on the section of the questionnaire relating to driving styles and coping strategies. The internal consistency of the questionnaire items was calculated using Cronbach's  $\alpha$ . All MDSI factors achieved an acceptable score above 0.70 (Kline, 1994). Given that some new scales consisted of fewer than 12 items, a lower alpha value of 0.6 was considered acceptable for the purpose of the pilot and for exploratory purposes (cf. Cortina, 1993). After removal of items, three new scales – affective ( $\alpha = 0.61$ ) and instrumental ( $\alpha = 0.88$ ) attitude, and reluctant driving ( $\alpha = 0.75$ ) achieved acceptable levels of

reliability. The reluctant driving scale which contained items relating to driving avoidance was renamed “avoidance”. Findings relating to two of the new scales - affective and instrumental attitude - are not discussed in Study 1 but are reported in Study 2 (See Chapter 3).

Driving style and coping items were also subject to a Principal Components Analysis (PCA) to determine the extent to which the factor structure of the new questionnaire replicated the structure of the MDSI (Taubman-Ben-Ari *et al.*, 2004), to review the structure of new items and to determine which items failed to contribute to the analysis.

Unfortunately, the pilot sample size (N=64) was inadequate to provide reliable results. Although inspection of the correlation matrix revealed the presence of many coefficients above 0.3, the value of the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy (Kaiser, 1970) was 0.17, well below the recommended value of 0.6 (Pallant, 2007). Despite the exclusion of 14 variables with KMO statistics <0.1, resulting in a revised KMO of 0.60, a six factor solution failed to achieve acceptable communalities (range 0.42 to 0.74) or factor loadings (range 0.30 to 0.73). Given the limited factor solutions, low sample size and the inadequacy of the strength of the data, the factor structure was deemed unreliable. However, since internal consistency analysis revealed that the new scales (affective and instrumental attitude and avoidance) achieved acceptable levels of reliability for exploratory purposes, these and the MDSI were retained for use in the main study. Reliability and validity were further examined in the actual study with a larger number of participants (N=395).

## **2.2.2. Main Study**

### **2.2.2.1. Participants**

Participants comprised 395 drivers (267 women and 128 men) aged between 18 and 78 years ( $M = 32.9$  years,  $S.D. = 13.89$ ). Participants’ duration of driving experience ranged from 2 months to 55 years ( $M = 13.21$  years,  $S.D. = 12.85$ ). 57.1% of drivers had a prior history of collision involvement over the course of their driving career.

Some participants were students at the University of Aston, enrolled on the undergraduate psychology course who received course credits for their participation. Participants from the wider community were sourced through advertising at Aston University, on social networking sites and through social clubs. Older participants were specifically targeted through the Aston Research Centre for Healthy Ageing (ARCHA) programme and by direct approach to the University of the Third Age. The only pre-determined criteria for inclusion were that participants had to be over 17 years of age, hold a full driving licence and be practising drivers.

#### **2.2.2.2. Materials**

The complete questionnaire comprised five sections. In order to clarify and examine distinct hypotheses and for ease of reporting and reading, the results are divided between two studies, Study 1 described here and Study 2, in Chapter 3. Therefore not all of the results are presented in Study 1. However, the questionnaire is described here in full for completeness and to reduce the need for repetition later. The full questionnaire can be found in Appendix A.

The first section included demographic information (age and gender), driving experience (length of time an individual had been in possession of a full driving licence), driving patterns (number of miles driven per week) and crash history over the participant's driving career. Participants were also asked about their planning and preparation strategies for emergencies using a question about the emergency equipment that they kept in their car. A list of 25 items including mobile phone, jack, tow rope, breakdown service telephone number and first aid kit was given as a prompt and participants also had the opportunity to record additional items in an open text box.

The second section measured habitual driving behaviours known as driving style using the Multi-Dimensional Driving Styles Index (MDSI: Taubman-Ben-Ari *et al.*, 2004) which consists of 44 items across eight different driving styles and coping strategies (e.g. careful, anxious, dissociative) on a six point likert type scale from 'not at all' (1) to 'very much' (6). Example items include "It worries me when driving in bad weather" (anxious); "I like to take risks while

driving” (risky) or “I drive cautiously” (cautious). Participants’ scores for each of the eight styles were calculated.

The third section measured instrumental and affective attitudes and avoidance behaviours using eighteen items on a likert type scale from (1) ‘strongly disagree’ to (5) ‘strongly agree’. Items relating to instrumental and affective attitude were adapted and extended from an existing survey (Lindstrom-Forneri, Tuokko & Rhodes, 2007) reviewing driver attitudes and behaviour change in older adults (> 60 years). Affective attitude questions were worded to derive a measure of negative affect. Findings relating to affective and instrumental attitude are reported in Study 2 (see Chapter 3) The avoidance factor consisted of five items relating to commonly avoided difficult driving situations adapted from the Driving Habits Questionnaire (DHQ: Owsley *et al.*, 1999). A list of questionnaire items and internal consistency (Cronbach’s alpha) for all three factors can be found in Table 3.

**Table 3: Questionnaire items and internal consistency (Cronbach’s alpha)**

	Items	Cronbach’s alpha
Instrumental Attitude	Driving a car is central to my independence	0.85
	Being able to drive is important to me	
	Being able to drive is important to my work or family life	
Affective Attitude	Driving is necessary to give me the flexibility I need	0.85
	Driving a car is pleasurable (-)	
	I am apprehensive about driving	
	I am concerned about the unsafe and aggressive behaviours of other drivers	
	I would be anxious driving an unfamiliar route	
	I worry about getting lost when I drive	
	I am happy to overtake other vehicles (-)	
	I feel comfortable when driving (-)	
	I am happy to drive in the dark (-)	
	I worry about breaking down or getting a puncture	
Avoidance	I avoid driving on the motorway	0.79
	I avoid changing lanes or overtaking on the motorway	
	I avoid making right hand turns at busy junctions	
	I avoid driving in bad weather, e.g. heavy rain, snow or ice	
	I avoid driving in heavy traffic, e.g. at rush hour	

The last two sections measured perception of risk and feelings of vulnerability respectively.

Perception of risk was measured using a comparative risk estimate, i.e. a participants’ personal risk compared with the average driver of the same age and gender. Since traffic collisions are

not the only potential source of risk when driving, wider vehicle related incidents which could create feelings of vulnerability in drivers were investigated. Participants were asked to rate their comparative risk to the likelihood of each of six events – fatal or serious collision (KSI), road rage incident, carjacking, car theft, car vandalism and vehicle related personal attack. Analyses were conducted separately for each risk event and a total scale score for optimism bias was calculated (range minimum 0, maximum 18) and used in some analyses. The Cronbach's  $\alpha$  for the optimism bias scale was 0.78.

Feelings of vulnerability were measured by presenting participants with a list of fifteen challenging driving circumstances and asking them to respond with a yes/no answer to the question 'Do you feel vulnerable when driving in these circumstances?' Circumstances were based on an adapted and extended version of the difficulty scale of the Driving Habits Questionnaire (DHQ: Owsley *et al.*, 1999) which was developed to assess the differences in driving habits between older drivers with cataracts and those without. This scale consists of 8 items assessing the level of difficulty drivers have had with certain challenging driving circumstances in the last three months, e.g. 'driving in rain', 'driving alone', 'parallel parking', 'making turns across oncoming traffic', 'driving on interstates or expressways', 'driving on high traffic roads', 'driving in rush-hour' and 'driving at night' also with a yes/no answer. Circumstances were amended to reflect UK terminology and driving circumstances, e.g. 'interstates' was amended to 'motorways'. Two items were amalgamated to read 'driving in rush hour or heavy traffic'.

After a review of the literature relating to self-regulation in driving, six additional items were added to reflect a wider range of challenging driving circumstances, i.e. 'driving with a passenger' (derived from MacDonald, 2007), 'driving unfamiliar routes' (derived from MacDonald, 2007; D'Ambrosio, 2008), 'driving distances of greater than 50 miles' (slightly adapted from MacDonald, 2007; D'Ambrosio, 2008), 'negotiating a roundabout' (derived from Charlton *et al.*, 2006), 'changing lanes on a motorway' (derived from Charlton *et al.*, 2006 and MacDonald, 2007), 'reversing into a space between two cars' (slightly adapted from

MacDonald, 2007). Two completely new items were also included ‘overtaking’ and ‘driving in your local area’. The former reflects a challenging driving situation not previously examined by other studies while the latter provides a baseline for emotions in driving and is identified as a theme by Sullivan *et al.*, (2011) in their review of older drivers’ avoidance behaviours. Total scores for feelings of vulnerability were calculated (range minimum 0, maximum 15). The internal consistency (Cronbach’s  $\alpha$ ) for this scale was 0.89.

#### **2.2.2.3. Design**

A between participants design was employed. Participants were divided by gender and age into three groups - young drivers (18 to 25 years), middle years (26 to 64 years) and older drivers (over 65 years). Scores for perception of risk, feelings of vulnerability and avoidance were used as dependent variables.

#### **2.2.2.4. Procedure**

After Aston university ethics committee approval and informed consent were obtained, participants were asked to complete the self-report questionnaire using the online electronic survey creator SurveyMonkey® at a time and place convenient for them. Data were analysed using PASW statistics version 18.

#### **2.2.2.5. Analysis**

Descriptive analyses were performed on demographic information. ANOVAs were conducted to review the effects of gender and age on perception of risk and feelings of vulnerability. To further examine any gender effects on perception of risk, feelings of vulnerability, driving style and avoidance behaviours, correlation analyses were carried out separately for men and women. Finally, hierarchical regression modelling by age group was used to identify the best predictors of feelings of vulnerability.

## 2.3. Results

### 2.3.1. Preliminary analyses- driving experience, driving patterns and crash history

Analyses of driving experience, driving patterns and crash history were conducted separately by gender. Kruskal-Wallis tests revealed significant differences in driving experience (time since licensure) in male  $\chi(2,124) = 89.85, p < 0.001$  and female drivers  $\chi(2, 257) = 160.97, p < 0.001$  across three different age groups. The same test also demonstrated significant differences in crash history in male  $\chi(2,124) = 28.67, p < 0.001$  and female drivers  $\chi(2, 264) = 43.55, p < 0.001$  across the three age groups. Means, medians and standard deviations of driving experience and crash history are shown in Table 4. Given the significant findings, post-hoc analyses were conducted.

**Table 4: Means, medians and standard deviations of driving experience and crash history by gender and age group.**

Gender	Age		Experience	Crash history
Male	18-25 (N=49)	Mean	3.33	0.59
		S.D.	1.92	0.82
		Median	3.00	0.00
	26-64 (N=68)	Mean	20.85	1.97
		S.D.	11.53	1.48
		Median	20.00	2.00
	>65 (N=7)	Mean	51.86	2.00
		S.D.	4.63	1.29
		Median	53.00	2.00
Female	18-25 (N =106)	Mean	2.82	0.51
		S.D.	1.72	0.88
		Median	3.00	0.00
	26-64 (N =141)	Mean	17.15	1.38
		S.D.	9.55	1.22
		Median	17.00	1.00
	>65 (N =10)	Mean	40.20	1.80
		S.D.	7.87	1.48
		Median	40.00	1.50

Post hoc analyses using Mann-Whitney U tests between pairs of groups with a Bonferroni correction ( $\alpha = 0.017$ ) determined that, as anticipated, driving experience increased with age. Effect sizes (calculated using an approximate value of  $r$ , i.e.  $r = z/\sqrt{N}$  (see Pallant, 2007) were

large (>0.5 Cohen, 1992)) for all groups except between middle-years and older female drivers.

Table 5 shows the results of the post-hoc analyses.

**Table 5: Post-hoc analyses of driving experience between pairs of age groups by gender.**

Gender		Young and middle years' drivers	Middle years and older drivers
Male	N	117	75
	Mann-Whitney U	59.00	4.00
	z	-8.89	-4.26
	p	<0.001	<0.001
	r	0.82	0.57
Female	N	247	151
	Mann-Whitney U	803.00	50.00
	z	-12.03	-4.91
	p	<0.001	<0.001
	r	0.77	0.35

Post hoc analyses using Mann-Whitney U tests between pairs of groups with a Bonferroni correction ( $\alpha = 0.017$ ) found differences in crash history between young and middle-years drivers, and young and older drivers in both genders with medium effect sizes (>0.3 Cohen, 1992). Middle-years and older drivers reported higher crash histories than younger drivers. However, no significant differences were found in crash history between middle-years and older drivers in either gender. Table 6 shows the results of the post-hoc analyses.

**Table 6: Post-hoc analyses of crash history between pairs of age groups by gender.**

Gender		Young and middle years' drivers	Middle years and older drivers	Young and older drivers
Male	N	117	73	58
	Mann-Whitney U	784	227	64.5
	z	-5.15	-0.07	-2.99
	p	<0.001	0.07	<0.01
	r	0.48	0.01	0.39
Female	N	254	151	123
	Mann-Whitney U	4492	592	252
	z	-6.36	-0.87	-3.39
	p	<0.001	0.38	<0.001
	r	0.39	0.07	0.31

Given that driving patterns (weekly mileages) were reported using categorical data, chi-square tests for independence were used to explore the associations between age in three groups and driving patterns. A significant association was noted in female drivers,  $\chi (10, N = 258) = 23.25$ ,

$p = 0.01$ , Cramer's  $V = 0.21$ . The age group by mileage cross-tabulation for female drivers is shown in Table 7. A review of the table shows that older women's mileage is lower in comparison with other groups. Given the low numbers of older female participants, care should be taken when generalising these findings to a wider population. No such association was found between age group and mileage in male drivers.

**Table 7: Female driving patterns (weekly mileage) by age**

Age group		Miles per week						Total
		0	1-50	51-100	101-150	151-200	>201	
18-25	N	14	50	31	8	2	6	111
	% within group	12.60	45.00	27.90	7.20	1.80	5.40	100.00
26-64	N	5	53	33	18	9	21	139
	% within group	3.60	38.10	23.70	12.90	6.50	15.10	100.00
>65	N	0	5	1	2	0	0	8
	% within group	0.00	62.50	12.50	25.00	0.00	0.00	100.00

Analyses were also conducted to review the type of emergency equipment participants kept in their cars. The ten most popular items are shown in descending order in Table 8.

**Table 8: Emergency items retained by participants**

	N	% of participants with item
Mobile phone	289	73.0
Ice scraper	272	68.7
Sunglasses	243	61.4
Jack	241	60.9
Breakdown service number	230	58.1
First aid kit	178	44.9
Spare change	170	42.9
Tools	148	37.4
Warning triangle	138	34.8
Water	136	34.3

Independent t tests were carried out to determine whether there were any significant differences in terms of the types of emergency equipment carried by gender and found that men were more likely than women to carry the items listed in Table 9. There were no items that women were more likely to carry than men.

**Table 9: Emergency equipment more likely to be carried by men**

Item	<i>t</i>	<i>df</i>	<i>P</i>	Men		Women	
				<i>Mean</i>	<i>S.D.</i>	<i>Mean</i>	<i>S.D.</i>
High visibility jacket	3.46	199	<0.01	0.30	0.46	0.14	0.35
Tools	6.28	229	<0.01	0.59	0.49	0.27	0.45
Jack	5.02	293	<0.01	0.77	0.42	0.53	0.50
Warning triangle	2.88	233	<0.01	0.45	0.50	0.30	0.46
Foot pump	2.36	206	<0.01	0.23	0.42	0.13	0.33
Torch	4.35	219	<0.01	0.48	0.50	0.26	0.44
Tow rope	3.11	178	<0.01	0.19	0.39	0.07	0.26
Light bulbs	3.05	203	<0.01	0.28	0.45	0.14	0.35

### 2.3.2. Descriptive analyses - perception of risk and feelings of vulnerability

A review of the descriptive statistics suggested that participants generally underestimated their comparative risk of a potentially traumatic or vehicle related criminal event. Table 10 shows the level of risk perception as a proportion of the sample to each of the events by gender.

**Table 10: Comparative perception of risk to a range of traumatic events.**

%		Less than average	Average	More than average
KSI	Male	50.5	41.4	8.1
	Female	40.2	57	2.9
Road rage	Male	46.8	43.2	9.9
	Female	41.4	54.9	3.7
Carjacking	Male	61.3	38.7	0
	Female	42.6	56.1	1.2
Car theft	Male	36.9	62.2	0.9
	Female	28.3	69.3	2.5
Vandalism	Male	30.6	67.6	1.8
	Female	23.4	73	3.7
Personal attack	Male	42.3	57.7	0
	Female	27	69.3	3.7

*Note: N men = 111, women = 244*

Chi-square tests for independence were conducted to examine the differences in reported, comparative perceptions of risk between the genders. There were statistically significant differences in the way men and women reported their risk of KSI, road rage, carjacking and personal attack with men reporting that they were more optimistic about risk than women. Effect sizes measured using the phi coefficient were small to moderate (Cohen, 1992). The results of these analyses are shown in Table 11. No gender effect was seen in terms of optimism bias toward property crime, i.e. car theft or car vandalism.

**Table 11: Chi square test for independence comparing gender effects in risk perception to a range of traumatic events circumstances.**

Item	<i>X</i>	<i>df</i>	<i>p</i>	<i>Phi</i>
KSI	10.04	2	<0.001	0.17
Road rage	7.80	2	0.02	0.15
Car jacking	11.39	2	<0.001	0.18
Car theft	3.36		0.19	0.10
Vandalism	2.76	2	0.25	0.09
Personal attack	11.27	2	<0.001	0.18

A higher proportion of the sample of female drivers also reported greater feelings of vulnerability across the range of challenging driving circumstances than men did. The results are shown in Table 12.

**Table 12: Proportion of sample by gender experiencing feelings of vulnerability in a range of challenging driving circumstances.**

%	Men	Women
Driving alone	15.3	48.6
With a passenger	12.6	15.0
In local area	7.3	4.9
In unfamiliar area	33.3	63.8
Greater than 50 miles	14.4	38.5
When overtaking	27.9	50.8
Turning right across traffic	19.8	37.4
Negotiating a roundabout	20.7	31.6
On a motorway	17.3	38.1
Changing lanes on a motorway	18.2	40.5
In rush hour or heavy traffic	23.9	28.2
At night	24.3	38.0
In bad weather	51.4	75.2
When parallel parking	21.8	46.7
Reversing into a space between cars	17.3	47.2

*Note: N ranges men = 109-111, women =245-247*

Given that feelings of vulnerability were reported using dichotomous responses, chi-square tests for independence were used to explore the differences in feelings of vulnerability between the genders. Women were more likely than men to feel vulnerable in all circumstances, except when driving with a passenger, in the local area and in rush hour. Effect sizes measured using the phi coefficient were very small to moderate (Cohen, 1992). The results of these analyses are shown in Table 13. There were no circumstances in which men felt more vulnerable than women.

**Table 13: Chi square test for independence comparing gender effects in feelings of vulnerability in a range of challenging circumstances.**

Item	<i>X</i>	<i>df</i>	<i>p</i>	<i>Phi</i>
Driving alone	35.88	1	<0.01	-0.32
With a passenger	0.35	1	0.55	-0.03
In local area	0.84	1	0.36	0.05
In unfamiliar area	28.65	1	<0.01	-0.28
Greater than 50 miles	20.70	1	<0.01	-0.24
When overtaking	16.28	1	<0.01	-0.21
Turning right across traffic	10.87	1	<0.01	-0.18
Negotiating a roundabout	4.46	1	<0.05	-0.11
On a motorway	15.12	1	<0.01	-0.21
Changing lanes on a motorway	16.97	1	<0.01	-0.22
In rush hour or heavy traffic	0.71	1	0.40	-0.04
At night	6.36	1	=0.01	-0.13
In bad weather	19.93	1	<0.01	-0.24
When parallel parking	19.77	1	<0.01	-0.24
Reversing into a space between cars	28.83	1	<0.01	-0.29

### 2.3.3. Effect of age and gender on perception of risk and feelings of vulnerability.

Two-way between groups ANOVAs were conducted to explore the relationships between perception of risk as measured using total optimism bias, feelings of vulnerability, gender and age. Main effects for gender were found for both perceptions of risk  $F(1,353) = 5.40, p < 0.05$ , partial  $\eta^2 = 0.01$  and feelings of vulnerability,  $F(1,342) = 12.62, p < 0.01$ , partial  $\eta^2 = 0.36$ , confirming Hypotheses 1 and 2 that women would report greater perceived levels of risk and feelings of vulnerability than men. Contrary to Hypotheses 3 and 4, that risk perception and feelings of vulnerability would increase with age, there were no significant main effects of age on either perception of risk,  $F(2,353) = 0.82, p = 0.44$  or feelings of vulnerability,  $F(2,342) = 0.91, p = 0.40$  and no age by gender interactions were found for perception of risk,  $F(2,353) = 0.512, p = 0.60$  or feelings of vulnerability,  $F(2,342) = 0.98, p = 0.38$ .

### **2.3.4. Correlation analyses: effect of perception of risk and feelings of vulnerability on driving style.**

The relationships between age, perception of risk, feelings of vulnerability, driving style and avoidance were explored using bivariate correlations, separately for men (see Table 14) and women (see Table 15).

#### *2.3.4.1 Associations by age*

Hypothesis 3 proposed that perceptions of risk would increase with age. However, no such associations were noted in men or women when bivariate correlations of age and total score for perceived risk were conducted. When divided by event, perception of risk, did increase with age in the case of one event. The perceived risk of a fatal or serious collision (KSI) was significantly positively correlated with age in female participants, perhaps this reflects greater feelings of vulnerability to the outcome of an incident rather than a misplaced sense of risk.

In contrast, a significant negative relationship was noted between age and perceived risk of road rage incidents in male drivers. This might reflect a trend in the reduction of risky driving behaviours and law violations in older age (e.g. Groeger & Brown, 1989; Parker, Reason, Manstead & Stradling, 1995a). If men are not driving in a risky or impatient manner, then they may perceive that they are less likely to attract aggression from other road users. No other significant relationships were noted between age and perception of risk.

Hypothesis 4 proposed that feelings of vulnerability would increase with age. In fact, feelings of vulnerability were significantly negatively correlated with age in female drivers suggesting that older women felt less vulnerable when driving than younger women. This relationship is of particular interest since it might have been anticipated that older women would feel more vulnerable than younger women, give that they are potentially frailer and therefore at greater risk of being killed or seriously injured in the event of a crash (Gandolfi, 2010). No relationship was found between age and feelings of vulnerability in male drivers.

#### *2.3.4.2 Associations by risk perception*

Providing evidence for Hypothesis 5, the associations between perception of risk and driving style in male drivers were largely intuitive. The perceived risk of being involved in a KSI was negatively correlated with patient and careful driving styles. This finding might reflect an underestimation of self-reported prudent driver's risk potential, or it may accurately reflect a sensible driver's risk. As might be expected the perception of risk of a road rage incident was strongly negatively correlated with patient and careful driving styles and weakly negatively correlated with an anxious driving style, perhaps then anxious drivers take greater care to avoid road rage incidents while patient and careful drivers perceive that their style reduces any risk of aggression from other drivers. Further, perception of risk of road rage was strongly positively correlated with risky, angry and high velocity driving styles suggesting that drivers who habitually adopt these styles recognise that they are putting themselves at greater risk through risky driving choices.

Also in male participants, an anxious driving style was correlated with increased perceptions of risk of carjacking and personal attack; perhaps this reflects a general disposition towards worry and anxiety rather than an accurate reflection of risk potential.

In female drivers, the correlations between perception of risk and driving style are more difficult to explain. For example, the perceived risk of a KSI was negatively correlated with a high velocity driving style, suggesting that women who take risks, drive fast and demonstrate signs of time pressure when driving are overly optimistic about their risk potential. An association was also found between perception of risk of carjacking and a risky driving style, perhaps women who are habitually inclined towards sensation seeking and making risky driving decisions feel that they put themselves at greater risk of this event by their behaviours. Finally, perceived risk of personal attack was weakly positively correlated with a patient driving style.

**Table 14: Correlations for age, perception of risk events, feelings of vulnerability, driving style and avoidance behaviours in male drivers**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Age	1																
2 Risk KSI	-0.07	1															
3 Risk Road Rage	-0.25**	0.32**	1														
4 Risk Carjacking	0.01	0.27**	0.22*	1													
5 Risk Car Theft	0.02	0.34**	0.14	0.46**	1												
6 Risk Vandalism	-0.04	0.27**	0.15	0.39**	0.68**	1											
7 Risk Attack	0.06	0.29**	0.13	0.57**	0.44**	0.54**	1										
8 Vulnerability	-0.05	-0.10	-0.09	-0.14	-0.09	-0.12	-0.03	1									
9 Dissociative	0.13	0.15	0.12	0.17	0.08	0.02	0.07	0.20*	1								
10 Anxious	0.11	-0.07	-0.22*	0.29*	0.01	-0.04	0.19*	0.34**	0.42**	1							
11 Risky	-0.48**	0.15	0.39**	0.07	0.04	0.08	-0.05	0.01	0.09	-0.23*	1						
12 Angry	-0.30**	0.15	0.38**	0.05	-0.04	0.06	0.05	-0.07	0.13	-0.19	0.39**	1					
13 High Velocity	-0.25**	0.12	0.36**	0.10	-0.06	0.04	0.00	-0.02	0.19	-0.24*	0.53**	0.55**	1				
14 Distress Reduction	0.10	0.12	0.11	-0.08	-0.06	-0.03	-0.08	0.02	0.29**	-0.02	0.12	0.25**	0.20*	1			
15 Patient	0.35**	-0.31**	-0.30**	-0.06	0.07	0.01	-0.12	0.04	-0.13	0.11	-0.47**	-0.39**	-0.42**	0.03	1		
16 Careful	0.40**	-0.20*	-0.32**	-0.04	-0.13	-0.11	-0.02	-0.01	-0.22*	0.02	-0.64**	-0.18	-0.36**	0.07	0.58**	1	
17 Avoidance	0.00	-0.28**	-0.19*	-0.04	-0.06	-0.12	-0.01	0.50**	0.28**	0.58**	-0.15	-0.11	-0.16	-0.01	0.05	0.03	1

\* $p < 0.05$  \*\* $p < 0.01$  Note: Male  $N$  ranges from 109 to 127

**Table 15: Correlations for age, perception of risk events, feelings of vulnerability, driving style and avoidance behaviours in female drivers**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Age	1																
2 Risk KSI	0.17**	1															
3 Risk Road Rage	-0.03	0.28**	1														
4 Risk Carjacking	0.01	0.25**	0.36**	1													
5 Risk Car Theft	0.02	0.19**	0.26**	0.61**	1												
6 Risk Vandalism	-0.06	0.24**	0.27**	0.56**	0.72**	1											
7 Risk Attack	-0.07	0.37**	0.33**	0.46**	0.49**	0.52**	1										
8 Vulnerability	-0.13*	0.12	0.02	-0.08	0.01	-0.02	0.14*	1									
9 Dissociative	-0.09	-0.03	-0.08	0.01	0.10	0.05	0.10	0.30**	1								
10 Anxious	-0.11	0.04	0.00	-0.11	-0.01	-0.01	0.09	0.58**	0.34**	1							
11 Risky	-0.13*	-0.02	0.09	0.15*	0.07	0.05	0.01	-0.20**	0.10	-0.22**	1						
12 Angry	-0.17*	-0.09	0.19**	0.04	0.00	0.09	-0.03	-0.26**	0.01	-0.07	0.17**	1					
13 High Velocity	-0.22**	-0.13*	0.03	0.03	-0.03	0.10	-0.06	-0.22**	0.23**	-0.09	0.44**	0.45**	1				
14 Distress Reduction	0.12	0.02	-0.08	0.06	0.03	-0.01	-0.01	0.05	0.18**	-0.02	0.03	-0.09	0.12	1			
15 Patient	0.25**	0.06	0.00	-0.03	0.02	0.05	0.13*	0.12	-0.05	0.15*	-0.32**	-0.30**	-0.39**	0.04	1		
16 Careful	0.03	-0.08	-0.05	-0.04	-0.06	0.02	-0.01	0.02	-0.30**	0.08	-0.37**	-0.21**	-0.29**	-0.02	0.51**	1	
17 Avoidance	-0.14*	-0.02	-0.06	-0.19**	-0.05	-0.04	0.09	0.65**	0.26**	0.69**	-0.20**	-0.23**	-0.19**	-0.01	0.10	0.10	1

\* $p < 0.05$  \*\* $p < 0.01$  Note: Female N ranges from 232 to 265

#### *2.3.4.3 Associations by feelings of vulnerability*

In order to explore the sixth hypothesis, associations between driving style and feelings of vulnerability were explored. Feelings of vulnerability were positively correlated with the maladaptive dissociative and anxious driving styles and avoidance behaviours in both genders. Further, feelings of vulnerability were significantly negatively correlated with risky, angry and high velocity styles in women only. This finding is intuitive. Women who feel vulnerable when driving would not wish to exacerbate those feelings by engaging in dangerous behaviours such as speeding, sensation seeking or making risky driving decisions.

The only relationship noted which supported Hypothesis 9 was that feelings of vulnerability were significantly positively correlated with perceived risk of personal attack in female drivers. This may reflect an inability to control the outcome of such events and as such depicts the vulnerability hypothesis in driving.

#### *2.3.4.4 Effect of perception of risk and feelings of vulnerability on avoidance – correlation analyses*

Significant negative associations were found between perceived risk of KSI and road rage and driving avoidance in male drivers, and carjacking and driving avoidance in female drivers, suggesting that those who avoid driving perceive that they are at lower risk of certain events. This finding is interesting but not in the expected direction of Hypothesis 7, which stated that there would be a positive association between risk perception and avoidance. A total value for risk optimism was calculated and correlation analyses conducted by gender for driving avoidance. A significant negative association was found between driving avoidance and risk perception in men ( $r = -.19$   $df = 111$ ,  $p < 0.05$ ) but no such association was determined in women ( $r = -.06$   $df = 244$ ,  $p > 0.05$ ), although the relationship was in the same direction.

When the associations between feelings of vulnerability and avoidance were explored, a significant positive association was noted between vulnerability and avoidance in both male ( $r =$

.50  $df = 111$ ,  $p < 0.01$ ) and female drivers ( $r = .65$   $df = 237$ ,  $p < 0.01$ ). This finding was in the anticipated direction and provided support for Hypothesis 8.

Finally, to further explore Hypothesis 9 the associations between total risk optimism and feelings of vulnerability were conducted by gender. There was a positive (non-significant) relationship between risk perception and feelings of vulnerability in women ( $r = 0.04$   $df = 237$ ,  $p > 0.05$ ) while a negative (non-significant) relationship was found in men ( $r = -.14$   $df = 107$ ,  $p > 0.05$ ). Although the relationship is in the anticipated direction for female drivers, the finding that risk perception and feelings of vulnerability are not positively associated is contrary to Hypothesis 9 for men.

### **2.3.5. Regression analyses**

The associations between risk perception and driving style were not straightforward and there were numerous differences between the genders. However, clear relationships were established between feelings of vulnerability and the habitual adoption of specific maladaptive driving styles and avoidance behaviours. Therefore, in order to assess the ability of habitual driving behaviours (driving style) and avoidance to predict feelings of vulnerability a hierarchical regression analysis was conducted.

The entry criterion was set at  $\alpha = .05$ . Only the driving styles and behaviours found to be significantly correlated with feelings of vulnerability in both genders were entered, i.e., anxious and dissociative driving styles and avoidance. Given the significance of gender on vulnerability, this was entered at Step 1 as a control measure. Dissociative and anxious driving styles were entered at Step 2. Finally, avoidance behaviours were entered at Step 3. In order to explore the predictors of feelings of vulnerability across the lifespan, analyses were carried out separately for each age group. The results are displayed in Table 16. The models explained between 36% and 70% of the variance in feelings of vulnerability by age group.

In the youngest age group (18 to 25 years), the overall model accounted for 55% of the total variance in feelings of vulnerability,  $F(4,126) = 38.56$   $p < 0.01$ . In Step 1, gender accounted for a significant 15% of the variance. The addition of anxious and dissociative driving styles in Step 2, accounted for an additional, significant 29.2% of the variance. The subsequent addition of avoidance in Step 3, accounted for an additional, significant 11% of the variance. In the final step of the equation, the significant predictors of feelings of vulnerability were an anxious driving style ( $\beta = 0.23$ ) and avoidance ( $\beta = 0.49$ ) with higher scores for anxious driving style and avoidance predicting greater feelings of vulnerability.

In the middle-years group (26 to 64 years), the overall model accounted for 36% of the total variance in feelings of vulnerability,  $F(4,173) = 24.98$   $p < 0.001$ . In Step 1, gender accounted for 6% of variance. The addition of driving styles at Step 2, accounted for an additional, significant 21% of the variance. The subsequent addition of avoidance at Step 3, accounted for an additional, significant 9% of the variance. Similar to younger drivers, in the final step of the analysis, a significant predictor of feelings of vulnerability in middle-years' drivers was the adoption of avoidance ( $\beta = 0.45$ ). However, in middle-years' drivers, it was a dissociative driving style ( $\beta = 0.15$ ) rather than an anxious style which was a significant predictor of feelings of vulnerability. In both the younger and middle-years' drivers, avoidance behaviours recorded a higher beta value than anxious driving style.

In the older drivers (65 years and over), the overall model accounted for 70% of the total variance in feelings of vulnerability,  $F(4,9) = 5.24$   $p < 0.05$ . In Step 1, gender accounted for 8% of variance but this value was not significant. The addition of driving styles at Step 2, accounted for an additional, significant 54% of the variance. The subsequent addition of avoidance at Step 3, accounted for an additional, non-significant 8% of the variance. In the final step of the analysis, there were no statistically significant predictors of feelings of vulnerability.

The results from the regression analyses provide additional support for Hypotheses 6 and 8, that driving style and avoidance influence the reported level of feelings of vulnerability, since

avoidance is a significant predictor of feelings of vulnerability in two of the three age groups. Further, an anxious driving style and a dissociative driving style are significant predictors of feeling of vulnerability in the youngest and middle-years' age groups respectively.

**Table 16: Hierarchical multiple regression of gender, anxious and dissociative driving styles and avoidance on feelings of vulnerability by age group.**

Age	Step	Variable	B	R <sup>2</sup>	R <sup>2</sup> change	F
18 to 25 (N=126)	1	Gender	-0.39**	0.15**	0.15**	22.43**
		Gender	-0.16*	0.44**	0.29**	33.25**
	3	Dissociative	0.21			
		Anxious	0.58**			
		Gender	-0.12	0.55**	0.11**	38.56**
		Dissociative	0.01			
		Anxious	0.23*			
		Avoidance	0.49**			
26 to 64 (N=173)	1	Gender	-0.25**	0.06**	0.06**	11.83**
		Gender	-0.12	0.27**	0.21**	21.62**
	3	Dissociative	0.15*			
		Anxious	0.40**			
		Gender	-0.09	0.37**	0.09**	24.98**
		Dissociative	0.15*			
		Anxious	0.09			
		Avoidance	0.45**			
65+ (N=9) <sup>1</sup>	1	Gender	-0.28	0.08	0.08	0.98
		Gender	0.18	0.62	0.54*	5.32*
	3	Dissociative	0.26			
		Anxious	0.62*			
		Gender	-0.15	0.70	0.08	5.24*
		Dissociative	0.17			
		Anxious	0.40			
		Avoidance	0.39			

\* $p < 0.05$  \*\* $p < 0.01$

<sup>1</sup>Given the low numbers of participants in the older age group, regression analyses were re-run using slightly lowered age cut off points at 55 years (N=26) and 60 years (N=18) to determine whether the pattern of results would be affected. The revised overall models accounted for 59% and 63% of the variance in feelings of vulnerability,  $F(4,26) = 9.43, p < 0.01$  and  $F(4,18) = 7.54, p < 0.01$  at 55 and 60 years respectively. Although the results were not substantially affected, in the final steps of the revised analyses, avoidance became a significant predictor of feelings of vulnerability amongst those aged over 55 and 60 years recording beta values of 0.55\*\* and 0.60\*\* respectively, providing further support for Hypothesis 8.

## 2.4. Discussion

The aim of this study was to explore perception of risk and feelings of vulnerability in drivers across the lifespan to determine whether they affected driving behaviour. To summarise, the results indicated that women reported greater total perceived levels of risk and feelings of vulnerability than men. However, limited evidence was found to link increased perception of risk and feelings of vulnerability with age. Feelings of vulnerability were consistently associated with habitual but maladaptive driving styles in both genders while the associations between driving style and risk perception were less clear. Finally, emotional responses to risk, i.e. feelings of vulnerability were found to significantly influence driving avoidance.

Consistent with findings from the fear of crime literature (e.g. Akers *et al.*, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984) and supporting the first two study hypotheses, women reported greater perceived levels of risk and feelings of vulnerability in driving than men. This finding suggests that women and men do indeed respond differently to perceived risk in driving and that emotional responses to risk, i.e. feelings of vulnerability may be implicated in decisions about ongoing mobility and driving cessation.

Interestingly, the patterns of risk perception were quite different between the genders. Similar to the findings of previous studies (e.g. DeJoy, 1992; Harré & Sibley, 2007) women were less likely to report an optimism bias in their assessment of risks related to potentially traumatic events and vehicle related criminal events than men. Although in terms of crash risk optimism, this has been linked with greater self-enhancement skill biases in male drivers (Harré & Sibley, 2007), perhaps given the range of events requiring comparative risk evaluation in this study, some of the gender differences stem from differences in vulnerability to outcomes. For example, the fear of crime literature suggests that the outcome of personal attack may be worse for women than for men and that women may be less able to defend themselves from such attacks (Jackson, 2009). Of the six risk scales in this study, two in particular – carjacking and personal attack – could have more potentially more serious outcomes for women. Alternatively, these

differences in optimism bias may partly reflect the ‘risk as feelings’ hypothesis in driving, in that women are more accurately reporting their potential risk but then also reporting a greater emotional response to that risk than men do.

Despite evidence that older demographic groups may report optimism bias (Gosselin *et al.*, 2010), there were no significant effects of age on optimism bias in this study. However, in order to examine Hypothesis 3, risk perception was examined separately by event (e.g. KSI, road rage, carjacking etc) and two relationships between age and risk perception were noted. Increased age was found to be a factor in increased perception of KSI in women drivers only. This may reflect a strong optimism bias in younger women, or might be reflect greater feelings of vulnerability to the outcome of such an event in older women. Older women are potentially frailer and more prone to serious injury or death in the event of a crash (Gandolfi, 2010) so perhaps this association implies a greater sensitivity to the consequences of a crash rather than a misplaced sense of risk.

An inverse relationship was noted between age and perception of road rage risks in male drivers. This may reflect a trend in the reduction of risky driving behaviours and law violations in older age, apparent from both the driving literature (e.g. Groeger & Brown, 1989; Parker *et al.*, 1995a) and the relationship noted between age and habitual risky behaviours in correlation analyses. If men are not driving in a risky or impatient manner, then they may perceive that they are less likely to attract aggression from other road users.

This was the first study to examine feelings of vulnerability in drivers and it was found that although they are present in many drivers, they are particularly prevalent in women. With the exception of three relatively ‘safe’ circumstances – driving with a passenger, in familiar areas and at rush hour - women consistently reported feeling more vulnerable in a range of challenging driving circumstances than men did. The three instances in which women did not feel more vulnerable, can perhaps be explained by reference to the fear of crime literature.

Criminologists have suggested that there are certain physical (e.g. older age, female gender, poor health status), social (e.g. people with limited social support) and situational (e.g. time of day, deserted areas) ‘markers’ of perceived vulnerability. Driving with a passenger may provide social support (see Chapter 3), a lack of which has been linked with increased feelings of vulnerability (Jackson, 2009; Killias, 1990). Driving in a familiar area and in rush hour traffic might be considered to reduce situational feelings of vulnerability since one is less likely to be anxious in a familiar or well populated area (Jackson, 2009; Killias, 1990). An alternative suggestion is that driving in rush hour means that drivers’ speed and direction are well-regulated and perhaps drivers are less likely to make sudden manoeuvres that trigger feelings of vulnerability.

Feelings of vulnerability were significantly associated with the habitual adoption of the maladaptive driving styles, dissociative and anxious driving in both men and women. A dissociative style reflects a driver’s distractibility and tendency to commit errors due to distraction while an anxious style reflects a tendency towards anxiety, distress and reduced confidence in the driving task and both styles are linked with reduced self-esteem and high trait anxiety (Taubman-Ben-Ari *et al.*, 2004). The discovery that dissociative and anxious driving styles are key predictors of feelings of vulnerability is of concern given that dissociative driving may be linked with a higher incidence of crashes and driving offences (Taubman-Ben-Ari *et al.*, 2004). In this case, emotions about driving appear to be negatively influencing behavioural choices, since drivers who manage their emotions by disconnecting from the driving task may actually be putting themselves at greater risk.

Feelings of vulnerability were strongly related to avoidance behaviours in both men and women. Further, avoidance was a key predictor of feelings of vulnerability in younger and middle-years drivers (but not in the older group). These findings demonstrate that the emotional response to risk perception in driving has the power to affect behavioural choices by ‘constraining’ driving behaviour. Significantly, as in the fear of crime literature (Gordon & Riger, 1989; Scott, 2003) these changes were of greater magnitude in women.

On a minor note, another gender effect determined in this study was the difference in emergency planning behaviours between men and women. Men were significantly more prepared than women and more likely to carry emergency equipment. Although a minor finding of this study, it provides scope for future studies to explore wider coping behaviours perhaps within a spectrum of self-regulation behaviours. It may be that men report feeling less vulnerable than women because they are better prepared to deal with the outcomes of any situation.

The implications of the results of this study for a behavioural intervention are twofold. Firstly, improving drivers' emotional reaction to beliefs about risk (i.e. feelings of vulnerability) could potentially reduce risk potential through the adoption of more appropriate habitual driving styles. Secondly, the study has revealed that driver coping strategies may present a useful target for the intervention. Therefore, avoidance and planning strategies should be explored further, in a wider context as 'self-regulation', to determine whether they do indeed have the potential to be used as a basis for a behavioural change intervention targeting feelings of vulnerability.

## **2.5. Limitations**

This study has some limitations. A convenience sample was used and so care should be taken when generalising to the wider population. Further, the sample size for older participants was small and consisted mainly of a group of highly motivated and well older adults.

Although the measures of risk perception were consistent with other literature in the field (e.g. DeJoy, 1989; Harré & Sibley, 2007; Horswill *et al.*, 2004) the nature of the data in conjunction with the relatively small sample size of older adults meant that certain analyses could not be conducted reliably. However, in many instances, this could be corrected for summing risk perception to each event and creating a continuous variable measuring total perceived risk.

## **2.6. Conclusion**

This study provides new evidence relating to the prevalence of feelings of vulnerability in drivers but particularly in female drivers. It also reveals significant associations between feelings of vulnerability and driving avoidance suggesting that emotional responses to risk perception have the capacity to constrain driving behaviour and potentially affect decisions relating to mobility. The results from this study suggest that behavioural interventions designed to target emotional responses to risk, i.e. feelings of vulnerability could even reduce actual risk through the adoption of more adaptive coping strategies. Follow up work should explore driver coping behaviours further, particularly planning and avoidance as part of the self-regulation spectrum.

## CHAPTER THREE

### **3. The effect of age, gender and attitudes on self-regulation in driving.**

Chapter 3 reports the results of the first stage of the model building phase of the research. Given the findings in Chapter 2 that avoidance was significantly related to feelings of vulnerability in younger and middle-years' drivers in both genders, and the potential that avoidance behaviours in their wider context on a self-regulation spectrum could be used as a basis for a behavioural change intervention, self-regulation was explored further in this study. The study revealed that self-regulation was indeed used by drivers across the lifespan and determined a link between anxiety and over-regulation. These findings suggested that interventions designed to reduce anxiety and feelings of vulnerability could be successful in reducing over-regulation and extending safe mobility, and consequently provide a framework for follow-on studies to explore self-regulation further. This study comprises an original paper (Gwyther & Holland, 2012) published in *Accident Analysis and Prevention*.

### 3.1. Introduction

Self-regulation has been widely researched in ‘older’ drivers as a mechanism for safely extending driving mobility and independence in an ageing population. The definition of ‘older’ varies between studies with inclusion criteria ranging from 50 to over 70 years of age. Although self-regulation may be a precursor to driving cessation, it can be considered on a continuum (Lyman *et al.*, 2001). The spectrum runs from complete driving independence through voluntary reduction of driving exposure, e.g. trips and reduced distances (Charlton *et al.*, 2006; Marottoli & Richardson, 1998) as well as avoidance of challenging driving circumstances, e.g. unfamiliar routes, poor weather, heavy traffic; (Baldock *et al.*, 2006; Ball *et al.*, 1998; Charlton *et al.*, 2006) to complete driving cessation.

Self-regulation has generally been thought of as a compensatory coping strategy for older drivers who, recognising some physical, cognitive or functional impairment, purposely limit or restrict their driving, in order to maintain independence but reduce accident risk (e.g. Baldock *et al.*, 2006; Ball *et al.*, 1998; Hakamies-Blomqvist & Wahlström, 1998). However, it may also reflect lifestyle changes, be used as a coping mechanism following a traumatic experience such as a crash (Blanchard *et al.*, 1994), or as a sensible general risk reduction strategy (Charlton *et al.*, 2006). It is this latter process which is of most interest to this research.

If self-regulation is thought of on a continuum and as a risk reduction strategy, then it is possible that a wider population could use self-regulatory behaviours to manage driving risk. Certainly, since self-regulation incorporates a wide range of driving behaviours, from driving avoidance through active planning and preparation including route planning and trial runs, pre-arranging rest stops and making vehicle adaptations (Molnar *et al.*, 2009), it is likely that all drivers are to some extent ‘self-regulators’. If, self-regulation is used to manage driving risk, then the theoretical models that have been applied to decision making about risky health behaviours can also be applied to self-regulatory driving practices.

The theory of planned behaviour assumes that planned behaviours are chosen and rational, specifically that behaviours are determined by intentions which are based, in part, on an individual's attitudes towards that behaviour (Ajzen, 1985, 1991). The theory has been used extensively to understand and predict people's attitudes towards their health (e.g. exercise, dieting, smoking habits, binge drinking), as well as travel choices and driving behaviour (e.g. seat belt usage, drink driving and intention to violate traffic laws). For example, behaviours such as speeding in urban areas and overtaking have been linked to attitude in terms of beliefs about getting to a destination faster (Parker *et al.*, 1992; Wallén Warner & Aberg, 2008). In the case of self-regulation, it is possible that an individual's beliefs and attitudes about driving risk may affect their intention to drive and ultimately alter their driving behaviour, and consequently the role of attitudes on self-regulation will be examined in this study.

Studies in older drivers reveal that the extent of self-regulation varies between individuals and that complex interactions exist between age, gender, health status and driving confidence which influence self-regulatory driving practices. Although self-regulation has been shown to increase with age (e.g. Bauer *et al.*, 2003), this is tempered by health status, such that in a sample of drivers aged over 50 years, older people in better health self-regulated less than younger people in poorer health (D'Ambrosio *et al.*, 2008; Donorfio *et al.*, 2008). The current study seeks to examine whether self-regulation behaviours occur across the full driving age spectrum, irrespective of health status.

The most consistent predictor of self-regulation is gender, with women adopting more restrictive driving habits than men (Bauer *et al.*, 2003; Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). This has been described as a cohort effect, since the older generation of women have not traditionally been the main household driver, and so may have less experience than their male counterparts and therefore feel less confident when driving (Kostyniuk & Shope, 1998).

Several studies have demonstrated that older women have less driving experience than their male counterparts (e.g. Marottoli *et al.*, 1993; Rosenbloom, 1993), but the effects of experience on self-regulation behaviours have not been fully explored. This is not surprising given the population under scrutiny. Accurate assessments of duration of driving experience are difficult to obtain and are generally aggregate estimates of time since licensure by age (McCartt *et al.*, 2003). Consequently, older people of the same age tend to have relatively similar levels of experience. Some researchers have managed experience differences by recruiting only experienced participants (e.g. >10 years driving experience: Baldock *et al.*, 2006). This assumes that drivers achieve a level of competence after an elapsed period of time but does not account for differences in driving patterns (i.e. amount of driving). Hakamies-Blomqvist and Siren (2003) reviewed driving habits in a sample of Finnish women drivers and recent ex-drivers aged over 70 years. They determined that the current drivers had been more active and driven greater distances throughout their driving career than those women who had chosen not to renew their licences. They concluded that women with an active driving history were more likely to continue driving later in life. This finding suggests that driving habits are of interest in this study. Given that age and duration of driving experience are closely related and that self-regulation increases with age, it follows that self-regulation will also increase with duration of driving experience. However, differences in driving habits may also affect self-regulation behaviour such that more active drivers, i.e. those who drive more often, should self-regulate less than their less active counterparts. So, the question is whether self-regulation behaviours are affected by duration of experience (time since licensure) or amount of experience (driving habits), or both.

The effects of confidence and self-efficacy on self-regulation have been found in a number of studies. Stacey and Kendig (1997) revealed that low self-efficacy scores were associated with driving cessation in older drivers. Marottoli and Richardson (1998) found that low confidence was associated with reduced driving frequency and mileage in a sample of drivers aged over 77 years. Baldock *et al.*, (2006) investigated whether self-regulation was related to actual

driving ability in a community sample of 90 older drivers, aged between 60 and 92 years and found that where self-reported driving confidence was low, there was a high avoidance of easily avoided but challenging driving tasks (e.g. parallel parking and driving at night in the rain). Charlton *et al.*, (2006) reviewed self-regulatory driving practices, focusing on avoidance behaviours, in Australian drivers aged over 55 years, and although avoidance rates were low across the sample, they found that driving confidence was strongly predictive of avoidance behaviour. The results of these studies, as well as their own findings, led Kostyniuk and Molnar (2008) to question whether the gender effect seen in self-regulatory studies is in fact a confidence effect, and to this end, the role of gender and confidence in self-regulation will be examined in this study.

The factors influencing self-regulatory behaviours are complex but several questions can be answered by extending the scope of self-regulation studies to a wider population. The first question of interest is whether drivers in younger age groups also employ self-regulatory techniques to manage driving risk. Secondly, the appearance of a gender effect in younger drivers will go some way to refuting the cohort effect theory in older women drivers. Next, driving habits can be reviewed to determine whether self-regulation behaviours are affected by the amount, rather than duration of driving experience. Finally, taking a measure of participants' driving style will assist in understanding the characteristics of high self-regulators and determining whether self-regulation is influenced by driving confidence.

Driving style refers to the way drivers habitually choose to drive and is an established pattern of driving behaviour encompassing speed choice, overtaking behaviours and attitudes to other road users (Elander *et al.*, 1993; Taubman-Ben-Ari *et al.*, 2004). In order to measure driving style, the Multidimensional Driving Styles Inventory (MDSI: Taubman-Ben-Ari *et al.*, 2004) was used. The MDSI is a reliable and validated scale which consists of 44 statements relating to eight driving styles. These are (i) dissociative, which measures distractibility (ii) anxious driving, which reviews distress and lack of confidence (iii) risky driving which looks at sensation seeking and risky decisions (iv) angry driving which reviews aggression and

hostility towards other drivers (v) high-velocity driving which looks at orientation towards high speed driving (vi) distress reduction which examines engagement in relaxing activities when driving (vii) patient driving which looks at courtesy toward other drivers and finally (viii) careful driving style, which refers to planning and problem solving in the driving task.

One final area of interest for this study is the role of attitudes in predicting self-regulation. Attitudes are important in determining the individual's overall assessment of the desire to perform a particular behaviour. Attitudes towards a behaviour are deemed to be composed of affective (e.g. like/dislike) and instrumental (e.g. beneficial/harmful) appraisals (Ajzen, 1991). Theoretical models of decision making and persuasion recognise the role of these affective (emotional) and instrumental (cognitive) components in attitudinal measurement. The extension of the theory of planned behaviour (Ajzen, 1985, 1991), to incorporate two subcomponents of attitude, affective as well as instrumental, has received wide empirical support, given that it increases the predictive power of the model (Ajzen, 1991; Ajzen & Driver, 1992; Ajzen & Timko, 1986; Conner & Armitage, 1998; Trafimow *et al.*, 2010). Further, recent work in decision making has focused on the implications of a dual process model of information processing (e.g. Gerrard, Gibbons, Houlihan, Stock & Pomery, 2008; Smith & DeCoster, 2000). These models also propose two modes of behavioural decision making, one based on heuristics and affect, the other on systematic reasoning or cognition (Gerrard *et al.*, 2008). Instrumental attitude would provide a logical basis for decision making and as such could be considered a component of the latter mode.

The role of affective attitude in driving is intuitive; some people simply enjoy driving more than others. Instrumental attitudes stem from evaluations about driving being beneficial or harmful, and as such may be influenced by lifestyle and employment choices, as well as risk perceptions. In the context of self-regulation, although visiting friends may be enjoyable (affect), a driver may decide not to travel if the roads are icy because it is unsafe (cognition). Alternatively, they may choose to drive their children to school during rush hour even though they fear or dislike driving at busy times (affect) because it is in their children's best interests

to attend school on time (cognition). Assuming that self-regulation behaviours stem from rational choices about driving risk, then a clear relationship should be found between instrumental attitude and self-regulation across the driving lifespan. However, a relationship may also exist between affective attitudes and self-regulation, if these behaviours develop as a result of low confidence, fears or worries about driving. To summarise, the purpose of the current study was to examine self-regulation as a risk management strategy in drivers across the lifespan and to determine whether age, gender, duration of experience, driving patterns (weekly mileage), style or attitude affect self-regulation behaviours. In order to achieve this, the following hypotheses were tested.

**Hypothesis 10:** Female drivers will self-regulate more than male drivers.

**Hypothesis 11:** Self-regulation behaviours will increase with age.

**Hypothesis 12:** Duration of driving experience (time since licensure) and amount of driving experience (weekly mileage) will influence self-regulation behaviour such that self-regulation will increase with experience duration and decrease with increased mileage.

**Hypothesis 13:** Driving style will influence the level of reported self-regulation. No directional hypotheses are proposed.

**Hypothesis 14:** Instrumental and affective attitudes towards driving will mediate the relationship between age and self-regulation.

### **3.2. Methods**

The methods used to explore the significance of self-regulation behaviours across the lifespan were identical to those employed in the first study with some minor adjustments to the design and analyses.

#### **3.2.1. Materials**

The questionnaire comprised three sections. The first section included demographic information (age and gender), driving experience (length of time an individual had been in possession of a full driving licence), driving patterns (number of miles driven per week) and crash history.

The second section measured driving style using the Multi-Dimensional Driving Styles Index (MDSI: Taubman-Ben-Ari *et al.*, 2004) which consists of 44 items across eight different driving styles and coping strategies (e.g. careful, anxious, dissociative) on a six point likert type scale from ‘not at all’ (1) to ‘very much’ (6). Example items include “It worries me when driving in bad weather” (anxious); “I like to take risks while driving” (risky) or “I drive cautiously” (cautious). Participants’ scores for each of the eight styles were calculated.

The third section measured instrumental and affective attitudes and self-regulation behaviours using eighteen items on a likert type scale from (1) ‘strongly disagree’ to (5) ‘strongly agree’. A list of questionnaire items and internal consistency (Cronbach’s alpha) for all three factors can be found in Table 17.

**Table 17: Questionnaire items and internal consistency (Cronbach's alpha).**

	Items	Cronbach's alpha
Instrumental Attitude	Driving a car is central to my independence	0.85
	Being able to drive is important to me	
	Being able to drive is important to my work or family life	
Affective Attitude	Driving is necessary to give me the flexibility I need	0.85
	Driving a car is pleasurable (-)	
	I am apprehensive about driving	
	I am concerned about the unsafe and aggressive behaviours of other drivers	
	I would be anxious driving an unfamiliar route	
	I worry about getting lost when I drive	
	I am happy to overtake other vehicles (-)	
	I feel comfortable when driving (-)	
	I am happy to drive in the dark (-)	
	I worry about breaking down or getting a puncture	
Self-regulation	I avoid driving on the motorway	0.79
	I avoid changing lanes or overtaking on the motorway	
	I avoid making right hand turns at busy junctions	
	I avoid driving in bad weather e.g. heavy rain, snow or ice	
	I avoid driving in heavy traffic e.g. at rush hour	

### 3.2.2. Design

A between participants design was employed. Participants were divided by gender and age into three groups - young drivers (18 to 25 years), middle years (26 to 64 years) and older drivers (over 65 years). Scores for self-regulation, instrumental attitude and affective attitude were used as dependent variables.

### 3.2.3. Analysis

Descriptive analyses were performed on avoidance behaviours. A series of ANOVAs and ANCOVAs were conducted to review the effects of gender and age on self-regulation behaviours and attitudes whilst controlling for experience duration. To further examine any gender specific effects on self-regulation, correlation analyses were carried out separately for men and women.

Mediation analyses were conducted to test the effects of instrumental and affective attitudes on the relationship between age and self-regulation using an SPSS macro for the bootstrapped sampling distribution model (Preacher & Hayes, 2004). Bootstrapping has been widely

advocated as a more accurate method of assessing the indirect effects of variables, overcoming some of the limitations associated with Baron & Kenny's (1986) four-steps method (MacKinnon, Fairchild & Fritz, 2007; Preacher & Hayes, 2004; Shrout & Bolger, 2002). Finally, hierarchical regression modelling by age group was used to identify the best predictors of self-regulation.

### 3.3. Results

#### 3.3.1. Descriptives

Overall avoidance of the difficult driving scenarios ranged between 10.1% and 12% of the participants, with the exception of avoidance of inclement weather which was significantly higher at 53.4%. Table 18 shows a breakdown of the level of avoidance in each of the challenging driving circumstances by gender and age.

**Table 18: Levels of avoidance (per cent) in difficult driving situations by gender and age group.**

Driving Situation	Male			Female		
	18-25	26-64	65+	18-25	26-64	65+
N	42	62	7	102	132	10
Motorway	2.4	3.2	0	21.5	11.3	12.5
Bad weather	26.2	37.1	57.2	62	61.9	70
Lane change	4.8	1.6	14.3	15.9	10.6	0
Heavy traffic	11.9	0	28.6	15.9	14.2	10
Right hand turn	2.4	8	18.6	13.7	12.1	0

*Note: After excluding missing variables, analyses were conducted on 355 participants.*

The most commonly avoided situation was driving in bad weather, including heavy rain, ice or snow and over half of the sample reported that they had adopted this strategy. The least commonly avoided situation was changing lanes or overtaking on the motorway. A series of two-way ANOVAs were used to review individual avoidance behaviours by gender and age group, see Tables 19 and 20, with partial  $\eta^2$  used to calculate effect size (0.01 = small effect, 0.06 = medium effect, > 0.15 = large effect, Field, 2000).

Women were consistently more likely than men to avoid all types of difficult driving circumstances except for right hand turns. Main effects for age were seen in terms of avoidance of lane changes on the motorway and driving in heavy traffic. In both circumstances younger drivers were more likely than middle-years' drivers to report avoidance behaviours. No interaction effects were found.

**Table 19: Mean levels of avoidance in difficult driving situations by gender and age group.**

Driving Situation	Male						Female					
	18 to 25		26 to 64		65+		18 to 25		26 to 64		65+	
N	42		62		7		102		132		10	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Motorway	1.45	0.74	1.44	0.74	1.57	0.53	2.27	1.27	1.91	1.10	2.00	0.93
Bad weather	2.57	1.11	2.65	1.26	3.29	1.60	3.61	1.02	3.42	1.17	3.70	0.82
Lane change	1.71	0.86	1.40	0.61	2.00	1.15	2.29	1.11	2.00	1.03	2.22	0.44
Heavy traffic	2.05	0.99	1.79	0.76	2.43	1.27	2.41	1.04	2.21	1.05	2.60	0.70
Right hand turn	1.86	0.81	1.71	1.03	2.14	1.35	2.24	1.02	2.03	1.13	1.90	0.74

Scale score minimum = 1, maximum = 5. Note: After excluding missing variables, analyses were conducted on 355 participants.

**Table 20: ANOVA results for avoidance in difficult driving situations by gender and age.**

Driving Situation		F Ratio	Partial $\eta^2$
Motorway	Gender	8.23**	0.02
	Age	1.15	0.007
Bad weather	Gender	12.67**	0.03
	Age	1.23	0.007
Lane change	Gender	6.66**	0.01
	Age	3.99**	0.02
Heavy traffic	Gender	3.07	0.009
	Age	3.26*	0.01
Right hand turn	Gender	0.63	0.002
	Age	1.04	0.006

\* $p < 0.05$  \*\* $p < 0.01$

An index of self-regulation was generated using scores from all ( $N = 5$ ) avoidance items (Cronbach's alpha = 0.79). In this study, self-regulators were defined using an existing definition as "those who avoided one or more difficult driving situations" (Charlton *et al.*, 2006, p.370). Overall self-regulation (on a scale from 5 to 25) ranged between 5 and 24 ( $M = 11.2$ ,  $S.D. = 3.98$ ), suggesting that self-regulatory behaviour was common within the sample. Means and standard deviations for self-regulation and all other variables are presented in Table 21 by gender and age group.



### 3.3.2. Effect of age and gender on self-regulation.

A two-way between groups ANOVA was conducted to explore the relationships between self-regulation, gender and age. A main effect for gender,  $F(1,356) = 8.32, p < 0.01, \eta^2 = 0.02$ , confirmed Hypothesis 10 that women were more likely than men to self-regulate, see Table 5. Although there was no significant main effect of age on self-regulation,  $F(2,356) = 2.75, p = 0.06$ , a plot of mean self-regulation scores, shown in Figure 1, revealed a significant ( $p < 0.05$ ) quadratic effect such that younger and older participants' reported higher scores than middle-years' drivers. No age by gender interactions were found  $F(2,356) = 0.93, p = 0.39$ . In order to further explore the gender effect, and the eleventh hypothesis that self-regulation would increase with age, post hoc comparisons were conducted. Contrary to expectations, the Hochberg GT2 test for use with different sample sizes (Field, 2000) indicated that the mean self-regulation score for younger participants was significantly higher than middle-years' drivers. Further post-hoc analyses revealed that younger and middle-years women were significantly more likely than younger and middle-years men to engage in self-regulatory behaviours, respectively (18 to 25:  $t(139) = 4.91, p < 0.01$ ; 26 to 64:  $t(147) = 4.54, p < 0.01$ ), but that there were no significant differences by gender in the older age group.



**Figure 1: Mean self-regulation scores by gender and age group**

### **3.3.3. Effect of experience on self-regulation**

In order to determine whether self-regulation in young drivers was occurring as a function of inexperience, an ANCOVA was conducted. The above age by gender analysis was repeated with experience (time since licensure) as a covariate. In this model, the effect of experience on self-regulation was significant ( $F(1, 349) = 11.19$ ,  $p < 0.01$ , partial  $\eta^2 = 0.3$ ). When experience was controlled for, the gender effect diminished but remained significant ( $F(1, 348) = 4.78$ ,  $p < 0.05$ , partial  $\eta^2 = 0.01$ ) whilst the age effect became significant ( $F(2, 348) = 4.87$ ,  $p < 0.01$ , partial  $\eta^2 = 0.03$ ). These results provide additional support for Hypotheses 9, 10 and 11, respectively, that women self-regulate more than men and that when experience is controlled for, self-regulation increases with age. Means and adjusted means can be found in Table 22.

**Table 22: Means, standard deviations and adjusted means by gender and age group for self-regulation.**

Gender	Age group (years)	N	Mean	S.D.	Adjusted Mean	S.E.
Male	18-25	40	9.55	3.18	8.66	0.64
	26-64	62	8.95	3.17	9.56	0.50
	65+	7	11.42	4.50	14.62	1.69
Female	18-25	96	12.47	3.81	11.56	0.46
	26-64	134	11.49	4.10	11.79	0.33
	65+	10	11.80	2.52	14.01	1.34

*Note: Adjusted means are adjusted based on the participants' driving experience.*

### **3.3.4. Effect of driving style and attitudes on self-regulation: correlation analyses**

The relationships between age, experience, crash history, driving habits, self-regulatory behaviours, attitudes (instrumental attitude and affective attitude) and driving style were explored using bivariate correlations separately for men (see Table 23) and women (see Table 24).

**Table 23: Correlations between age, self-regulation, attitudes and driving style in male drivers.**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Age	1														
2 Experience	.98**	1													
3 Weekly Mileage	.23**	.26**	1												
4 Crash involvement	.51**	.53**	.25**	1											
5 Self Regulation	0.00	-0.01	-.48**	-0.15	1										
6 Instrumental Attitude	0.14	.19*	.55**	.29**	-.41**	1									
7 Affective Attitude	-0.06	-0.10	-.47**	-.24*	.72**	-.55**	1								
8 Dissociative	0.13	0.13	-.25**	0.13	.28**	-.25*	.34**	1							
9 Anxious	0.11	0.06	-.28**	0.01	.58**	-.39**	.72**	.42**	1						
10 Risky	-.48**	-.45**	0.00	-.22*	-0.15	0.05	-0.18	0.09	-.23*	1					
11 Angry	-.30**	-.27**	0.10	-0.08	-0.11	0.09	-0.11	0.13	-0.19	.39**	1				
12 High Velocity	-.25**	-.20*	0.10	-0.02	-0.16	0.10	-0.07	0.19	-.24*	.53**	.54**	1			
13 Distress Reduction	0.10	0.11	0.03	0.16	-0.01	0.05	0.04	.29**	-0.02	0.12	.25**	.19*	1		
14 Patience	.35**	.34**	0.10	0.12	0.05	-0.03	0.07	-0.13	0.11	-.47**	-.39**	-.42**	0.03	1	
15 Careful	.39**	.37**	0.12	.26**	0.03	0.13	0.00	-.22*	0.02	-.64**	-0.18	-.36**	0.07	.58**	1

\* $p < 0.05$  \*\* $p < 0.01$  ( $N$  ranges from 110 to 127).

**Table 24: Correlations between age, self-regulation, attitudes and driving style in female drivers.**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Age	1														
2 Experience	.93**	1													
3 Weekly Mileage	.24**	.26**	1												
4 Crash involvement	.39**	.42**	.26**	1											
5 Self Regulation	-.14*	-.21**	-.31**	-.16*	1										
6 Instrumental Attitude	0.11	.13*	.44**	.18**	-.26**	1									
7 Affective Attitude	-0.10	-.17**	-.24**	-.14*	.79**	-.30**	1								
8 Dissociative	-0.09	-0.11	-0.04	0.00	.26**	-0.09	.30**	1							
9 Anxious	-0.10	-.16*	-.24**	-0.09	.69**	-.26**	.75**	.34**	1						
10 Risky	-.13*	-0.07	0.02	0.03	-.21**	0.06	-.30**	0.09	-.22**	1					
11 Angry	-.16*	-0.10	0.09	-0.01	-.23**	0.09	-.24**	0.01	-0.07	.17**	1				
12 High Velocity	-.22**	-.14*	0.08	0.05	-.19**	.18**	-.23**	.23**	-0.09	.44**	.45**	1			
13 Distress Reduction	0.12	0.09	0.11	0.09	-0.01	-0.01	0.01	.18**	-0.08	0.03	-0.01	0.12	1		
14 Patience	.24**	.14*	-0.05	-0.01	0.10	-0.05	.15*	-0.05	.15*	-.32**	-.30**	-.39**	0.04	1	
15 Careful	0.03	-0.04	-0.07	-0.03	0.10	-0.02	.16*	-.30**	0.08	-.37**	-.21**	-.29**	-0.02	.51**	1

\* $p < 0.05$  \*\* $p < 0.01$  ( $N$  ranges from 238 to 264).

#### 3.3.4.1 Associations by age

Contrary to Hypothesis 11, age was negatively correlated with self-regulation and this relationship was significant in female participants. This may reflect the quadratic effects of age on self-regulation such that younger and older groups of drivers report higher scores. However, after controlling for experience (time since licensure) by calculating a partial correlation, a significant positive correlation was determined between age and self-regulation in the entire sample ( $r = .14$   $df = 348$ ,  $p < 0.01$ ).

In the whole sample, age was significantly positively correlated with instrumental attitude ( $r(393) = .12$ ,  $p < 0.05$ ) suggesting that the relative importance of a car increases with age. However, when the sample was divided by gender, this association was no longer significant. Similarly, age was significantly negatively correlated with affective attitude in the whole sample ( $r(393) = -.11$ ,  $p < 0.05$ ), suggesting that emotions affect older drivers less. Again this did not hold true for the divided sample.

In keeping with previous research (Taubman-Ben-Ari *et al.*, 2004) age was significantly negatively correlated with maladaptive driving styles including risky, angry and high velocity styles and significantly positively correlated with a patient style in both genders. Significant relationships between age and a careful driving style were also noted in male drivers. No relationships were found between age and anxious driving, dissociative or distress reduction driving styles.

#### 3.3.4.2 Associations by driving experience, patterns and crash history.

Driving experience (time since licensure) was negatively associated with self-regulation such that as driving experience increased, self-regulation behaviours decreased. This association was significant in female drivers. These findings provided evidence of the effects of driving experience on self-regulation behaviours but the direction of effect was contrary to that anticipated in Hypothesis 12.

Drivers reporting considerable lengths of driving experience were found to report significantly higher levels of instrumental attitude than those with less driving experience, suggesting that their car was more important to them. Further, low levels of driving experience were significantly associated with higher levels of negative affect, suggesting that participants with limited driving experience had greater worries and concerns about driving.

Significant relationships between driving experience and driving style were also noted. Of particular interest to this study was the significant relationship between experience and an anxious driving style in women, such that women with greater driving experience were less likely to report anxious feelings when driving.

As anticipated in Hypothesis 12, higher weekly mileages were significantly associated with lower levels of self-regulation, higher instrumental attitudes and lower affective attitudes in both genders. There was a significant negative relationship between weekly mileage and an anxious driving style such that anxious drivers reported lower mileages than less anxious drivers.

Crash history was significantly negatively correlated with self-regulation behaviours in women only such that as the number of reported collisions increased, self-regulation behaviours reduced.

#### *3.3.4.3 Associations by attitudes*

Self-regulation was strongly, significantly negatively correlated with instrumental attitude in both genders such that the more a person agreed with statements such as ‘driving a car is important to me’, then the less they adopted self-regulation behaviours. However, it was positively associated with affective attitude in both men and women, which suggests that the more a person reports worries and concerns about driving, the more likely they are to avoid driving.

#### 3.3.4.5 Associations by driving style

Confirming Hypothesis 13 that driving style will affect reported self-regulation, self-regulation was significantly associated with an anxious driving style in both genders and negatively correlated with the risky, angry and high-velocity maladaptive driving styles in women only. These findings suggest that drivers who report high avoidance scores are apprehensive about driving. Self-regulation was also significantly highly correlated with a dissociative driving style in both genders.

#### 3.3.5. Mediation Analysis

In order to test Hypothesis 14, that instrumental and affective attitudes towards driving would mediate the relationship between age and self-regulation, mediation analyses were conducted. The analyses used 5000 bootstrap resamples of the data with replacement and alpha was set at .05.

There was a significant mediation effect of instrumental attitude on the relationship between age and self-regulation (estimate = -2.02;  $CI_{95\%} = -.01, \text{ to } -.001$ ) such that older participants with high instrumental attitude scores were less likely to self-regulate. There was also a significant mediation effect of affective attitude on the relationship between age and self-regulation (estimate = -2.16;  $CI_{95\%} = -.05 \text{ to } -.003$ ) such that after controlling for affective attitude, the effect of age on self-regulation decreased. These findings support Hypothesis 14, that the relationship between age and self-regulation is mediated by attitudes.

#### 3.3.6. Regression analyses

In order to identify the most salient predictors of self-regulation, a hierarchical regression analysis was conducted. The entry criterion was set at  $\alpha = .05$ . Only the variables found to be significantly correlated with self-regulation in both genders were entered, i.e. driving experience, dissociative and anxious driving styles and instrumental and affective attitudes. Given the significance of gender and experience on self-regulation, these were entered at Step 1.

Dissociative and anxious driving styles were entered at Step 2. Finally, affective and instrumental attitudes towards driving were entered at Step 3. Given the effect of experience on self-regulation by age, analyses were carried out separately for each age group. The results are displayed in Table 25. The models explained between 65% and 68% of the variance in self-regulation by age group.

In the youngest age group (18 to 25 years), the overall model accounted for 68% of the total variance in self-regulation. In Step 1, gender and experience accounted for a significant 14% of the variance. The addition of anxious and dissociative driving styles in Step 2, accounted for an additional, significant 41% of the variance. The subsequent addition of attitudes in Step 3, accounted for an additional, significant 13% of the variance. In the final step of the equation, the significant predictors of self-regulation were an anxious driving style and (negative) affective attitude with higher scores for anxious driving and affective attitude predicting greater self-regulation.

A similar pattern followed in the middle-years group (26 to 64 years), with the overall model accounting for 65% of the variance in self-regulation. In Step 1, gender and experience accounted for a significant 13% of variance. The addition of driving styles at Step 2, accounted for an additional, significant 40% of the variance. The subsequent addition of attitudes at Step 3, accounted for an additional, significant 11% of the variance. As with younger drivers, in the final step of the analysis, the significant predictors of self-regulation in middle-years' drivers were an anxious driving style and (negative) affective attitude such that greater anxiety and (negative) affective attitude predicted a greater level of self-regulation. In both the younger and middle-years' drivers, affective attitude recorded a higher beta value than anxious driving style.

In the older drivers (65 years and over), gender and experience accounted for only 1% of the variance in self-regulation and this result was not significant. The addition of two driving styles in Step 2 resulted in a significant increase of 43% in the explained variance. The subsequent addition of attitudes in Step 3, accounted for an additional 22% of the variance. There were no

significant predictors of self-regulation in the final step of the analysis in the oldest age group. However, the model as a whole was significant and explained 66% of the variance in self-regulation. The results from the regression analyses provide additional support for Hypothesis 13, that driving style will influence the level of self-regulation, since an anxious driving style is a significant predictor of self-regulation behaviour in two of the three age groups. Further, the findings strengthen the argument in Hypothesis 14, that affective attitude mediates the relationship between age and self-regulation.

**Table 25: Hierarchical multiple regression of gender, experience, anxious and dissociative driving styles and attitudes on self-regulation by age group.**

Age	Step	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
18 to 25 (N=134)	1	Gender	-0.33**	0.14	0.14**	10.72**
		Experience	-0.14			
	2	Gender	-0.07**	0.55	0.41**	39.26**
		Experience	-0.03			
		Dissociative	0.04			
		Anxious	0.69**			
	3	Gender	-0.05	0.68	0.13**	44.44**
		Experience	-0.02			
		Dissociative	-0.00			
		Anxious	0.24**			
		Instrumental Attitude	-0.03			
		Affective Attitude	0.59**			
26 to 64 (N=184)	1	Gender	-0.26**	0.13	0.13**	13.63**
		Experience	-0.22**			
	2	Gender	-0.06	0.54	0.40**	50.66**
		Experience	-0.11*			
		Dissociative	-0.01			
		Anxious	0.68**			
	3	Gender	-0.01	0.65	0.11**	53.26**
		Experience	-0.07			
		Dissociative	-0.01			
		Anxious	0.27**			
		Instrumental Attitude	0.01			
		Affective Attitude	0.56**			
65+ (N=13)	1	Gender	0.01	0.01	0.01	0.06
		Experience	-0.10			
	2	Gender	0.09	0.44*	0.43*	2.18
		Experience	-0.02			
		Dissociative	0.24			
		Anxious	0.55*			
	3	Gender	0.31	0.66	0.22	2.94*
		Experience	-0.23			
		Dissociative	0.07			
		Anxious	0.08			
		Instrumental Attitude	0.01			
		Affective Attitude	0.75			

\**p*<0.05 \*\**p*<0.01

### 3.4. Discussion

The aim of this study was to examine self-regulation as a potential risk management strategy in a wider population than has previously been examined and to identify the characteristics of those who self-regulate. Consistent with other studies (e.g. Bauer *et al.*, 2003; Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Kostyniuk & Molnar, 2008; Siren & Hakamies-Blomqvist, 2005) and supporting Hypothesis 10, women reported higher levels of self-regulation than men, although this relationship was only significant in young and middle-years' drivers.

The finding that women, even in their younger years, self-regulate more than men demonstrates that self-regulation is not solely cohort related. Instead, self-regulation in younger drivers may be due to feelings of vulnerability in the driving task possibly arising from a lack of experience, or, as has been suggested in older adult drivers, from a lack of confidence (Kostyniuk & Molnar, 2008; Siren & Hakamies-Blomqvist, 2004). Whilst no direct measure of driving confidence was taken in this research, Taubman-Ben-Ari *et al.*,(2004) states that the anxious driving style reflects “ a person’s tendency to feel distress during driving, to display signs of anxiety due to the driving situation, and to express doubts and lack of confidence about his or her driving skills” p325. The discovery that an anxious driving style predicted self-regulation supports previous findings that low confidence is an important factor in control of driving. Further, an anxious driving style was significantly correlated with low levels of experience in women which supports the hypothesis that self-regulation in young drivers is a function of experience.

Hypothesis 11, that self-regulation would increase with age is partially supported. Initially, the relationships between age and self-regulation in this study appeared inconsistent with previous findings that self-regulation increases with age (e.g. Bauer *et al.*, 2003; D'Ambrosio *et al.*, 2008; Donorfio *et al.*, 2008) since a negative correlation was determined between the two variables. However, after further analyses, a quadratic effect of age such that younger and older

participants reported higher scores for self-regulation than middle-years' drivers was noted. The implication here is that self-regulation is used as a coping strategy by drivers and is applied more readily by drivers at either end of the driving lifetime.

Self-regulation at the poles of the driving age range may be a compensatory effect. Older people may perhaps be compensating for functional decline (e.g. Baldock *et al.*, 2006; Ball *et al.*, 1998; Hakamies-Blomqvist & Wahlström, 1998) whereas younger, novice drivers may be compensating for insufficiently developed higher-order driving skills. The individual review of self-reported avoidance behaviours provides some supporting evidence for this theory. For example, motorway driving and lane changes were most commonly avoided by the youngest group and avoidance of these circumstances declined with age. Both of these situations require higher order skills such as automatism in manoeuvring including correct speed control and positioning, an awareness of the dynamic traffic environment and an ability to predict other road users' behaviours which may predicate younger drivers to avoidance.

Certainly, when driving experience was controlled for, significant age effects were found on self-regulation behaviours with younger drivers self-regulating less than older drivers. This finding, which provides evidence for Hypothesis 12, suggests that experience affects the relationship between age and self-regulation. Although the reasons behind self-regulatory behaviours may vary by age, the end point is identical with drivers' reducing their crash risk whilst ensuring mobility. To this end, accurately applied self-regulation (that is, each individual applying appropriate strategies for their own needs and concerns, c.f. Berry, 2011) can be considered a positive coping strategy to manage driving risk.

The reasons for adopting this coping strategy are likely to be diverse. A further issue may be that drivers at either end of the age and experience spectrum simply have the opportunity to avoid difficult driving circumstances because they do not have the same family or employment obligations as middle-years' drivers (Eberhard, 1996). Certainly when avoidance behaviours were reviewed separately, reported avoidance of heavy traffic (rush hour) was lowest in the

middle-years' groups who presumably have the greatest need to travel in peak hours to work or to take children to school whilst it was higher in both the younger and older groups. This is consistent with Baldock *et al's.*, (2006) finding that driving in peak hour is one of the most easily avoidable situations for older drivers.

However, unnecessary self-regulation, or over-regulation, could be detrimental to an individual's health and wellbeing, particularly if it significantly curtails their driving. In this context, over-regulation could, to some extent, be considered a maladaptive response, perhaps to driving anxiety. The findings of this study suggest that anxious drivers and less confident drivers may be most at risk of over-regulation since an anxious driving style and negative affective attitude were significant predictors of self-regulation in regression modelling. In such cases, a balance needs to be achieved between reducing driver anxiety, encouraging safe regulation and preventing the type of self-regulation, or over-regulation that restricts mobility and social engagement.

Self-regulation was significantly positively correlated with affective attitude and the maladaptive anxious and dissociative driving styles, suggesting that drivers with high scores for self-regulation deal with the worries and stressors of driving by disconnecting from the driving task. This is of particular concern since a dissociative driving style has been linked with crash involvement (Taubman-Ben-Ari *et al.*, 2004). Further, affective attitude mediated the relationship between age and self-regulation, such that after controlling for affective attitude, the effect of age on self-regulation reduced. This suggests that affective attitude is critical in preventing over-regulation. These findings provide support for Hypotheses 13 and 14 that driving style and attitudes influence self-regulation strategies.

Instrumental attitude was also measured in this study and found to be significantly negatively correlated with self-regulation, affective attitude and anxious driving styles in both genders. Further, supporting Hypothesis 14, instrumental attitude mediated the effect of age on self-regulation such that after controlling for instrumental attitude, the effect of age on self-

regulation increased. These findings suggest that people who have a strong requirement for their car are less likely to let their age or emotions affect their driving behaviour either in terms of driving avoidance or making mistakes. Curiously, instrumental attitude was positively correlated with a high velocity driving style. This might reflect people with a strong dependence on their car, perhaps due to work or family commitments, reporting greater effects of time pressures on driving.

One of the key findings of this study was that instrumental attitude scores were significantly positively correlated with age, even in the over-65's age group, such that as age increased, the importance of the car also increased. This result supports and extends Molnar *et al's* (2009) finding that in drivers aged over 70 years, older participants rated the importance of driving higher than younger participants. Since older people tend to travel less as they age, particularly aged over 65 years (Eberhard, 1996), the assumption has been that they are less reliant on their car. However, these findings challenge that assumption and suggest that although older people may travel less and take fewer risks, their car is more important to them in terms of maintaining mobility, flexibility and independence than it is to younger drivers. The implication in this study is that the car is of greater significance to older people in terms of maintaining a lifestyle than in it is to younger drivers in terms of honouring work and family commitments.

### **3.5. Limitations**

This study has some limitations. A convenience sample was used and so care should be taken when generalising to the wider population. Further, the sample size for older participants was small and consisted mainly of a group of highly motivated and well older adults. The women of this group may have been atypical of a wider driving population in that several of them were military wives and as such had to shoulder primary driving responsibility for their families whilst their husbands had been deployed. Hakamies-Blomqvist and Siren (2003) suggest that self-regulation and driving cessation are related to driving habits such that more active drivers are less likely to give up driving, regardless of their age, gender or ability. As this group of

women are habitually used to driving, they may be less likely to self-regulate than the general population of older women drivers. In fact, this group may be more comparable with middle-years' women drivers in terms of habituation to driving and as such may provide insight into the driving patterns of future older female drivers.

The measure of self-regulation taken in this study was restricted to avoidance behaviours and although this is consistent with other literature in the field (e.g. Charlton *et al.*, 2006), it provides scope for future studies to incorporate wider aspects of self-regulation including planning and coping strategies. Finally, self-regulation was only measured through self-report which may have led to over- or under-reporting of avoidance behaviours.

### **3.6. Conclusion**

This work has demonstrated that self-regulation is not exclusive to older drivers but is used by drivers, to varying degrees, across the lifespan. Although appropriately applied self-regulation can be considered a positive coping strategy to reduce risk and safely extend mobility, there is evidence that some drivers over-regulate, giving up or curtailing driving before they need to. The results from this study suggest an association between anxiety and over-regulation. Therefore, interventions designed to reduce anxiety may be successful in reducing over-regulation, encouraging safe regulation and extending mobility. Follow up work could explore this further while extending the definition of self-regulation to incorporate planning and coping strategies as well as driver preparedness.

## CHAPTER FOUR

#### **4. Feelings of vulnerability and effects on driving behaviour - a qualitative study**

Having established that self-regulation comprises a suitable range of behaviours on which to build an education intervention, it is necessary to explore feelings of vulnerability in drivers across the lifespan and to examine whether and how such feelings are expressed as driver behaviours and coping strategies. This study employs thematic analysis of focus group transcripts with 48 licensed drivers to identify the key themes relating to feelings of vulnerability in driving and to identify safety related coping strategies in everyday driving behaviours. The coping behaviours identified will be distilled into new items for the novel self-report, self-regulation instrument and reported in Chapter 5.

#### **4.1. Introduction**

Safely extending driving mobility is critical in maintaining the health and social wellbeing of the ageing population. Decisions about driving cessation are often emotive (Adler & Rottunda, 2006; Coughlin, Mohyde, D'Ambrosio & Gilbert, 2004) and although many drivers self-regulate or retire from driving at a suitable time, there are some who delay their driving retirement inappropriately while others stop prematurely (Berry, 2011), risking the range negative health and social consequences associated with loss of mobility including increased loneliness and social isolation (Marottoli *et al.*, 2000), clinically significant depression (Marottoli *et al.*, 1997) and increases in depressive symptoms (Fonda & Herzog, 2001a).

Individuals' judgements about risk are often a fundamental part of their decision making process to reduce, restrict or stop driving. For example, in a study of older adults aged between 70 and 85 years, failing health and poor eyesight were cited as reasons to stop driving (Adler & Rottunda, 2006). However, participants framed their health issues in a risk context; notably, one female participant who had undergone cataract surgery commented that it "was too dangerous to keep driving" (Adler & Rottunda, 2006, p230). This suggests a risk-based decision about ongoing mobility.

Risk-based decisions about mobility may stem from rational assessments of personal competence or health status, or could be associated with feelings about risk. The 'risk as feelings' hypothesis suggests that feelings or anticipatory emotions, i.e. visceral and immediate reactions to risk have a direct effect on behavioural choices (Loewenstein *et al.*, 2001). Thus, theoretical health behaviour models may assist in explaining how emotional responses to risk perceptions affect behavioural choices. The Theory of Planned Behaviour (TPB: Ajzen, 1985) does not incorporate risk perception within its framework but beliefs about risk, particularly about emotional responses to risk or feelings of vulnerability, can be considered through an attitudinal component of the model, notably affective attitudes.

The basic tenet of the TPB model is that a person will perform a behaviour if a) they value the outcome, b) influential others approve of the behaviour and c) they believe that they have the required skills and opportunities to carry out that behaviour. Within the latter stage of this model, an individual's evaluation of their own driving may lead them to conclude that they have insufficient skills or functional abilities to cope with the perceived risk. This may then affect their intention to continue driving. To some extent, this implies a rational assessment of driving risk versus personal competence. However, the TPB model also recognises the role of emotion in personal decision making. Attitudes towards a given behaviour are deemed to be composed of instrumental (e.g. beneficial/harmful) and affective (e.g. like/dislike) appraisals (Ajzen, 1991). So, while risk perception may contribute to a driver's instrumental decision making process, feelings of vulnerability may supply the affective component.

Feelings of vulnerability go beyond simple worries or concerns about driving. They reflect an individual's feelings about their susceptibility to potential harm (either physical or emotional) and as such can be thought of as an emotional response to perceived risk (Klein *et al.*, 2011). Given that risk perception is highly individual and judgements about risks vary between individuals (Millstein & Halpern-Felsher, 2002), it is likely that emotional responses to risk and consequently feelings of vulnerability will similarly vary. The aim of this study is to examine whether risk perception and ensuing feelings of vulnerability affect driving behaviour and decisions about self-imposed restrictions. If they do, then intervention studies could potentially educate drivers about risk and enable them to recognise and overcome feelings of vulnerability by selecting positive, instrumental coping strategies, for example planning behaviours. An outcome of such interventions would be to improve confidence through planning and preparation behaviours and safely extend the driving lifespan of individuals whose sensitivity to feelings of vulnerability is in danger of prematurely curtailing their driving career.

This study begins with the premise that feelings of vulnerability affect behaviour. Certainly, evidence from early chapters of this present research (Chapter 2) suggests that there is a link between emotional reactions to risk and behavioural choices in driving. There is also evidence

in the literature to support this hypothesis in some groups of drivers. It is well established that female drivers consistently give up driving earlier and in better health than do men (Hakamies-Blomqvist & Siren, 2003; Siren & Hakamies-Blomqvist, 2005). Further, a significant number of studies have demonstrated that they are more likely than men to restrict or self-regulate their driving (e.g. Bauer *et al.*, 2003; Charlton *et al.*, 2006; Donorfio *et al.*, 2008; Kostyniuk & Molnar, 2008). Although confidence (Kostyniuk & Shope, 1998) and anxiety (Gwyther & Holland, 2012) are acknowledged as likely factors in women's decisions about self-regulation and driving cessation, it may be that some women are comparatively more sensitive to perceptions of risk than men and that this sensitivity influences their driving behaviour.

Evidence from the fear of crime literature suggests that women are indeed comparatively more sensitive to risk than men, being more fearful of crime (e.g. Akers *et al.*, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984) and having disproportionately higher levels of fear in relation to actual risk (Lindquist & Duke, 1982; Skogan & Maxfield, 1981). The findings in Chapter 2 of the present research also support the view that women are more risk aware than men. Further, criminologists have suggested that there are certain physical (e.g. older age, female gender, poor health status), social (e.g. people with limited social support) and situational (e.g. time of day, deserted areas) 'markers' of perceived vulnerability (Jackson, 2009; Killias, 1990). It may be that these 'markers' also exist within a driving population.

Research has shown that fear of crime can result in 'constrained behaviour', or lifestyle adaptations including changes in dress and daily activities, as well as restricted movement (Ferraro, 1995; Liska *et al.*, 1988) and that these changes are often of greater consequence for women (Gordon & Riger, 1989; Scott, 2003). Since fear of crime can negatively affect normal activities and restrict behaviour, it can be hypothesised that risk evaluation and feelings of vulnerability could similarly affect driving, potentially leading to restrictive practices, 'over-regulation' and ultimately premature cessation. Therefore, the aim of this research is to explore feelings of vulnerability in driving, to review their effects on driver behaviours and to examine

whether those feelings are expressed in coping behaviours. The nature of coping behaviours is of particular interest.

### *Driver Coping Behaviours*

Driver coping behaviours have been widely studied, particularly in relation to stress (Matthews, Dorn & Hoyes, 1992; Westerman & Haigney, 2000); fear (Taylor *et al.*, 2002; Taylor, Deane & Podd, 2007) and anxiety (Taylor *et al.*, 2007). Since feelings of vulnerability can be conceptualised by feelings of fear and worry, it is likely that the coping strategies adopted will be similar.

Driver stress has been comprehensively examined using a 'transactional' approach (Lazarus & Folkman, 1984; Matthews, 2002) which suggests that personality (e.g. dislike of driving) and environmental factors (e.g. poor weather conditions) affect cognitive processes, generating subjective stress symptoms (e.g. tiredness and worry) and impairing driving performance (e.g. loss of attention). Reliability studies (e.g. Lajunen & Summala, 1995; Matthews *et al.*, 1997) have established three consistent dimensions of driver stress behaviour (i) alertness (ii) aggression and (iii) dislike of driving.

Alertness describes an inclination toward risk awareness and active hazard seeking. This dimension of behaviour is considered an adaptive, rational response to driving stress (Matthews *et al.*, 1991) and is characterized by observation, planning and precaution. Alertness strategies fall within a spectrum of self-regulatory driving practices and are highly desirable characteristics for safe driving.

Self-regulation studies have traditionally focused on driving avoidance behaviours. However, self-regulation covers a spectrum of risk reduction strategies from complete driving independence to complete driving cessation (Lyman *et al.*, 2001). It accommodates pre-journey planning and preparations, i.e. route planning and trial runs, pre-arranging rest stops and making vehicle adaptations (Molnar *et al.*, 2009) as well as voluntary reduction of driving exposure, e.g.

reduced trips and distances (Charlton *et al.*, 2006; Marottoli & Richardson, 1998) and avoidance of challenging driving circumstances, e.g. unfamiliar routes, poor weather, heavy traffic; (Baldock *et al.*, 2006; Ball *et al.*, 1998; Charlton *et al.*, 2006). To some extent all drivers are self-regulators but research shows that it is particularly prevalent amongst anxious drivers, inexperienced drivers and older drivers (Baldock *et al.*, 2006; Charlton *et al.*, 2006; Gwyther & Holland, 2012)

Aggressive driving incorporates anger, impatience and risk-taking behaviours. When aggressive driving is used in response to driving stress, it is known as 'confrontive coping' (Matthews, 2002) and can include behaviours such as shouting, gesticulating, hooting the horn and tailgating. Confrontive coping is a risky driving behaviour and has been associated with a higher rate of vehicle crashes (Dula & Ballard, 2003; King & Parker, 2008) and traffic violations (Matthews *et al.*, 1992).

Dislike of driving can be conceptualised by feelings of anxiety, self-criticism and low confidence. In terms of coping behaviours, it leads to disconnection from the driving task, e.g. a tendency to become distracted and display cognitive (attention) gaps (Matthews, 1997; Taubman-Ben-Ari, 2004), driving avoidance (Ehlers *et al.*, 1994) and employment of exaggerated safety behaviours, e.g. maintaining excessive distances, driving at exceptionally slow speeds, giving way unnecessarily and slowing for green traffic lights (e.g. Koch & Taylor, 1995; Taylor & Koch, 1995). These strategies are thought to reduce distress by increasing feelings of control (Mayou, Simkin & Threlfall, 1991; Taylor & Koch, 1995) and whilst they are not conventional violations of traffic laws, they are violations of traffic norms.

Unlike driving aggression, driving anxiety has not been directly associated with crash susceptibility (Parker *et al.*, 1995a; Parker, D., West, R., Stradling, S. G. & Manstead, A. S. R., 1995c). However, trait anxiety has been linked with an increase in riskier driving behaviours as measured using the Driver Behaviour Questionnaire (DBQ: Reason *et al.*, 1990) and its associated subscales (errors, lapses, ordinary violations and aggressive violations) in a sample

of 120 Israeli male drivers (Shahar, 2009). Further driving anxiety has been linked with driving aggression in a Norwegian sample of drivers aged between 18 and 23 years (Ulleberg & Rundmo, 2002).

In this study, young drivers were clustered into six risk groups based on five personality measures (sensation seeking, aggression, anxiety, altruism and normlessness) as well as a measure of driving anger. Two clusters were found to have high levels of anxiety. The first cluster was predominantly female (84%) and considered low risk, with low scores for driving anger, sensation seeking and normlessness. Interestingly, the authors reported that this group tended to overestimate their risk of being injured in a crash. This group is of particular significance to this study; their sensitivity to risk may mean that they are more susceptible to over-regulation and premature driving cessation. Conversely, the second anxious cluster, also predominantly female (59%) was considered high risk, reporting high levels of aggression and driving anger. This cluster had a higher rate of crashes and ordinary violations (speeding and rule breaking) than most other clusters. The implication here is that confrontive coping strategies may be found in a subset of anxious drivers.

Although the coping strategies described provide a useful framework, they do not recognise the involvement of other people in coping. Wider stress, coping and problem-solving models acknowledge that individuals often involve others in the problem solving process and that this involvement typically takes the form of social support (Cutrona & Russell, 1990; Lazarus & Folkman, 1984). Although driving is, by nature, a solo activity in a socially transient environment (Stradling, 2007), examples of collaborative strategies have been seen in some groups of drivers. A 'co-pilot' phenomenon has been observed in older drivers and older drivers with an Alzheimer's disease diagnosis (Miller Polgar & Shaw, 2003; Shua-Haim, Shua-Haim & Ross, 1999). In effect, the driver delegates part of the driving workload to the passenger, sharing task effort. Typically deputised tasks include navigation (Shua-Haim *et al.*, 1999) such as reading maps and/or road signs and helping with directions and hazard spotting (Vrkljan & Millar Polgar, 2007).

### *Study Aim*

The effects of risk perception and feelings of vulnerability on driving behaviour have not been widely explored and so, the purpose of this qualitative study was to investigate feelings of vulnerability in driving. There were two research aims (1) to examine the prevalence of feelings of vulnerability in drivers across the lifespan, and (2) to delineate the types of coping strategies adopted in response to those feelings.

Focus groups were chosen as the most appropriate method of data collection in this instance in order to undertake a preliminary exploration of the topic (Kreuger, 1988), to generate discussion and facilitate collaborative information sharing within a group (Neuman, 2004) and to develop questions and concepts (e.g. on coping strategies adopted in response to feelings of vulnerability) for future questionnaires on self-regulation (See Chapter 5). It is well established that judgements about risks vary between individuals (Millstein & Halpern-Felsher, 2002) and that driving behaviour varies between subgroups of drivers. It was expected therefore that the focus groups would generate rich qualitative data and a deeper understanding of the behavioural variation between sub-groups of drivers than would be available using a quantitative method alone (Nagy Hesse-Biber & Leavy, 2006).

## 4.2. Method

### 4.2.1. Participants

Participants comprised a convenience sample of 48 licensed drivers (8 male, 40 female) ranging in age from 18 to 75 years ( $M = 33.89$  years,  $S.D. = 20.52$ ). Participants' driving experience ranged from 1 month to 53 years ( $M = 13.78$  years,  $S.D. = 17.65$ ). Some participants ( $N=30$ ) were students at Aston University, enrolled on the undergraduate psychology course who received course credits for their participation. Participants from the wider community ( $N = 18$ ) were sourced through advertising within Aston University and on social networking sites. Older participants were specifically targeted through the Aston Research Centre for Healthy Ageing (ARCHA) programme and by direct approach to local social clubs. Non-student participants were offered the opportunity to have their travel expenses reimbursed. The only pre-determined criterion for inclusion was that participants had to hold a full driving licence and be practising drivers. Participants' demographic information was also collected during the focus groups and is given in Table 26. Information collected included demographic information (age and gender), crash history and driving experience (length of time an individual had been in possession of a full driving licence).

**Table 26: Participants' demographic characteristics**

Age (years)	Driving experience (years)		Crash history (over driving lifespan)	
	Mean	<i>S.D.</i>	Mean	<i>S.D.</i>
18 to 25 (N = 27)	1.17	0.77	1.33	0.48
26 to 64 (N = 12)	17.92	5.79	1.75	0.45
Over 65 + (N = 9)	46.11	6.68	1.78	0.44

### 4.2.2. Materials and procedure

After Aston University ethics committee approval and informed consent were obtained, data were collected through a series of nine focus group sessions. A focus group can be defined as "a group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research (Powell & Single, 1996 p.499).

Group sizes varied between 2 and 8 participants. The composition of focus groups is shown in Table 27.

**Table 27: Composition of focus groups**

Focus Group	Age range (years)	Male (N)	Female (N)
1	18 to 33	2	6
2	18 to 31	0	6
3	18 to 19	0	5
4	18 to 39	0	7
5	18 to 35	3	1
6	19 to 20	2	0
7	59 to 65	1	3
8	34 to 54	0	5
9	65 to 75	0	7

All interviews were digitally recorded, lasted between 36 and 54 minutes and were transcribed verbatim soon after completion. The same interviewer (HG) facilitated all groups and the same procedure was followed for all groups. This consisted of a semi-structured format covering broad driving safety themes, which were compiled based on the available literature in line with the study's aims (see Table 28). The topics were designed to guide a participant led discussion and reduce interviewer bias and so the concept of driving avoidance as a strategy to reduce feelings of vulnerability was not introduced.

**Table 28: Interview topics**

Interview Topics	Aspects considered
Openers	General feelings about driving (enjoyment/dislike) Personal confidence when driving
Feelings of Vulnerability	Feelings of vulnerability when driving (e.g. to crashes, criminal events and road/weather conditions).
Coping behaviours	Strategies used to feel safe when driving Strategies used to reduce victimisation Strategies imposed by others to ensure safety (e.g. parents and curfews, or restrictions on passenger numbers) Behaviour changes after experiences of crashes/victimisation Relaxation techniques, e.g. music, breathing exercises

Initially, the facilitator introduced the topic and asked participants to describe their feelings about driving. This was followed by open questions about feelings of vulnerability when driving and the strategies participants used to feel safe. Focus group members were encouraged to expand on topics through the use of open questions and prompts. Probes were also used to encourage reticent participants to divulge information, to clarify ambiguous statements and to obtain more detail on unanticipated subjects.

### **4.2.3. Analysis**

Thematic analysis was used to analyse the data set. This method has been described by Braun and Clark (2006) as a six phase model consisting of 1) Familiarisation with the data. 2) Initial code generation. 3) Searching for themes. 4) Reviewing themes. 5) Defining and naming themes. 6) Producing the report.

Consistent with this model, interpretation of the themes was conducted using an iterative process of reading and re-reading the focus group transcripts, consultation with other colleagues and supervisor and reference to relevant literature.

Individuals' accounts were examined carefully to identify meaningful units of text. Initial ideas for codes were generated and noted adjacent to units of text. These units of data or quotations, termed data extracts (Braun & Clarke, 2006) were then manually coded and collated into provisional themes on the basis of semantic content, i.e. surface meanings of the data. Thus the researcher did not attempt to infer anything from the data other than what was explicitly stated. Each item was examined systematically and given equal attention during the coding process.

Relevant extracts from the dataset were collated to form preliminary themes. Analyses can be predominantly 'inductive', i.e. data driven or 'deductive', i.e. theory driven. Braun and Clark (2006 p.86) suggest that where the latter method dominates, the resulting data will tend to provide "a less rich description of the data overall and a more detailed analysis of some aspect of the data". In this instance, the analysis was predominantly inductive, i.e. 'bottom up', in that preliminary themes were identified directly from the data during the data coding process. However, as analyses progressed and preliminary themes were distilled, a more theoretical process was used to organise the data. This involved reference to the existing literature to identify patterns in the data and to determine which concepts, particularly those related to coping and self-regulation behaviours were relevant to the final themes. Themes were reviewed in relation to the coded extracts, to determine whether they captured a coherent, consistent and distinctive patterned response and against the entire data set. Analysis continued as themes were

reviewed and refined and appropriate names generated. During the analysis, the researcher continually questioned whether the extracts matched the analytic claims and whether the analysis provided an appropriate representation of the original data.

Once themes had been identified across the sample, a further analysis was conducted to look for differences in thematic patterns between subgroups of drivers, specifically addressing the differences between male and female drivers, and between age related subgroups - younger drivers (18 to 25 years), middle-age drivers (26 to 64 years) and older drivers (> 65 years). This study did not set out to test a hypothesis as such; rather it sought to examine the range and nature of feelings of vulnerability in drivers across the lifespan, and to determine the types of coping strategies adopted in response to those feelings.

### **4.3. Results**

Four super-ordinate themes were identified namely: *triggering events*, *influence of personal risk biases*, *challenging circumstances* and *influence of passengers, 'co-pilots' and assistive devices*. Data extracts are used to illustrate key concepts and are identified by respondent number (e.g. R1-48), gender and age group - younger drivers (18 to 25 years), middle-age drivers (26 to 64 years) and older drivers (> 65 years). All recordings, notes and transcripts were otherwise anonymised. Within each theme, results are structured broadly in terms of reported feelings of vulnerability, then strategic coping measures raised by participants and finally where relevant examples of avoidance coping behaviours.

#### **4.3.1. Triggering events**

When participants spoke about feelings of vulnerability in driving, they often related them to specific traumatic events such as crashes or near misses, extreme acts of aggression and breakdowns.

“I had that [worries about breaking down] with the long journey I went on. I didn't have any [breakdown] cover and the car was making noises and I was getting really nervous

– I actually started crying while I was driving because I was dead scared.” (R3, younger female)

In this extract, the participant recognises her vulnerability and highlights a sensible preparatory coping strategy, emergency breakdown cover. It is implied that cover would have assuaged her concerns and this is confirmed later when she reveals that she had avoided buying cover because of the cost and on reflection, the financial outlay would be offset by the reassurance that cover provides: ‘it’s worth it’ (R3, younger female).

Generally, feelings of vulnerability related to an event were described in the past tense and were signalled through statements such as “I was scared” (R15, younger female), “I was really panicking and crying” (R4, middle-years female) and “It just scared me so much” (R13, younger female). Some participants reported that their triggering event had improved their driving behaviour, although the longevity of these improvements was not explored.

“I think that they’ve [near miss and crash experiences] made me a better driver to be honest because now I’m focusing more [...] on who’s in front of me, who’s behind me and if anyone’s overtaking or whatever” (R31, younger male).

In this extract, the driver describes becoming more task-focused as a result of his risky experience which brings to mind ‘alertness’, a dimension of driver stress behaviour. He reports an improvement in hazard awareness and observation skills as well as a reduction in the tendency to engage with distractions.

One common distracter for younger participants was the mobile phone. Although several young drivers said that they did not use their phone in the car, many admitted that they did, sometimes with detrimental consequences.

“I never used to be that cautious and then last week, I was in traffic and I looked down at my phone because I had a text – it was on my lap – and I looked up and I’d started going and went into the back of someone. So since then I’ve been really worried about

crashing into someone again and it's made me feel nervous again. I used to be confident but it's just...I feel a bit nervous now" (R9, younger female).

In this extract, the driver relates her anticipation of serious consequences through comments about 'crashing into someone again' and her feelings of loss of control. Interestingly, she fails to acknowledge responsibility for the crash by engaging in an illegal act and instead describes her ongoing feelings of vulnerability and worries about her risk potential. This evokes 'dislike of driving', the emotional coping response to driving stress conceptualised by feelings of anxiety and low confidence.

These drivers were typical of many drivers in the study who failed to acknowledge risk until after they had experienced a specific triggering event that 'switched on' feelings of vulnerability.

In terms of coping strategies, after a significant incident, participants commonly reported changing their habits in light of the circumstances, so for example where an incident was exacerbated by their retaliating to road rage, they tended to retaliate less after the experience. Where it was believed an incident was caused by bad weather, participants reported that they had adjusted their driving in those specific weather conditions accordingly.

"If it's icy then I get a bit worried because I had a crash once when it was icy; and I was speeding a bit and I wasn't expecting it. [...] now I'm really cautious when it's icy. [...] like if there's a car up my backside I'll just think I'm not going to crash because of them and I'll keep calm and put it in low gears and stuff" (R9, younger female).

A couple of participants also reported that they avoided particular roads because they had been involved in incidents at those locations.

#### **4.3.2. Influence of personal risk biases**

The second theme in this study, related to personal risk biases that influenced feelings of vulnerability and coping behaviours. There seemed to be a contradiction in reported feelings of vulnerability to certain harmful, criminal events. For example, participants reported greater feelings of vulnerability to low probability events such as personal attack and carjacking than they did to more common events such as crashes or acts of intentional aggression 'road rage'. As might be expected, these feelings of vulnerability were exacerbated at night and when travelling alone.

Drivers reported a wide range of strategic coping strategies to manage feelings of vulnerability to low probability events. These ranged from simple safety behaviours such as keeping car doors locked when driving and carrying car keys in hand when leaving or returning to vehicles, to premeditated actions such as buying and carrying a personal alarm and making one's whereabouts known to friends or family members. Despite inflated perceptions of risk regarding the likelihood of personal attack and the fact that many participants 'armed' themselves against such an attack, drivers were unlikely to research a secure, well-lit parking location before travelling. Most drivers planned a safe route, some planned rest breaks at safe locations but all left parking to chance, generally accepting whatever was closest to their destination.

Although most of the sample recounted examples of intentional aggression, i.e. 'road rage' from other road users, risks were generally underplayed and outbursts dismissed as trivial events. A number of participants related tales of extreme road rage victimisations including direct confrontations, being forcibly shunted by the vehicle behind and aggressive braking by the vehicle in front. However, participants typically reported that they did not perceive road rage as risky, or feel vulnerable to it, using phrases such as "it doesn't worry me" (R12, younger female) and "I don't really get bothered by that" (R9, younger female), although this was sometimes qualified with 'because I've never experienced it' (R9, younger female).

Many middle-years and confident younger drivers mentioned that despite the risk of escalating aggression, they coped with aggressive challenges by responding in kind, in effect using confrontive coping strategies to manage their feelings of vulnerability. Generally participants admitted to mild road rage behaviours such as swearing, gesticulating and hooting the horn. However, a few participants reported the use of more risky driving manoeuvres, such as blocking or rapid braking.

“Well, usually you’re in the outside lane and you’ve got some souped up car behind you with some boy racer in who’s right up your backside, flashing you and you’ve nowhere to go [...] so I [...] ‘engage the idiot brake’ whereby you just lightly press your brake [...] to show them that you’re braking and that they’ve got to back off” (R37, middle-years female).

In this extract, the lead driver describes a confrontive coping technique, rapid braking, to signal her disapproval with the tailgating driver. Although considered by many participants in this study to be a useful safety warning, rapid braking could increase crash risk by escalating aggressive behaviours or by prompting an over-reaction to the unanticipated braking by the tailgater.

Although some drivers acknowledged feelings of anger and frustration when being challenged by a tailgater, few explicitly recounted feeling vulnerable. However, several recognised the risks associated with escalating road rage and employed passive coping strategies to manage feelings of vulnerability during road rage outbursts.

“Most of the time I just ignore it and let them behave stupidly [...] I’ll just try to stay calm because there’s no point, the situation won’t change if you start shouting back and [...] I always think that that could make them worse and they could get out and come and have a go” (R40, middle-years female).

As demonstrated in this extract, participants raised a range of passive coping strategies to manage road rage risks including behaviours such as ignoring aggressive behaviours, failing to react visibly to road rage outbursts, identifying a safe gap in traffic and pulling out of the range of tailgaters and pulling off the road entirely to let aggressive drivers pass. Although these behaviours are passive, they can be considered adaptive strategies to reduce risk and lessen feelings of vulnerability while remaining task focused and achieving one's goal.

#### **4.3.3. Challenging circumstances**

The third theme reveals an increased incidence of feelings of vulnerability when driving in challenging circumstances. As might be expected, feelings of vulnerability were particularly high when drivers had to make an unusual or difficult journey. Difficulties might include a journey's length, or because it was an unfamiliar route or because the weather conditions were inclement.

Most participants reported feeling particularly vulnerable when driving in extraordinary weather conditions such as heavy snow, fog or ice. In these circumstances, participants generally employed sensible risk reduction strategies such as self-regulation and driving avoidance. Where journeys could not be easily avoided, most commonly, 'alertness' style strategies were adopted with an emphasis on task focus, planning and preparation. Commonly participants put emergency equipment in the car and reported that when driving in bad weather they would reduce their speed 'drive slower' (R24, younger female) and allow extra time 'I usually add an extra hour on to the journey' (R21, middle-years female).

These strategies were selected irrespective of age and gender and participants emphasised the feelings of control and safety that preparing gave them.

“And also, things like if the weather is bad [...] I put the radio on just to know the weather review and to be prepared [...] and I put stuff in the boot, just in case I got

stuck. I made sure I had some food or something! [...] So that was a bit scary but it made me feel safer to be prepared before leaving home. (R14, younger female)

Similarly when driving long distances or making unusual journeys, the emphasis was often on route planning and preparation.

“I plan long journeys, [...] I always plan in advance and make sure I know the way. And with long journeys I always make sure I’ve got an alternate route because what if the motorways blocked? So I have my sat nav and all different routes. I don’t want to be lost and run out of petrol. There’s all these things that scare me! [laughs]” (R16, younger female).

Older drivers were the only group who reported that they checked their vehicle’s tyres, oil or water before making a long journey.

However, driving avoidance was employed as a strategy to reduce feelings of vulnerability in older drivers who reported that they found driving at night challenging, perhaps as a result of age-related changes in visual acuity.

“You feel more vulnerable. If I know the road well, then I don’t mind so much driving at night but if I don’t know the road very well I like to be able to see where I am and in the dark you can’t see when the corner’s coming up. You’ve a vague idea it’s coming up soon but you know, in the daylight, you can actually see where you’re going.” (R45, older female).

Conversely, younger participants were often very keen to drive at night because it provided them with an opportunity to practice their vehicle handling and manoeuvring skills in a traffic free environment, ‘It just feels safer, you can see things more’ (R22, younger female).

Avoidance behaviours were also employed by anxious drivers and those lacking confidence to manage feelings of vulnerability when driving in challenging circumstances.

“If I’ve got to go somewhere like another town or a journey where I’ve never been before, I’ve got to get through a city centre or park or whatever, I just wouldn’t go because I’m not confident in my own ability to drive safely because I’m nervous or cautious.” (R39, middle-years female).

This extract demonstrates an over-regulation of driving behaviour such that the participants’ lifestyle choices in terms of social engagement and economic activity are affected. A number of such instances were found. Some drivers in the study avoided travelling on motorways, a few avoided driving in rush hour or heavy traffic and one reported avoiding making right hand turns. Others avoided specific places due to concerns about safety, or most commonly in younger women, fears about parking. One participant had even made a major life decision, her choice of university, based on her feelings about driving.

“I was looking forward to coming here [to a city centre University] so I didn’t have to drive.... I’m glad that everything’s so compact that I don’t have to stress about driving and travelling because I don’t enjoy it.” (R15, younger female).

#### **4.3.4. The influence of passengers, ‘co-pilots’ and assistive devices.**

The presence of passengers significantly influenced participants’ feelings of vulnerability in driving. Many participants spoke about feelings of safety, protection and well being when they had a trusted passenger in the car. However the role of the passenger was not simply for reassurance. Younger drivers particularly, described feeling less confident when travelling in unfamiliar areas or on long journeys and wanted their passengers to act collaboratively and assist with navigation or observation related tasks such as map reading, checking road signs and checking for safe gaps in moving traffic. Participants used phrases such as “an extra set of eyes and ears” (R11, younger female) and “an extra pair of eyes” (R25, younger female) to describe their passengers function. In effect, these participants were using their passenger as a ‘co-pilot’ to reduce their workload in the driving task.

The choice of co-pilot appears to be critical. Participants reported that it should be a trusted, non-judgemental individual and in younger participants it appeared that family members particularly parents were favoured over friends. The reasons for this were diverse but included a respect for the driving experience that parents and other family members possessed as well as a fear of embarrassment in front of their peers.

“He has no choice and has to come with me because I don’t like long journeys on my own. My boyfriend or my Dad. I think it’s always nice to have someone really calm and really patient in the car with you because you don’t feel as nervous and they can calm you down; and you don’t feel embarrassed if you’re stressed out or don’t know what you’re doing.” (R15, younger female).

However, in older and middle-years’ female drivers in particular, some passengers notably partners, appeared to negatively affect emotions. Respondents signalled the effect on their emotions through statements such as ‘he makes me nervous’ (R42, older female) and ‘I get really stressed’ (R38, middle-years female). These feelings seemed to arise from uninvited collaboration, the so called ‘backseat driver’ and included unsolicited advice on the presence of hazards, road position, speed and manoeuvring.

A few drivers reported that they had become so enraged with their passenger’s interjections that they ‘stopped the car and [...] said drive yourself’ (R47, older female), ‘chucked my husband out of the car’ (R42, older female), ‘think urgh, just drive yourself’ (R33, middle-years female), ‘literally have to relax my muscles because I’m about to stop the car and push him out’ (R38, middle-years female). Although passengers were not always exacerbating participants’ feelings of vulnerability, they often negatively influenced emotions, distracting attention from the driving task.

More positively, many drivers commented on their reliance on assistive devices such as satellite navigation systems and to some extent, they appeared to act as a substitute for the human co-pilot in terms of navigation tasks. Both older and younger drivers described their merits.

“I love it. Well, I find it so useful because I can’t follow a map to save my life; and I’m really impatient with other people but with the sat nav, it knows what it’s doing and I can trust it. I rely completely 100% on it.” (R15, younger female).

Many older drivers in this study owned satellite navigation systems, viewed them as a positive asset and felt that they reduced feelings of vulnerability as well as benefiting their lifestyle and relationships by reducing navigation related arguments. However, drivers in the middle-years were least likely to use satellite navigation systems, preferring to ‘plan before I go’ (R38: middle-years female) or ‘just go and get lost’ (R40, middle-years female).

#### **4.4. Discussion**

This study did not set out to support a hypothesis as such; rather it sought to examine risk perception and associated affect, i.e. feelings of vulnerability in drivers across the lifespan, and to delineate the coping strategies adopted in response to those feelings. Certainly, driver behaviour was affected by notions of risk and ensuing emotional responses. Although initially feelings of vulnerability were unlikely to be acknowledged, drivers displayed a complex array of safety related coping strategies in their everyday driving. When explored, these strategies were designed to minimise discomfort and maximise feelings of control and safety, usually in response to feelings of vulnerability.

The *triggering events* theme demonstrates the significance of conditioning events in explaining feelings of vulnerability. Traumatic events such as crash involvement can affect driving behaviour and result in driving reluctance, fears or phobia (for a review see Taylor *et al.*, 2002). It is not therefore surprising that when participants spoke about feelings of vulnerability, they often related them to specific traumatic events such as crashes, extreme acts of aggression and breakdowns. Younger participants particularly only questioned their personal vulnerability when faced with a significant, traumatic experience. Perloff (1983) suggests that individuals who have not experienced negative life events tend to perceive themselves as “uniquely invulnerable” and once this illusion is shattered by a significant experience, it creates a sense of

vulnerability which is often accompanied by psychological distress. This has been borne out in the driving literature, where traumatic events such as crashes commonly result in fears and phobias about driving and seriously affect driving behaviour (Taylor *et al.*, 2002). Although older drivers mentioned conditioning events, the finding was more noticeable in younger participants, perhaps because they had experienced their 'event' more recently or because it was the first time that they had been faced with their own vulnerability.

Although traumatic events were reported in the past tense as frightening or stressful, they had implications for driving behaviour. In some instances, triggering events raised risk awareness and ensured that participants established positive risk reduction strategies commensurate with appropriate self-regulation behaviours and the 'alertness' dimension of driver stress behaviour. While this is an encouraging finding, there is limited evidence for the longevity of these improvements in this study. In other cases, triggering events created a 'dislike of driving' and oversensitivity to risk which resulted in feelings of worry and concern as well as manifesting in over-regulation behaviours. The reason for these differing responses to the same (or similar) events is unclear and this is an area for future research.

While over-regulation offers a straightforward method of avoiding driving risk and feelings of vulnerability for the individual, there are wider societal concerns. Driving habits such as annual distance travelled and driving frequency have been shown to influence decisions about driving cessation (Hakamies-Blomqvist & Siren, 2003) and premature driving cessation has implications for an individual's health status (Fonda & Herzog, 2001a) and, quality of life (Marottoli *et al.*, 2000). It could be considered therefore that encouraging drivers who over-regulate to increase their driving would improve their prospects. This could be achieved by encouraging them to view risk differently and adopt alternative coping strategies, for example those which promote mobility through positive self-regulation, e.g. planning and preparation behaviours.

The *personal risk biases* theme showed that participants reported greater feelings of vulnerability to low probability events such as personal attack than to relatively common victimisations such as road rage. Although this is counter-intuitive, this finding is supported by work in the fear of crime literature. Warr (1984) determined that individuals are more 'sensitive' to a perceived risk when they view the consequences as more severe. Although collisions and road rage can result in extreme harm, they can also be relatively minor events. Since the consequences fall on a spectrum, perhaps participants optimistically view the outcome as less serious than low probability events such as personal attacks or carjacking. It may also be that since these events are so frequent, up to 75% of drivers have experienced some form of mild road rage event (Roberts & Indermaur, 2005; Smart, Mann & Stoduto, 2003), drivers have become habituated to them and have established strategies to reduce feelings of vulnerability.

Interestingly, when participants spoke about their negligible feelings of vulnerability to road rage, some of them qualified their responses by reporting that these events had not happened to them. In a theoretical paper on perceptions of vulnerability to victimisation, Perloff (1983) determined that non-victims tended to have an 'illusion of invulnerability' and this may lead them to take fewer precautions than necessary to manage associated risks. This perception of invulnerability may also mean that the impact of victimisation is overwhelming, resulting in psychological distress and a feeling of 'unique vulnerability' whereby one sees oneself as highly vulnerable.

In terms of coping, some participants reported reacting aggressively to relatively mild road rage outbursts. Clearly, these types of behaviour are a threat to driving safety, creating a distraction from the driving task. Overall, the perception of the focus groups was that driver aggression is increasing and that retaliation has become socially acceptable. Interestingly, women were just as likely as men to retaliate to road rage with aggressive behaviours, although attempts were often made to normalise this behaviour. One question for further study is whether it has become more acceptable for drivers and in particular women to retaliate to aggressive behaviour and express anger in a car, or whether the car is just a secure place for drivers to vent general anger

and frustration. Whichever it may be, the proliferation of aggression and confrontive coping behaviours is likely to increase perpetrators' crash risk (e.g. Dula & Ballard, 2003; King & Parker, 2008).

The *challenging circumstances* theme revealed the significance of situational factors on driving vulnerability. In accordance with situational 'markers' of vulnerability (Killias, 1990) participants reported greater feelings of vulnerability at night and in deserted areas (e.g. car parks and country lanes). Many drivers described the adoption of appropriate avoidance strategies in extreme weather conditions as well as self-regulation coping behaviours such as speed and mileage reduction where journeys could not easily be avoided.

Interestingly, older participants were most likely to report that they felt vulnerable at night. It might be anticipated that these drivers would feel most vulnerable since they meet Killias'(1990) criteria for physical indicators of vulnerability including age, gender and worsening health (eyesight). However, the driving behaviour literature shows that there is a strong association between ratings of functional night vision and drivers' avoidance of night driving (Charlton *et al.*, 2006). Perhaps then, feelings of vulnerability in older drivers at night are associated with perceptions of increased crash risk due to age-related changes in visual acuity. In this case, feelings of vulnerability provoke a sensible response to age-related declines in vision in drivers who avoid driving at night.

Finally, this theme revealed that feelings of vulnerability affect the social and economic engagement of some participants. This provides some evidence for the assertion at the beginning of the study that emotional responses to beliefs about risk can directly influence choices about driving behaviour and decisions about self-imposed restrictions. These latter two findings raise questions about the influence of feelings of vulnerability or affective responses on driving behaviour. It seems that in some instances, e.g. night driving, feelings of vulnerability may have a positive influence on driver behaviour if they lead to appropriate preventative action, i.e. self-regulation strategies as long as they do not curtail mobility and social

engagement. So, regulating driving at night would be beneficial as long as the individual rearranged their social events for daylight hours rather than simply stopping going to things.

*The influence of passengers, 'co-pilots' and assistive devices* theme revealed the importance of social or collaborative coping mechanisms on driving, an activity which has previously been considered a 'solo' endeavour. In terms of reducing feelings of vulnerability, collaborative coping offers two categories of support. Firstly, it reduces workload through the delegation of specific tasks and secondly, it appears to provide reassurance to drivers through social interaction.

The influence of passengers on young drivers' behaviour has been widely researched. Generally, passengers increase risk and negatively affect driving behaviour (Chen, Baker, Braver & Li, 2000; Doherty, Andrey & Macgregor, 1998; Williams, Ferguson & McCartt, 2007). However, Aldridge *et al.*, (1999) determined that adult passengers have a protective effect on young drivers and perhaps this effect is related to the reduction of workload established through collaborative coping. Given that older adults appear to use a co-pilot to compensate for declining cognitive resources, it may be that younger adults, who have not yet achieved a state of automaticity in driving, similarly use a co-pilot to compensate for stretched cognitive resources. In effect, delegating certain tasks reduces their workload and enables them to direct attention to basic driving skills such as vehicle handling, manoeuvrability and mastering the traffic situation (Hatakka *et al.*, 2002).

In younger drivers, a trusted passenger also provided feelings of safety and reassurance. However, in middle-years and older drivers, the 'co-pilot' only reduced feelings of stress or vulnerability through invited participation. Unsolicited attempts at collaboration resulted in loss of attention and heightened emotional states which may be detrimental to safety. The implications of these findings are that drivers who feel vulnerable could be encouraged to use an invited co-pilot to reduce risk perceptions and improve confidence.

In the absence of a human co-pilot, assistive devices such as in-vehicle satellite navigation systems provided a well-regarded alternative. Younger and older drivers described their merits and suggested that to some extent, they acted as a substitute for a human co-pilot. Although they reduce workload in terms of navigation tasks, they do not fulfill the entire collaborative role of a trusted passenger in that they cannot provide social support or reassurance. Further, complete reliance on a satellite navigation system could be dangerous in that drivers may devolve route planning responsibility to the system rather than taking active control over their route. However, the use of a satellite navigation system could be of use to drivers whose feelings of vulnerability stem from concerns about getting lost in unfamiliar areas.

#### **4.5. Study Limitations**

This study has some limitations. The sample was not balanced by gender, with women being better represented than men. However, since women are an under-researched subgroup in driver behaviour and other work has suggested that women are more likely to be over-regulators, the findings are of value.

In particular, the gender balance is of interest during discussions relating to confrontive coping. Road rage has typically been described in terms of perpetrators and victims, with predictors of perpetration including male gender, youth and history of aggressive/violent behaviour (Fong, Frost & Stansfeld, 2001). In this study, women commonly report retaliating aggressively to road rage. It may be that these women would not have admitted to aggressive behaviours in mixed company since they are not traditionally 'female' behaviours. This raises questions about socially desirable responding and the terminology used in road rage studies, perhaps the inclusion of an additional category 'retaliators' would be beneficial.

Further, the sample of older participants was small and consisted of a group of highly motivated and well older adults. Some of the women of this group may have been atypical of a wider driving population in that several of them were military wives and as such had to shoulder primary driving responsibility for their families whilst their husbands were deployed. As

habituated older drivers, they may be more comparable with middle-years women in terms of driving behaviours than another older cohort. Finally, this study was undertaken using a small, convenience sample of participants in a focus group setting. As such, the findings are not representative of an entire population and should not be generalised.

#### **4.6. Conclusions**

The benefit of this exploratory qualitative research is that it demonstrates that there is a link between risk sensitivity and decisions about driving behaviour. Emotional responses to risk appear to affect driver safety in terms of choosing appropriate coping strategies, as well as affecting major life decisions and choices about social and economic engagement. With this in mind, there is potential to develop intervention studies to educate drivers about risk and enable them to overcome feelings of vulnerability by selecting appropriate coping strategies. This is the intention of the behavioural intervention reported in Chapter 6.

## CHAPTER FIVE

## **5. Development and preliminary validation of a novel self-regulation index using an objective, simulated measure of driving behaviour**

Having established a link in Chapter 4 between risk sensitivity and driver coping, and identified a range of coping strategies (besides avoidance) used by drivers to manage feelings of vulnerability, this study sought to construct and undertake a preliminary reliability and validity assessment of a novel self-regulation index. Existing self-regulation measures tend to be based on the driving habits questionnaire (DHQ: Owsley *et al.*, 1999) which is a cumulative measure of avoidance behaviours in eight specific circumstances. Over the course of the last decade, significant but inconsistent adaptations have been made to the scale by researchers. Generally these adaptations have not been subject to rigorous reliability or validity testing. This study assessed factor scores in relation to demographic data to identify group differences in self-regulation and establish construct validity of the index. Further, since self-report data is vulnerable to bias, participants undertook an objective simulated driving task to establish concurrent criterion validity of the index. Finally, the index was used to explore some of the complex relationships between self-regulation, perception of risk, feelings of vulnerability and self-efficacy (driving confidence) to determine the effects of those same variables on social and economic engagement.

## 5.1. Introduction

Although self-regulation has been widely promoted as a mechanism for safely extending driving mobility and independence in an ageing population, studies have tended to conceptualise it as driving reduction, restriction or avoidance. While these strategies represent a significant proportion of the self-regulation spectrum (Gwyther & Holland, 2012; Lyman *et al.*, 2001), they do not convey the breadth of behaviours available. Recently self-regulation has been reported as incorporating a range of driver coping behaviours, including active planning and preparation, e.g. route planning and trial runs, pre-arranging rest stops, and making vehicle adaptations (Molnar *et al.*, 2009). Further, the findings from the formative phase of this research reported in Chapter 4 suggest that drivers adopt a range of strategic coping measures to manage feelings of vulnerability which can conceivably be included under a wider definition of self-regulation. In an attempt to reconcile the traditional concept of self-regulation with an expanded definition, this study focuses on the development and validation of a novel self-regulation index encompassing a range of coping strategies.

First, the conventional concept of self-regulation as an avoidant or restrictive driving practice is introduced. Driving self-regulation (i.e. self-restriction) has been described as a precursor to driving cessation in older drivers who, recognising some impairment, purposely limit or restrict their driving in order to reduce their feelings of vulnerability (e.g. Baldock *et al.*, 2006; Ball *et al.*, 1998; Hakamies-Blomqvist & Wahlström, 1998). It is believed that by adopting restrictive driving practices, older drivers will be able to remain mobile for longer and avoid the detrimental effects of early driving cessation, i.e. negative health effects and reduced social and economic engagement.

Certainly in older drivers, this may well be the case. However, there is evidence that other sub-groups of drivers also adopt restrictive driving practices, i.e. are over-regulating, and may therefore be unnecessarily restricting their levels of social and economic engagement. In these cases and for older drivers it may be that behavioural interventions to broaden the range of

coping strategies available to such drivers could enable them to better manage their feelings of vulnerability (i.e. their emotional response to risk perception: Gwyther & Holland, submitted) giving them greater autonomy and improving their prospects.

Research on self-restriction has attempted to identify the demographic characteristics of those drivers who self-regulate (e.g. Charlton *et al.*, 2006). The most consistent predictor of self-restriction is gender, with women adopting more restrictive driving habits than men (Bauer *et al.*, 2003; Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). Although this has generally been considered a cohort effect, with older generations of women possessing less driving experience than their male counterparts and subsequently feeling less confident in driving (Kostyniuk & Molnar, 2008; Kostyniuk & Shope, 1998), recent research (Gwyther & Holland, 2012) suggests that a relationship between gender and self-restriction exists even in younger drivers. While this finding goes some way to refuting the cohort effect theory, questions remain about whether the gender effect seen in the majority of studies is in fact a confidence effect. Some support for this assertion comes from a recent study of young drivers (N=295) where self-efficacy (control and confidence) was measured in relation to a range of risky driving behaviours, e.g. driving when tired, speeding and close following (Taubman - Ben-Ari & Yehiel, 2012). This study demonstrated that young women below the age of 21 years reported lower but not significantly lower self-efficacy than men.

The associations between age and self-restriction are complex and confounded by variables such as gender, health status and confidence. In older drivers (>63 years), self-restriction has been shown to increase with age (Bauer *et al.*, 2003). However, other studies have demonstrated that this relationship is affected by health status, such that older drivers in better health self-restrict less than younger drivers in poor health (D'Ambrosio *et al.*, 2008; Donorfio *et al.*, 2008).

However, longitudinal changes in health can reverse driving restrictions such that when a driver's health improves, they restrict their driving less (Rabbitt *et al.*, 2002). Other studies (Rimmö & Hakamies-Blomqvist, 2002) have demonstrated that irrespective of age and gender,

a driver who notices their own aberrant driving and health impairments would be more likely to self-restrict.

Recent work has shown that self-restriction occurs across the driving lifespan and appears to be related to driving anxiety/confidence rather than age *per se*. Gwyther and Holland (2012) reviewed driving behaviours in a sample of British drivers aged between 18 and 78 years old and found a quadratic effect of age on self-restriction such that younger (18-25 years) and older drivers (over 65 years), self-regulated more than middle-years drivers (26 to 65 years). Further, they found that an anxious driving style (MDSI: Taubman-Ben-Ari *et al.*, 2004) predicted driving avoidance in younger and middle-years drivers. The implication of these findings is that self-restriction is used as a tool to reduce feelings of vulnerability in drivers across the lifespan which also raises questions about a potential confidence effect in self-restrictive driving practices.

Certainly, driving confidence appears to be a factor in the adoption of self-restriction behaviours in older drivers, with low confidence ratings associated with adoption of restrictive driving practices (Charlton *et al.*, 2006), reduced driving frequency and mileage (Marottoli & Richardson, 1998) and avoidance of easily avoided but challenging driving tasks, e.g. parallel parking and driving at night in the rain (Baldock *et al.*, 2006). Although confidence appears to affect self-reported driving habits, in the latter study, no relationship was found between driving confidence, overall avoidance of difficult driving situations and an objective measure of driving performance using an on-road driving test, ostensibly suggesting that self-regulation behaviours are not associated with driving ability or significantly affected by confidence. However, a limitation of this study was that the driving assessment did not assess actual performance in the types of challenging circumstances (e.g. bad weather, at night) in which drivers may self-regulate. One of the challenges for this study is to gather an objective measure of self-regulation behaviour.

Existing measures of self-regulation (e.g. Baldock *et al.*, 2006; Donorfio *et al.*, 2008) are largely based on adaptations of the difficulty scale of the Driving Habits Questionnaire (DHQ: Owsley *et al.*, 1999) which was developed to assess the differences in driving habits between older drivers with cataracts and those without. This scale consists of 8 items assessing the level of difficulty drivers have had with certain challenging driving circumstances in the last three months, e.g. 'driving in rain', 'driving alone', 'parallel parking', 'making turns across oncoming traffic', 'driving on interstates or expressways', 'driving on high traffic roads', 'driving in rush-hour' and 'driving at night'.

Significant adaptations have been made to this scale in recent years, for example, Baldock *et al.*, (2006) added an additional item ('driving at night in the rain'), made changes to the time frame, e.g. extending it to one year, adapted the scale for a right-hand drive population and introduced a Likert scale rather than a yes/no response. Other authors (Molnar *et al.*, 2009; Ross *et al.*, 2009) have removed some items, e.g. 'parallel parking' and supported the use of a Likert scale.

While these studies focus exclusively on avoidance practices, one study has described a wider range of self-regulation behaviours. In a U.S. study, (Molnar *et al.*, 2009), piloted a new self-regulation questionnaire in a sample of 137 older drivers aged between 70 and 88 years. This questionnaire conceptualised self-regulation as a method of reducing and modifying driving exposure using a four level model of driver behaviour which focused on operational, tactical, strategic and life goals.

Wider self-regulation behaviours were considered including: 1) Life changes such as moving home to be closer to destinations, giving up work and buying a new vehicle (Item  $N = 6$ ). 2) Reductions in driving exposure such as reduced trip frequency, mileage and length (Item  $N = 4$ ). 3) Driving avoidance which was measured using the Baldock *et al.*, (2006) framework with minor amendments. The amendments included substituting 'bad weather' for 'rain', the removal of 'parallel parking' and the generation of two additional challenging circumstances - driving in unfamiliar areas and backing up [reversing], thus creating a 10 item avoidance scale. 4)

Avoidance of in-vehicle distraction such as conversations, eating and talking on a mobile phone (Item  $N = 6$ ). 5) Planning and way finding strategies such as route planning, practice runs, trip combining and having a passenger assist with navigation (Item  $N = 5$ ). 6) Vehicle modifications such as the addition of mirrors, steering knobs, hand controls, seating modification and satellite navigation (Item  $N = 5$ ). Items were generated inductively based on a literature review, although the source of and a rationale for each item was not given.

Perhaps the most interesting additions in terms of this present research were the inclusion of planning strategies (example items include ‘do you plan your trip ahead of time’ and ‘do you make a practice run ahead of time’) and vehicle modifications (e.g. ‘during the past year have you added special mirrors to your vehicle to make driving easier’) as self-regulation behaviours. Significant proportions of participants reported that they used planning strategies. Responses ranged from taking a passenger to help navigate (8.8%) to reducing trips into a single outing (83.1%). However, fewer reported making vehicle modifications in the last year to make driving easier (responses ranged from 1.5% to 9.6%). The exception was the addition of an in-vehicle navigation system which 16.9% of participants were reported to have done.

Unusually, no gender differences were found in any aspect of self-regulation behaviour in this study, including avoidance. Further, only small variations in two individual items by age group were noted. The authors suggest that this was to do with the generally high level of functioning within the sample. However, it may also be due to the restricted age range of the sample and the fact that some data, notably self-regulation practices and driving avoidance statistics were collected using nominal categories. That is questions were answered by participants with a simple yes/no response, i.e. do you try to avoid driving at night? This resulted in limitations on the types of statistical analysis that could be legitimately conducted. The authors acknowledged the need for multivariate analysis in future studies. Further, the questionnaire was not assessed for measures of reliability (e.g. internal consistency or test-retest reliability) or validity. The questionnaire was long, taking approximately 30-45 minutes to complete and the authors note

that factor analysis would assist in reducing the number of variables and simplifying the questionnaire.

In conclusion, Molnar *et al.*'s (2009) work is seminal in that it extends the definition of self-regulation but the findings were somewhat limited due to the exploratory nature of the pilot data and as such there is scope for improvement and development. This can be achieved by 1) the generation of additional items, particularly in terms of planning and preparation behaviours and 2) undertaking preliminary reliability and validation work. Since the evidence from the literature and findings in the present research suggest that beliefs about risk and affective responses to risk including feelings of vulnerability and driving anxiety/confidence are strongly associated with self-regulation (restriction) which in turn affects social and economic engagement, the effects of these variables will also be explored using the novel index.

#### *5.1.1 Study Aims*

Self-regulation in driving has largely been conceptualised as avoidance and consequently, planning behaviours have not been explored as a means of safely extending mobility, augmenting driving confidence and improving social and economic engagement. The aims of this study were:

(1) to construct and undertake preliminary reliability and validity testing on a short self-report index designed to assess self-regulation behaviours in drivers across the lifespan, establishing a) internal consistency, b) construct validity and c) concurrent criterion validity using an objective measure of driving behaviour in a simulator environment.

(2) to use the index to explore some of the complex relationships between self-regulation, perception of risk, feelings of vulnerability and self-efficacy (driving confidence/anxiety) and to determine the effects of those same variables on social and economic engagement. In order to achieve these aims, the following hypotheses were tested.

**Hypothesis 15:** The index should be able to differentiate between men and women, with women displaying higher mean scores for self-regulation than men.

**Hypothesis 16:** The index should be able to differentiate between different age groups such that a quadratic effect of age will be seen on avoidance self-regulation behaviour. Given the lack of suitable evidence, no directional hypothesis is proposed for planning behaviour.

**Hypothesis 17:** The index should be able to differentiate between drivers who are anxious and those who are not, with anxious drivers displaying higher scores for self-regulation than other drivers.

**Hypothesis 18:** Drivers with high scores for self-regulation will engage in fewer risky driving manoeuvres than other drivers during the simulated driving task.

**Hypothesis 19:** Drivers with high scores for self-regulation will regulate their behaviour to a greater extent during challenging driving circumstances in the driving simulator task.

**Hypothesis 20:** Risk perception and feelings of vulnerability will influence self-regulation behaviour such that self-regulation will increase with increasing perception of risk and feelings of vulnerability.

**Hypothesis 21:** Low self-efficacy (confidence) will be associated with self-regulation.

**Hypothesis 22:** Self-regulation will influence the reported level of social and economic engagement such that engagement will decrease with increasing self-regulation.

## **5.2. Method**

### **5.2.1. Participants**

Participants comprised 64 drivers - 36 women and 28 men - aged between 18 and 80 years ( $M = 40.72$  years,  $S.D. = 20.01$ ). Participants' duration of driving experience ranged from 1 year to 60 years ( $M = 20.70$  years,  $S.D. = 17.68$ ). Just less than half (49.2%) of the drivers considered themselves the main driver in their household while 27% ( $N=17$ ) were the only drivers in their household.

Nine participants were students at the University of Aston, enrolled on the undergraduate psychology course who received course credits for their participation. Participants from the wider community were sourced through advertising. Older participants were specifically targeted through the Aston Research Centre for Healthy Ageing (ARCHA) and by direct approach to the University of the Third Age. The only pre-determined criteria for inclusion were that participants had to be over 17 years of age, hold a full driving licence and be practising drivers. Participants who had motion sickness or photosensitive epilepsy were excluded at the recruitment stage to avoid attrition from simulator sickness. However, one participant had to be excluded during the simulated task due to sickness.

### **5.2.2. Materials**

#### **5.2.2.1. Self-Regulation Index**

The index assessed self-regulation behaviours using a scale specifically developed for this study and designed to reflect avoidance and planning coping strategies. The instrument was constructed by adapting common items from existing self-regulation measures (e.g. Baldock *et al.*, 2006; Donorfio *et al.*, 2008; Sullivan *et al.*, 2011) which were adaptations and extensions of the difficulty scale of the Driving Habits Questionnaire (Owsley *et al.*, 1999). Given that these tools only measured driving avoidance and that there is still a place for sensible risk-related avoidance in self-regulation behaviour, it was considered *a priori* that these items would form

an ‘avoidance’ scale. New items for the planning scale were generated using planning and preparation strategies gathered from focus group data (Gwyther & Holland, submitted) and literature review . Only items which could be considered *a priori* to incorporate some aspect of planning behaviour were included. It was considered that these items would form a ‘planning’ scale. Items are listed in Table 29. Participants were asked to rate their agreement with the eighteen items across a five point likert type scale from ‘strongly disagree’ to ‘strongly agree’.

**Table 29: *A priori* postulated dimensions of the self-regulation index**

Factors	Items
Planning	When I’m making a long journey, I check traffic news before I set off
	I take care to plan the best time of day to make a journey
	I think about my route before I set off
	When I’m making a long journey, I plan rest breaks ahead
	I have specific strategies to cope when I get tired driving
	When I’m making a long or unusual journey, I allow extra time before setting off
	I’d rather just get going and work out my route as I go along (-)
	I tell someone of my whereabouts when making a long or unusual journey
	When I’m making a long or unusual journey, I check my car (e.g. oil, water, tyre pressures) before setting off
	I prefer to have a trusted friend or family member with me when driving in difficult circumstances
	When driving on a long or unusual journey, I use a map or satellite navigation system
	I don’t really think that I need to adjust my driving in bad weather (-)
	I lock my car doors when driving
Avoidance	I avoid driving on the motorway
	I avoid changing lanes or overtaking on the motorway
	I avoid making right hand turns at busy junctions
	I avoid driving in heavy traffic, e.g. at rush hour
	I drive in the dark (-)

#### 5.2.2.2. Associated questionnaire

The associated questionnaire comprised three sections. The first section included demographic information (age and gender), driving experience (length of time an individual had been in possession of a full driving licence), driving patterns (number of miles driven per week and hours spent driving per week), driver status (whether participants were the main or only driver in the household) and whether participants believed that they were an anxious drivers (yes/no).

The second section consisted of five items designed to measure whether self-regulation behaviours affected social and economic engagement. There was no precedent for this scale in the driving literature. The engagement scale also used a five point likert type scale from

‘strongly disagree’ to ‘strongly agree’. Scores ranged from 5 to 25 with higher scores reflecting a tendency for feelings about driving to affect social and/or economic engagement. At the end of the engagement section were two additional items which required participants to rate their agreement on the same likert type scale with the statements ‘I believe that I am at risk when driving’ and ‘I feel vulnerable when driving’. These two items were included to measure beliefs about general driving risk and the likelihood of an emotional response to risk perception. The individual items can be seen in Table 30.

**Table 30: Questionnaire items and internal consistency for the engagement scale (Cronbach’s  $\alpha$ ).**

Scale	Items	Cronbach’s $\alpha$
Engagement	I have not applied for, or taken a job because it would mean driving further than I am comfortable with I have missed social events because I would have to drive further than I am comfortable with I rarely shop where I would prefer because it would mean driving further than I am comfortable with I have stayed in rather than go out because it would mean driving further than I am comfortable with It is harder for me to get to places because I am uncomfortable with driving	0.90

The third section incorporated a measure of self-efficacy which was based on the Adelaide Driving Self-Efficacy Scale (ADSES: George *et al.*, 2007). This scale was used to review self-efficacy in hospital and stroke patients (N=160) in order to establish positive driving rehabilitation practices. The scale asks participants ‘How confident do you usually feel’ on a five point likert type scale from ‘not at all confident’ to ‘completely confident’ when driving in a range of difficult driving situations including driving in the local area, driving in heavy traffic, driving in unfamiliar areas, driving at night, driving with people in the car, responding to road signs/traffic signals, driving around a roundabout, attempting to merge with traffic, turning right across oncoming traffic, planning travel to a new destination, driving in high speed areas and parallel parking. The scale achieved a high level of internal consistency (Cronbach’s  $\alpha = 0.98$ ) and construct validity demonstrating differences between a group of hospital staff and patients.

The existing twelve item scale was extended following a literature review to include additional challenging circumstances in driving and to reflect the circumstances where women drivers had

reported that they felt vulnerable in previous studies in the present research. The following items were added, 'when driving alone' (derived from Chapter 4), 'when driving distances of greater than 50 miles' (slightly adapted from MacDonald, 2007; D'Ambrosio, 2008), 'when overtaking' (from Chapter 2) 'when joining a motorway' and 'when changing lanes on a motorway' (derived from Charlton *et al.*, 2006 and MacDonald, 2007), 'when driving in bad weather, e.g. fog or heavy rain' (derived from Charlton *et al.*, 2006 and MacDonald, 2007) and 'when reversing into a space between two cars' (from MacDonald, 2007). Three items were slightly amended. The item 'driving in heavy traffic' was amended to 'driving in rush hour or heavy traffic'. The item 'driving with people in the car' was separated into two items firstly, 'when driving with passengers' and secondly, 'when driving with children in the car'. Finally, for clarity the item 'driving in high speed areas' was amended to read 'driving on motorways'. This resulted in a twenty item scale with scores ranging from 20 to 100. Low scores reflected low driving confidence. The Cronbach's  $\alpha$  coefficient for the scale was 0.97. This value was maintained across all items and could not be improved by deleting any item, indicating a high degree of internal consistency.

### **5.2.3. Driving Simulator**

Although an objective on-road driving test represents the ideal criterion measure of validity for this study, there are financial, ethical and safety issues associated with such tests. Research suggests that using a simulator to assess driving behaviour is a useful tool, since it has the advantage of safety, cost and experimental control (Reed & Green, 1999).

The Aston University driving simulator used to collect participants' data was a high fidelity, fixed-base simulator operating proprietary software - STISIM Drive<sup>(TM)</sup> by Systems Technology Inc. The hardware consisted of a high fidelity control steering wheel with force feed 360° rotation mounted on a dashboard with a speedometer displaying in miles per hour (MPH) and a rev counter detailing engine revolutions per minute (RPM). A turn signal indicator and horn were also present. Participants sat in an adjustable car seat with a manual gear stick to their left.

Additional software inputs were received from accelerator, brake and clutch pedals. Displays and controls operated as expected in 'real life'. In front of the 'car' were three, 1.27 x 1.18 metre projection screens, with the central surface located 1.63 metres away from the driver's seat with two peripheral screens angled at 40° left and right of the central surface, providing a 130° horizontal and 60° vertical field of view. Graphics were projected onto the screens by three projectors at a resolution of 1280 x 1024 pixels. The projected images were refreshed at a rate of 75 Hz. A speaker system located around the simulation suite and behind the participant provided simulated engine and braking noises as well as environmental noises such as road sounds, passing traffic and emergency vehicle sirens.

#### **5.2.3.1. Simulation scenario**

The scenario route was 21,653 metres long. It began as a single carriageway in a commercial urban environment and followed a route through a suburban landscape with a variety of parked vehicles to become an arterial dual carriageway. The speed limit was set at 30 miles per hour (50km per hour) throughout. Lane widths and road markings replicated the United Kingdom (UK) standard. Oncoming traffic was present throughout the scenario and traffic was also present in front of the participant. In the single carriageway section, traffic in front was situated so that it would not impede participants' progress, while in the dual carriageway setting, participants could choose their own speed by overtaking other vehicles.

The simulation scenario included two challenging driving scenarios designed to test self-regulation behaviour, as follows:

1000m fog patch at 3200 metres, with prior warning at 2750 metres.

Emergency vehicle siren heard between 19250 and 19370 metres with ambulance passing at 19300 metres.

## **5.2.4. Procedure**

### **5.2.4.1. Questionnaire**

The self-regulation index and associated questionnaire was pre-piloted by four lay people to remove question ambiguities and the readability was tested using the Flesch Reading Ease Index (Flesch, 1948). A score of 75.6 was achieved indicating that the questionnaire could be understood by literate adults. After Aston university ethics committee approval and informed consent were obtained, participants were asked to complete the index and questionnaire. Data were analysed using IBM SPSS statistics version 19.

### **5.2.4.2. Simulated Driving Task**

Each participant was allowed up to three practice trials in a simple, single carriageway scenario, free of other traffic, to familiarise themselves with the hardware controls. The practice run was 3500m long and contained one pedestrian and four intersections, of which two included traffic lights which were designed to stop participants to encourage practice with the gears and brakes. No speed limit was set. Participants were told that they should take the opportunity to familiarise themselves with the 'car' controls, for example by stopping and starting, slowing down and speeding up, changing gears and weaving. Once participants had familiarised themselves with the simulator hardware or had reached the three trial limit, they moved on to the main test run. Participants were informed that this was the scenario of interest and that they should drive as they would normally on the road. After the task, participants were debriefed with details of their mean speed, road position and errors.

### **5.2.4.3. Simulator measures**

Measures obtained from the simulator included risky driving behaviours and speed regulation. Risky driving behaviours included the percentage distance of the journey that the speed limit was exceeded and the total number of tailgating events. Speed regulation measures included the mean and standard deviations of driving speed through the two challenging driving

circumstances, i.e. the fog patch (1000m distance) and when the emergency siren was operating (120 metres) with ambulance passing (miles per hour).

#### **5.2.5. Validation procedures**

##### **5.2.5.1. Factor analysis**

First, the self-regulation index was subject to a Principal Components Analysis with oblimin rotation to identify independent dimensions of self-regulation. Principal components were then compared with dimensions of self-regulation that had been postulated *a priori*, i.e. planning and avoidance behaviours to establish construct validity. Internal consistency (reliability) was measured using Cronbach's  $\alpha$  and an acceptability level set at 0.7 (Kline, 1994)

##### **5.2.5.2. Discriminant validity**

An effective instrument should be sufficiently sensitive to discriminate between different groups. It was hypothesised that the index should be able to differentiate between men and women, different age groups and drivers who rated themselves as anxious or not. A series of ANOVAs and ANCOVAs were performed to establish any differences between groups.

##### **5.2.5.3. Concurrent criterion validity - simulated driving task**

It was hypothesised that drivers with high scores for self-regulation would perform fewer risky driving manoeuvres than those with lower self-regulation scores and that they would make greater adjustments to their speed during the challenging scenarios. Step-wise multiple regression modelling was used to assess how well observed driving behaviours (risky behaviours and observed regulation) predicted self-reported avoidance and planning behaviours and correlation analyses were used to review the associations between self-reported and observed behaviours.

#### **5.2.5.4. Analysis**

Descriptive analyses were performed on demographic information. A series of ANOVAs and ANCOVAs were conducted to establish the differences between groups and demonstrate discriminant validity. To further examine any gender specific effects, correlation analyses were carried out separately for men and women. Significant associations between self-regulation behaviours, feelings of vulnerability and self-efficacy were explored further using two-way MANOVAs. Finally, step-wise regression modelling was used to determine the best predictors of reduced social and economic engagement.

### **5.3. Results**

#### **5.3.1. Reliability and Validity**

##### **5.3.1.1. Internal consistency analysis**

Initial internal consistency analysis revealed that the Cronbach's  $\alpha$  for the six item avoidance behaviour scale was 0.60 but by discarding the item, 'I lock my car doors when driving' from the index, the scale could be improved to an acceptable 0.75. The initial Cronbach's  $\alpha$  for the twelve item planning behaviour scale was 0.77. Given that this was an acceptable result and that only very small improvements could be made to reliability, e.g. by deleting the item 'When driving on a long or unusual journey, I use a map or satellite navigation system' to 0.78, no items were deleted from the scale.

##### **5.3.1.2. Factor Analysis**

In order to establish construct validity, the 18 item self-regulation index was subjected to a Principal Components Analysis (PCA) with oblimin rotation. Prior to performing the PCA, the suitability of the data for factor analysis was assessed. The Kaiser-Meyer-Olkin value was .68, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and Bartlett's test of sphericity (Bartlett, 1954) reached significance ( $<0.001$ ), supporting the factorability of the correlation

matrix. The factor analysis revealed five main factors (eigenvalue >1) which explained 63.32% of the variance of the 18 items. However, after applying Catell's (1966) scree test, only three components were retained for further investigation, explaining 48.9% of the variance. A scree test assumes that where a factor is important, it will explain a large proportion of the variance in the model. Factors are displayed graphically in size order by variance using eigenvalues. Factors above the 'elbow', i.e. where the plot changes shape, account for the bulk of the correlations in the matrix and are considered important and are retained. However, Catell's (1966) scree test tends to overestimate the number of components in factor analysis and so parallel analysis is preferred as a method of obtaining and identifying the optimal number of components to retain (Pallant, 2007). Parallel analysis involves comparing the size of eigenvalues in the experimental matrix with a random set. Only those exceeding the random value in the experimental data are retained (Pallant, 2007). After conducting parallel analysis, only two components were retained for further investigation. The discarded third component broadly reflected safety behaviours such as locking car doors and using a map or satellite navigation system but given the low number of factor loadings on this component and the results of parallel analysis, retention was not considered viable. The final two component solution explained 40.87% of the variance.

Component 1 contributed 23.61% of the variance (Cronbach's  $\alpha = 0.82$ ) and consisted of 9 items with high loadings (>0.50). These items reflected planning and preparation behaviours and so the factor was labelled 'planning'. Component 2 contributed 17.26% of the variance (Cronbach's  $\alpha = 0.75$ ) and consisted of 6 items with some strong loadings. These items reflected restrictive and avoidant driving practices and so the factor was labelled 'avoidance'. There was a weak positive correlation between the two factors ( $r=.04$ ).

Table 31 shows the loadings of the items in each factor. As a result of the factor analysis, two items, 'I don't really think that I need to adjust my driving in bad weather' and 'When driving on a long or unusual journey, I use a map or satellite navigation system' were discarded from the index. The final index comprised 15 items.

**Table 31: Factor model coefficients of the self-regulation index**

	Items	Loading
Planning	When I'm making a long journey, I check traffic news before I set off	0.77
	I take care to plan the best time of day to make a journey	0.70
	I think about my route before I set off	0.70
	When I'm making a long journey, I plan rest breaks ahead	0.59
	I have specific strategies to cope when I get tired driving	0.58
	When I'm making a long or unusual journey, I allow extra time before setting off	0.64
	I'd rather just get going and work out my route as I go along (-)	0.62
	I tell someone of my whereabouts when making a long or unusual journey	0.54
	When I'm making a long or unusual journey, I check my car (e.g. oil, water, tyre pressures) before setting off	0.66
	Avoidance	I avoid driving on the motorway
I avoid changing lanes or overtaking on the motorway		0.85
I avoid making right hand turns at busy junctions		0.65
I prefer to have a trusted friend or family member with me when driving in difficult circumstances		0.58
I avoid driving in heavy traffic, e.g. at rush hour		0.48
I drive in the dark (-)		0.44

### 5.3.2. Discriminant Validity

#### 5.3.2.1. Age and gender

The associations between planning and avoidance behaviours were explored by gender and age in three groups – young drivers (18-25 years), middle years (26-64 years) and older drivers (over 65 years) –using two-way between-groups ANOVAs. Contrary to Hypothesis 15, no main effects of gender were found for either variable. However, the effect of gender on avoidance was reasonably close to significance  $F(1,64) = 3.04, p = 0.09, \text{partial } \eta^2 = 0.05$ , in the anticipated direction with a moderate effect size (Cohen, 1992). A main effect of age,  $F(2,64) = 5.79, p < 0.01, \text{partial } \eta^2 = 0.17$  was noted for avoidance behaviour. Post-hoc analyses revealed that younger drivers were significantly more likely than middle-years drivers to engage in self-regulatory avoidance behaviours. However, no significant effect was determined between middle-years and older drivers, suggesting that the hypothesised quadratic effect (Hypothesis 16) of age on self-regulation could not be supported.

Given the strength of association between age and driving experience ( $r = .99, df = 64, p < 0.01$ ) and to determine whether avoidance behaviours in young drivers were occurring as a function of lesser experience, an ANCOVA was conducted. The above age by gender analysis was

repeated with experience (time in years since licensure) as a covariate. When experience was controlled for, the gender effect diminished slightly ( $F(1, 64) = 2.66, p=0.1, \text{partial } \eta^2=0.05$ ) but the effect size remained. The age effect remained significant ( $F(2,64) = 5.25, p<0.001, \text{partial } \eta^2=0.16$ ). Means and adjusted means can be found in Table 32.

**Table 32: Means, standard deviations and adjusted means by gender and age group for avoidance**

Gender	Age group (years)	<i>N</i>	<i>Mean</i>	<i>S.D.</i>	<i>Adjusted Mean</i>	<i>S.E.</i>
Male	18 to 25	7	15.29	3.73	13.85	1.98
	26 to 64	13	11.15	2.19	11.14	1.12
	Over 65	8	12.00	3.34	14.31	2.48
Female	18 to 25	11	16.45	5.20	15.15	1.67
	26 to 64	20	12.40	3.94	12.22	0.91
	Over 65	5	15.40	6.27	17.38	2.50

*Note: Adjusted means are based on participants' driving experience at 20.70 years*

After controlling for experience, a significant ( $p<0.05$ ) quadratic effect of age was found, such that younger and older participants' reported higher scores than middle-years' drivers for avoidance self-regulation behaviours (see Figure 2). This finding partially supported Hypothesis 16.

There was no effect of age on planning, after controlling for experience ( $F(2, 63) = 0.23, p=0.81, \text{partial } \eta^2=0.01$ ). Similarly, there was no effect of gender on planning, after controlling for experience ( $F(1,63) = 0.06, p=0.80, \text{partial } \eta^2=0.001$ ). However, a means plot of planning scores, revealed an increase in planning with age in women and a slight quadratic effect in men, such that younger men planned slightly more than middle-years men, who then increased their planning into older age (see Figure 3). However, there was no interaction effect of age and gender on planning behaviour ( $F(2,63) = 0.07, p=0.98, \text{partial } \eta^2=0.002$ ).



**Figure 2: Mean avoidance scores by gender and age group**



**Figure 3: Mean planning scores by gender and age group**

### **5.3.2.2. Driver anxiety**

To further review the discriminant validity of the index, it was considered that it should also be able to differentiate between drivers who rated themselves as anxious or not. Since driver anxiety was measured using a categorical variable (yes/no), a Mann-Whitney U Test was used to determine whether the index could differentiate between drivers. The results indicated that anxious drivers were significantly more likely to adopt avoidance ( $Md=19$ ,  $N=13$ ) strategies than non-anxious drivers ( $Md=12$ ,  $N=51$ ),  $U = 86.50$ ,  $z=-4.11$ ,  $p<0.001$ . The effect size was large,  $r = 0.05$  (Cohen, 1992). However, no significant differences were seen between anxious ( $Md=34$ ,  $N=13$ ) and non-anxious drivers ( $Md=31$ ,  $N=51$ ), in terms of planning behaviours,  $U = 221$ ,  $z=-1.49$ ,  $p=0.14$ . When these results were reviewed separately by gender, it was determined that only anxious female drivers ( $Md=19$ ,  $N=11$ ) were significantly more likely to adopt avoidance behaviours than non-anxious females ( $Md=12$ ,  $N=25$ ),  $U = 41.50$ ,  $z=-3.31$ ,  $p<0.001$ . Although the relationship was close to significance in anxious ( $Md=18$ ,  $N=2$ ) and non-anxious men, ( $Md=11.5$ ,  $N=26$ ),  $U = 6.00$ ,  $z=-1.79$ ,  $p=0.07$ . Partially supporting Hypothesis 17, anxious drivers displayed higher median scores for self-regulation (avoidance) than non-anxious drivers.

### **5.3.3. Concurrent Criterion Validity – Simulated Driving Task**

#### **5.3.3.1. Correlation analysis – observed and self-reported self-regulation**

The relationships between self-reported, self-regulation coping behaviours, observed changes in response to challenging driving situations and risky driving behaviours were considered using bivariate correlations separately for men (see Table 33) and women (see Table 34). Self-reported avoidance was not associated with any observed driving behaviour. However, importantly self reported planning was associated with a lower mean speed through fog and a greater change (standard deviation) in mean speed through fog in men only. No associations were found between driving behaviours in the simulated driving task and self-reported planning or avoidance in female drivers.

Contrary to Hypothesis 18, no associations were noted between self-regulation behaviours and risky driving manoeuvres, i.e. drivers with high scores for self-regulation did not engage in fewer risky driving manoeuvres than other drivers during the simulated driving task.

However, with regard to risky driving behaviours, in one instance, the genders behaved differently. Although no significant associations were determined between age and risky driving, using a comparison of  $r$  values, it can be seen that the frequency of tailgating events decreased with age in men ( $r = -0.16$ ) but increased with age in women ( $r = 0.14$ ).

There was also a gender difference in terms of self-regulation behaviour. Avoidance was positively correlated with planning in women ( $r = 0.22$ ) but negatively correlated with planning in men ( $r = -0.08$ ), perhaps suggesting that men plan in preference to using avoidance behaviours while women use a combination of both coping behaviours to manage their feelings about driving.

**Table 33: Correlations between age, self-reported and observed self-regulation and risky driving behaviours in male drivers.**

	1	2	3	4	5	6	7	8	9
1 Age	1								
2 Avoidance	-0.29	1							
3 Planning	0.37	-0.08	1						
4 % distance exceeding speed limit	-0.30	-0.08	-0.11	1					
5 No Tailgating events	-0.16	0.13	0.04	-0.06	1				
6 Mean speed through fog (mph)	-0.65	0.28	-0.43*	0.59**	-0.09	1			
7 SD speed through fog (mph)	0.56**	-0.10	0.53**	-0.29	-0.26	-0.64**	1		
8 Mean speed through siren (mph)	-0.44*	0.05	-0.10	0.58**	-0.14	0.64**	-0.50**	1	
9 SD speed through siren (mph)	0.25	-0.14	-0.07	-0.17	0.37	-0.32	0.07	-0.18	1

\* $p < 0.05$  \*\* $p < 0.01$

**Table 34: Correlations between age, self-reported and observed self-regulation and risky driving behaviours in female drivers.**

	1	2	3	4	5	6	7	8	9
1 Age	1								
2 Avoidance	-0.02	1							
3 Planning	0.33	0.22	1						
4 % distance exceeding speed limit	-0.52**	-0.17	-0.21	1					
5 No Tailgating events	0.14	0.31	-0.02	-0.20	1				
6 Mean speed through fog (mph)	-0.56**	-0.06	-0.21	0.75**	-0.25	1			
7 SD speed through fog (mph)	0.15	0.32	-0.20	-0.30	0.37*	-0.51**	1		
8 Mean speed through siren (mph)	-0.35*	-0.07	-0.16	0.32	0.06	0.25	-0.07	1	
9 SD speed through siren (mph)	0.19	-0.13	0.25	-0.15	0.13	-0.24	-0.10	-0.11	1

\* $p < 0.05$  \*\* $p < 0.01$

#### **5.3.4. Regression analysis – observed and self-reported self-regulation.**

Hierarchical multiple regression modelling was used to assess how well observed driving behaviours predicted self-reported avoidance. Age and gender were entered at Step 1 and explained 5% of the variance. Risky driving behaviours – percentage distance exceeding the speed limit and number of tailgating events - were entered at Step 2 and explained an additional 9% of the variance. Finally, the mean and standard deviation of speed through fog, were entered at Step 3. The variance explained by the model as a whole was 22%,  $F(6, 64) = 2.98, p = 0.01$ . In the final step of the equation, four variables were significant predictors of avoidance behaviour.

Regression modelling was also used to assess how well observed driving behaviours predicted self-reported planning. Age, gender, risky driving behaviours and self-regulatory changes were entered as above. The variance explained by the model was 15% and not significant,  $F(6,63) = 1.57, p = 0.17$ . Results for planning and avoidance prediction are shown in Table 35. Using this model, only age was a significant predictor of planning behaviour.

**Table 35: Multiple regression of risky driving behaviours and observed self-regulation on self-reported self-regulation.**

	Step	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
Avoidance	1	Age	-.12	.05	.05	1.56
		Gender	0.17			
	2	Age	-.18	.13	.08	2.15
		Gender	0.14			
		% distance exceeding speed limit	-.16			
	3	Tailgating events	.22	.24	.11	2.98*
		Age	-.07			
		Gender	0.14			
		% distance exceeding speed limit	-.34*			
		Tailgating events	.24*			
		Mean speed through fog	.48*			
	Planning	1	S.D. through fog	.36*	.11	.11
Age			.33**			
2		Gender	0.02	.12	.00	1.88
		Age	.34**			
		% distance exceeding speed limit	-.03*			
3		Tailgating events	.02	.15	.03	1.57
		Age	.23			
		Gender	0.01			
		% distance exceeding speed limit	.09			
		Tailgating events	-.01			
		Mean speed through fog	-.29			
S.D. through fog		-.13				

### 5.3.5. Relationships between self-regulation, vulnerability and self-efficacy

#### 5.3.5.1. Correlation analyses

In order to examine Hypotheses 20, 21 and 22 that risk perception and feelings of vulnerability will influence self-regulation behaviour, that low self-efficacy will be associated with self-regulation, and that self-regulation will influence the reported level of engagement respectively, the relationships between age, risk perception, feelings of vulnerability, self-efficacy avoidance, planning and engagement were explored using bivariate correlations separately for men (see Table 36) and women (see Table 37).

There were significant positive relationships in both genders between risk perception and feelings of vulnerability, suggesting that the more a participant believes that they are at risk when driving, the greater their emotional response, i.e. feelings of vulnerability. In women only, increasing perceptions of risk were also associated with increasing levels of avoidance and reduced levels of self-efficacy. Feelings of vulnerability were also positively correlated with avoidance and negatively correlated with self-efficacy. These results suggest that an emotional response to risk perception negatively affects confidence and increases the likelihood of over-regulation behaviours. Further, feelings of vulnerability were correlated with engagement, suggesting that economic and social engagement, i.e. employment selection, shopping opportunities and social activities, are affected by feelings about driving. These results provide partial support for Hypothesis 20 that risk perception and feelings of vulnerability influence self-regulation behaviour.

In the entire sample, age was strongly positively correlated with planning behaviour ( $r = .34$   $df = 64$ ,  $p < 0.01$ ) but no such relationship was determined when the sample was divided by gender (see Tables 34 and 35).

Providing evidence for Hypothesis 21, avoidance behaviour was negatively correlated with self-efficacy and strongly positively associated with engagement in both men and women, suggesting that people with low confidence are more likely to avoid or perhaps over-regulate their driving and let their feelings about driving affect their lifestyle (high scores on the engagement measure reveal a tendency to allow feelings about driving to affect social and economic engagement. Finally, self-efficacy was negatively correlated with engagement in both genders, which supports the suggestion that low confidence affects lifestyle choices.

**Table 36 : Correlations between age, self-regulation, engagement and self-efficacy in male drivers.**

	1	2	3	4	5	6	7
1 Age	1						
2 Risk perception	-0.13	1					
3 Feelings of vulnerability	-0.19	0.67**	1				
4 Avoidance	-0.28	0.22	0.49**	1			
5 Planning	0.36	0.08	0.13	-0.08	1		
6 Engagement	0.07	0.29	0.47*	0.60**	0.06	1	
7 Self-efficacy	0.34	-.48**	-0.71**	-0.76**	0.16	-0.70**	1

$p < 0.05$  \*\* $p < 0.01$  ( $N$  ranges from 26-28).

**Table 37: Correlations between age, self-regulation, engagement and self-efficacy in female drivers.**

	1	2	3	4	5	6	7
1 Age	1						
2 Risk perception	-0.25	1					
3 Feelings of vulnerability	-0.20	0.57**	1				
4 Avoidance	-0.02	0.41*	0.63**	1			
5 Planning	0.33	0.15	0.32	0.22	1		
6 Engagement	-0.04	0.48**	0.66**	0.76**	0.33	1	
7 Self-efficacy	0.10	-0.56**	-0.64**	-0.88**	-0.19	-0.79**	1

$p < 0.05$  \*\* $p < 0.01$  ( $N$  ranges from 33-36).

### 5.3.6. Multivariate Analysis of Variance – Avoidance

Given the strong associations between avoidance and feelings of vulnerability and self-efficacy in both genders, two, two-way between groups MANOVAs were performed to investigate gender and age differences in feelings about driving and avoidance.

In the first analysis, two dependent variables were used: avoidance and feelings of vulnerability. There was a significant effect of gender on the combined dependent variables,  $F(5,58) = 3.17$ ,  $p < 0.05$ ; Pillai's trace = 0.10,  $partial \eta^2 = .10$ . When the results were considered separately, the only difference to reach significance, using a Bonferroni adjusted alpha of .025 was feelings of vulnerability,  $F(1,64) = 6.30$ ,  $p = 0.02$ ,  $partial \eta^2 = .10$ . An inspection of mean scores indicated that women ( $Mean = 2.66$ ,  $S.E. = 0.21$ ) reported slightly higher mean scores for feelings of vulnerability than men ( $Mean = 1.91$ ,  $S.E. = 0.21$ ).

A significant effect of age was also noted on the combined variables,  $F(5,58) = 3.33, p < 0.01$ ; Pillai's trace = 0.21,  $partial \eta^2 = .10$ . When the results were considered separately, the only difference to reach significance, using a Bonferroni adjusted alpha of .025 was avoidance,  $F(2,64) = 5.79, p < 0.005, partial \eta^2 = .17$ . Post-hoc tests revealed that younger driver's avoidance scores were significantly higher than middle-years drivers. Interestingly, although feelings of vulnerability did not achieve significance using an adjusted alpha,  $F(2,64) = 2.77, p = 0.07, partial \eta^2 = .09$ , post-hoc tests also revealed significant differences in reported scores for feelings of vulnerability between the youngest ( $Mean = 2.78, SE = 0.97$ ) and older ( $Mean = 1.97, SE = 0.31$ ) drivers.

In the second analysis, two dependent variables were used: avoidance and self-efficacy. There was a significant difference between age groups on the combined dependent variables,  $F(5,55) = 4.25, p < 0.01$ ; Pillai's trace = 0.27,  $partial \eta^2 = .13$ . When the results were considered separately, the only difference to reach significance, using a Bonferroni adjusted alpha of .025 was avoidance,  $F(2,61) = 6.21, p < 0.01, partial \eta^2 = .18$ . An inspection of mean scores indicated that younger drivers' avoidance scores were significantly higher than middle-years drivers. No effect of gender was noted,  $F(5,55) = 1.50, p = 2.32$ ; Pillai's trace = 0.05,  $partial \eta^2 = .05$ .

### **5.3.7. Effects of self-regulation on social and economic engagement**

Hypothesis 22 proposed that participants who reported high levels of self-regulation would allow their discomfort about driving to affect their level of social and economic engagement. Therefore, step-wise multiple regression modelling was conducted to determine whether self-regulation behaviours or feelings about driving could predict engagement. Planning and avoidance were entered at Step 1 and explained 55% of the variance in engagement. After entry of risk perception, feelings of vulnerability and self-efficacy at Step 2, the variance explained by the overall model was 66%,  $F(5,53) = 20.95, p < 0.001$ . In the final step of the equation, the only significant predictor of engagement was self-efficacy. Results are shown in Table 38.

**Table 38: Hierarchical multiple regression of avoidance, planning, risk perception, feelings of vulnerability and self-efficacy on engagement.**

Step	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
1	Avoidance	.71**	.55	.55	34.71**
	Planning	.14			
2	Avoidance	.21	.66	.11	20.95**
	Planning	.15			
	Risk perception	-.03			
	Feelings of vulnerability	.17			
	Self-efficacy	-.51**			

\*\**p*<0.01

## 5.4. Discussion

The aims of this study were: (1) to construct and undertake preliminary reliability and validity testing on a short self-report index designed to assess self-regulation behaviours in drivers across the lifespan, establishing a) internal consistency, b) construct validity and c) concurrent criterion validity using an objective simulated measure of driving behaviour. (2) to use the index to explore some of the complex relationships between self-regulation, perception of risk, feelings of vulnerability and self-efficacy (driving confidence/anxiety) and to determine the effects of those same variables on social and economic engagement.

### 5.4.1. Reliability and Validity

In terms of validation, the relatively small sample size failed to reach recommended numbers for factor analysis (e.g. Comrey & Lee, 1992; Everitt, 1975; Gorsuch, 1983; Guildford, 1954; Tabachnick & Fidell, 1996). Different authors have different views on the optimal numbers required for factor analysis with sample sizes ranging from approximately 100 upwards. For example, Gorsuch (1983) recommends at least 100 participants while Tabachnick and Fidell (1996) suggest that there should be at least 300 cases. However, Comrey and Lee (1992) urged researchers to collect data from over 500 participants wherever possible.

However, MacCallum *et al.*, (1999) argue that the minimum sample size for factor analysis depends on the 'strength' of the data and that strong data is data in which communalities are consistently high (in the order of 0.80 and above), factors exhibit high loadings on a substantial number of items (at least 3 or 4) and the number of factors is small. In effect, when the data is strong, the impact of sample size is reduced and in these instances, factor analysis may produce appropriate solutions (MacCallum *et al.*, 1999). In this study, the majority of items loaded onto the two factors (named as avoidance and planning) postulated *a priori* and exhibited high loadings ( $>0.5$ ) on more than 4 items. In addition, both factors achieved an acceptable level of reliability ( $r > 0.7$ : Kline, 1994), although only the planning factor achieved a communality above 0.8 (MacCallum *et al.*, 1999). While this small sample size ( $N = 62$ ) is not ideal in establishing validity, the strength of the data would suggest that a reasonable factor solution has been achieved.

Preliminary validation tests demonstrate that the self-regulation index is a valid instrument capable of discriminating between certain demographic and attitudinal groups. Given the strength of evidence that women consistently report higher levels of self-regulation, i.e. avoidance behaviours than men (e.g. Bauer *et al.*, 2003; Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Kostyniuk & Molnar, 2008; Siren & Hakamies-Blomqvist, 2005) it was unusual to find that there was no significant gender effect in this study. However, this is consistent with the other work reviewing wider self-regulation behaviours (Molnar *et al.*, 2009). While Hypothesis 15, that the index should be able to differentiate between men and women, cannot be entirely supported, there was some evidence of a trend in this direction. For example, in each age group, women consistently reported higher mean scores for avoidance than men. Further, the results of the age by gender ANOVA revealed that the effect of gender on avoidance was reasonably close to significance, in the anticipated direction, with a moderate effect size (Cohen, 1988). Although there did not appear to be any confounding variables which would influence the results, it may be that this group of women are somehow unusual. Participants were recruited to take part in a simulator study and perhaps women who self-select for an observed driving survey are more confident in their

driving ability. Certainly, some differences have been found in groups of people who participate in driving in driving studies. For example, Molnar and Eby (2008) noted that people who volunteer for driving studies do not have significant cognitive, motor or attention deficits while Blanchard *et al.*, (2010) suggested that older drivers who volunteer may be more confident than older drivers in general. Perhaps too, the women who took part in this driving simulator assessment were also more confident. As the raw data for a non-simulator group were not available, it was not possible to determine whether significant differences in confidence exist in simulator and non-simulator groups. However, this provides scope for future studies to investigate confidence differences and self-selection bias between simulator and non-simulator groups.

Hypothesis 16, that the instrument can differentiate between age groups is partially supported. Consistent with previous research (Gwyther & Holland, 2012), there was a quadratic effect of age on avoidance, such that younger and older drivers reported higher scores for avoidance than middle-years' participants. Further, correlation analyses demonstrated that planning behaviour increases with age, although this effect was not significant when the sample was divided by gender. This may perhaps be explained by an examination of the trends in planning which reveals a linear relationship between planning and age in women and a slight quadratic effect of age and planning in men, such that younger and older men plan more than middle-years men. The implication of this finding is that men and women choose different coping strategies at different ages to manage their driving anxieties.

Hypothesis 17 that the instrument should be able to differentiate between drivers who are anxious and those who are not, was partially supported. Previous studies have linked an anxious driving style with avoidance behaviours (Gwyther & Holland, 2012) and this was observed in the entire sample and in female drivers. The lack of a significant finding in men, may be partly due to the low numbers of anxious male drivers (N=2) in the study, or it may suggest that routine planning is part of the everyday behaviour of a male driver. Certainly evidence from the first reported study in Chapter 2 suggests that men are more likely than women to plan for emergencies.

In order to attempt to establish a form of criterion validity for the index, the self-report results were assessed against an objective measure of simulated driving behaviour. The simulator measures obtained included prevalence of risky behaviours and changes in driving speed during two challenging driving circumstances – driving in fog and driving through an emergency siren. In order to establish some form of concurrent validity, self-reported planning or avoidance behaviours should be related to actual driving behaviour, either risky manoeuvres (Hypothesis 18) or speed regulation (Hypothesis 19), through the two challenging scenarios. Contrary to Hypothesis 18, no significant correlations were noted between self-report, self-regulation data and observed risky driving behaviours, although the direction of relationship was in the anticipated direction, i.e. fewer risky behaviours were associated with increased avoidance/planning. However, an absence of risky driving behaviours was a significant predictor of avoidance behaviour in regression modelling. This finding is intuitive since drivers with high avoidance levels, would not wish to put themselves at risk by engaging in risky driving practices. This finding provides additional support for the validity of the self-regulation index.

When self-reported self-regulation data were correlated with observed self-regulation behaviours through the risky driving scenarios, significant negative relationships were found between self-reported planning and actual behaviour (mean speed and standard deviation) through the fog patch in men only. Prior warning was given of the fog patch and so perhaps this gave male drivers with a tendency to plan, an opportunity to enact prepared strategies to manage feelings of vulnerability, such as slowing down in bad weather conditions. The findings here provide some, albeit limited evidence of concurrent validity in the self-regulation index.

#### **5.4.2. Relationships between self-regulation, vulnerability and self-efficacy**

The findings of this study revealed that there are strong, significant relationships between perception of risk and the associated emotional response, i.e. feelings of vulnerability. Further, that these views and emotions are linked with low self-efficacy scores and significantly increase the adoption of self-

regulatory avoidance behaviours, particularly in women drivers. These findings partially support Hypotheses 20 and 21 and are consistent with previous findings relating to low self-efficacy and the adoption of avoidance behaviours (e.g. Baldock *et al.*, 2006; Charlton *et al.*, 2006; Stacey & Kendig, 1997). Interestingly, no significant associations were noted between feelings of vulnerability and planning behaviours, suggesting that although drivers feel at risk and vulnerable, they are unlikely to overcome those feelings by taking practical and positive action. In partial support of Hypothesis 22, avoidance behaviours were significantly correlated with engagement, such that as avoidance increased, engagement reduced. Self-efficacy was also the only independent predictor of engagement in multiple regression analysis suggesting that those with low self-efficacy in driving are most at risk of over-regulation and endangering their independent mobility. The fact that this index is capable of predicting such over-regulation means that it provides an extremely useful tool for determining which drivers are at risk of the negative effects of restrictive driving practices.

## **5.5. Limitations**

Although an objective on-road driving test represents the ideal criterion measure of validity for this study, there are financial, ethical and safety issues associated with such tests. While research suggests that using a simulator to assess driving behaviour is a useful tool, since it has the advantage of safety, cost and experimental control (Reed & Green, 1999), they cannot truly replicate the complexity of an on-road driving scenario. Whilst the absolute validity of the Aston University simulator has not been ethically assessed, other validation studies using the same STISIM technology have determined that similar trends in driving errors are made on the road and in the simulator. For example, Schechtman *et al.*, (2009) examined a variety of driving errors including speed regulation (e.g. ability to follow and maintain speed limits, travelling too fast/slow), in both an on-road test and in a simulator and determined that speed errors were committed more frequently on the road than in the simulator. This finding suggests the relative validity of the STISIM technology and indicates that the behavioural responses (errors) of drivers in this type of simulator are similar to those on the road.

## **5.6. Conclusions**

This study has established construct validity and internal consistency for the self-regulation index, suggesting that it is a reasonably reliable and valid tool to measure avoidance and planning behaviours in drivers across the lifespan. Although, the tool did not consistently discriminate between self-regulation behaviours in all age and gender groups and the results of the criterion validity assessments were somewhat limited, there is sufficient value in the tool to use it as a basis for a measure of self-regulation in further studies.

The findings also reveal that emotional responses to risk affect driver behaviour and choices relating to social and economic engagement, and provide further support for behavioural interventions designed to improve self-efficacy (i.e. confidence) in driving through the selection of appropriate coping strategies.

## CHAPTER SIX

## **6. Testing an intervention encouraging self-regulation in drivers**

This chapter reports the results of the second phase of the research, the design and evaluation of a theory based behavioural change package for drivers. Given the findings in the model building phase of the research (Chapters 2 to 5) that self-regulation behaviours held sufficient potential to be used as a basis for an intervention, an intervention based on the theory of planned behaviour (TPB: Ajzen 1991) was developed. A randomised controlled trial was used to evaluate the effectiveness of this extended TPB intervention incorporating action (Gollwitzer, 1993) and coping planning (Sniehotta, Schwarzer, Scholz & Schuz, 2005) in drivers across the lifespan. The intervention achieved moderate success with changes in affective attitude, normative beliefs and planning behaviours. Over 90% of participants reported that they had achieved their primary driving goal as a result of the intervention. The results suggest that wider self-regulation interventions (incorporating planning behaviours) could be successful in reducing over-regulation and extending safe mobility in drivers.

## 6.1. Introduction

Sustained driving in older age has implications for quality of life (Oxley & Whelan, 2008) and mental health (Fonda & Herzog, 2001a) including improved autonomy and independence (Yassuda *et al.*, 1997), greater social engagement (Marottoli *et al.*, 2000), reduced likelihood of significant depression (Marottoli *et al.*, 1997) and depressive symptoms (Fonda & Herzog, 2001a) and even in some cases, greater life expectancy (Marottoli *et al.*, 2000; Ragland, Satariano & MacLeod, 2005).

Studies have shown that despite the recognised importance of driving in maintaining health and engagement, many women give up driving prematurely or adopt self-imposed restrictive driving practices (Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005). Although feelings such as confidence (Kostyniuk & Molnar, 2008) and anxiety (Gwyther and Holland, 2012) have been implicated in decision making processes, the findings from the model building phase of this thesis suggest that feelings of vulnerability in the driving task are fundamental in decisions relating to driving avoidance, particularly in women drivers, indicating that emotional responses to risk have the capacity to constrain behaviour and affect lifestyle choices.

One potential method of addressing the mobility concerns of this sub-group of drivers is the development of an intervention to promote strategies which may lead to safe modifications in driving behaviour. To date, there have been a few campaigns aimed at reducing crash rates in older drivers but no interventions have been conducted to specifically address the problems of over-regulation.

The established campaigns to reduce crash rates in older drivers have generally provided refresher training, advice and instruction on risk reduction and legislation, e.g. the '55 Alive-Mature' driver refresher programme in the USA, the 'Wiser driver' programme in Australia and the 'KEYS' programme in USA. However, they have also promoted safer driving practices through the avoidance of challenging driving circumstances, i.e. traditional self-regulation behaviours.

Although evaluations of the various programmes have demonstrated some improvement in road knowledge (e.g. '55 Alive-Mature' Bedard *et al.*, 2005), driving skills and confidence (e.g. 'Wiser Driver' Strain, 2003), self-reported alertness and health awareness, specifically relating to visual impairments (e.g. '55 Alive-Mature' Nasvadi, 2007), less success has been noted in terms of reducing crash risk (Owsley *et al.*, 2004) through the adoption of self-regulatory avoidance practices. Further, no programme has demonstrated a change in self-regulation behaviour that was not avoidance related.

Nasvadi (2007) demonstrated, using a retrospective cohort design study of 367 '55 Alive-Mature' participants, that although 75% had changed some aspect of their driving practices after attending, only 9% of women and 4.2% of men said that they had increased their avoidance strategies as a result of the course. However, Owsley *et al.*, (2004) noted in an evaluation of the KEYS programme that drivers in their intervention group were more likely to adopt avoidance practices post- intervention than those in the control group. Although this is an interesting finding, the participants in this study (N=403) were recruited from an ophthalmology clinic and had either visual acuity deficits or slowed visual processing speed. Perhaps then, the relatively small changes in driving avoidance scores and subsequent significant differences between groups were related to a greater awareness of their visual deficit. Certainly, Holland and Rabbitt (1992) noted that some older drivers do not adequately compensate for age-related changes in vision when driving until they are made aware of their deficiencies.

The findings from these evaluation studies suggest that establishing safer driving practices through the adoption of avoidance behaviours has not been entirely successful. One reason for this may be that promoting driving avoidance fails to acknowledge an older driver's goals and motivations for driving (Hatakka *et al.*, 2002), i.e. to maintain day-to-day mobility and independence. Simply asking people to stop driving may be distressing (Coughlin *et al.*, 2004) and could lead to inappropriate restrictions. Over-regulation is not optimal in terms of a driver's health and quality of life, as it may result in some of the negative health and social effects associated with driving cessation (e.g. Oxley & Whelan, 2008). Therefore, it is unsurprising that campaigns report low level changes. Taking these findings into

consideration, the present intervention promotes changes in driving behaviour through the adoption of self-regulation practices, specifically those incorporating planning (see Chapter 5). Anticipated changes in behaviour using this intervention include better journey planning and preparation in order to increase aspects of driving, for example, the range of circumstances or type of journeys undertaken, rather than simply reducing driving further.

One final note regarding the described evaluation studies is that with the exception of the KEYS programme, the campaigns lack a sound theoretical basis and therefore the motivational factors for change are not easily identified or replicated. A theoretical basis provides a structured framework with which to give participants information and evaluate success (Kohler *et al.*, 1999). One of the best established and most influential social-cognition models (Ajzen, 2011; Godin *et al.*, 2005) is the theory of planned behaviour (TPB: Ajzen, 1991). The TPB model has been applied extensively to both health (e.g. exercise, dieting, binge drinking) and non-health related behaviours (e.g. travel choices and driving behaviour). The constructs provide a clear framework by which driving behaviour can be communicated to participants and evaluated (Kohler *et al.*, 1999). Meta-analytic reviews across a range of behaviours (Armitage & Conner, 2001; Cheung & Chan, 2000; Ravis & Sheeran, 2003; Schulze & Wittmann, 2003) provide empirical support for its capacity to predict a high proportion of the variance in behavioural intention. Further, it has been deemed as being superior to other health psychology models such as the Health Belief Model (HBM: Janz & Becker, 1984) and Protection Motivation Theory (PMT: Rogers, 1975) in terms of predictive power (Armitage & Conner, 2000). The TPB model also assumes a causal link between intention and actual behaviour. As such it is a useful theory on which to base interventions. For a review of the TPB model, please refer to Chapter 1.

According to the TPB an individual's decision about whether or not to perform a given behaviour is determined through behavioural intention which in turn is shaped via a combination of three variables – attitudes, subjective norms and perceived behavioural control (PBC). Attitudes, subjective norms and PBC are all functions of beliefs (behavioural, normative and control, respectively) and as such, the likely

consequence of the behaviour (belief strength) is weighted by an evaluation of the outcome of those beliefs (respectively outcome evaluation, motivation to comply and control belief power). Thus, according to the model, individuals are more motivated (i.e. have a stronger behavioural intention) to carry out a behaviour if they have a positive attitude towards that behaviour, they believe that significant others would want them to perform that behaviour (subjective norm) and they believe that they have the resources or capacity to carry it out (PBC). In addition, PBC has the capacity to independently influence behaviour where people perceive that they have sufficient control over the behaviour in question (Ajzen, 1991).

Developing effective interventions depends upon the identification of suitable psychological constructs for modification. Despite a growing literature on mobility in older age, driving cessation and self-regulation, recommendations for interventions targeting specific TPB constructs are not available. TPB studies conducted within the field of driving research have concentrated exclusively on risky driving behaviour, e.g. speeding. However, these studies have shown that TPB constructs including attitude, subjective norm and PBC, predict intention to perform the target driving behaviour (See Chapter 1 for more detail).

While, Ajzen (2002a) argues that the relative ability of TPB constructs to predict intention does not always provide a useful guide as to which construct should be the target of an intervention; and an intervention designed to safely extend driving mobility may ultimately rely on different constructs from those predicting risky driving behaviours, there is some benefit in examining the relationships between TPB constructs in studies of risky driving behaviours. The reviews of the selected studies in Chapter 1, demonstrate that attitude, subjective norm and PBC predict between 10% and 72% of the variance in intention to commit risky driving behaviours. However, in accordance with Ajzen (1991) it appears that the effect of the components varies across populations and behavioural domains. For example, PBC appears to be a strong predictor of drink-driving and speeding while attitude and subjective norms seem to be key predictors of mobile phone use. In light of these findings, it is difficult to offer a literature based

recommendation for a specific modifiable construct associated with self-regulation driving behaviour intentions.

However, findings from the model building phase of the present research suggest that affective attitudes (i.e. feelings of vulnerability) and self-efficacy (i.e. high anxiety, low confidence) are strongly associated with driving avoidance behaviours. Formative research by Gwyther and Holland (2012) reported that a negative affective attitude towards driving was a significant predictor of driving avoidance. They further suggested that feelings of vulnerability relating to anxiety and low confidence are associated with driving avoidance, particularly in female drivers across the lifespan. These findings suggest that attitudes and perceived behavioural control (specifically self-efficacy) may be implicated in women's choices about driving and therefore, a decision was made to target these constructs in the intervention.

Although attitude, subjective norm and PBC are described in the TPB model as single variables, authors (Conner & Armitage, 1998) have questioned the model's sufficiency and proposed that additional variables should be added to increase its predictive utility. One frequently mentioned factor is the absence of affect and emotion in the model. A number of researchers have highlighted the significance of affective attitudes on behaviour (Conner & Armitage, 1998; Van der Pligt & de Vries, 1998) and specifically on driving behaviour (e.g. Lawton *et al.*, 1997; Stead *et al.*, 2005; Stradling & Parker, 1996). Certainly, affective attitudes are of primary importance to this thesis since the work suggests that for women who over-regulate, affective appraisals may outweigh wider evaluations of the benefits and consequences of driving.

Ajzen (2011) argues that emotions have an indirect effect on intentions and behaviour by influencing underlying beliefs regarding attitudes (i.e. behavioural beliefs), subjective norms (i.e. normative beliefs') or perceptions of behavioural control (i.e. control beliefs'). However, other authors (Abraham & Sheeran, 2003; Conner *et al.*, 2003) argue that behaviour can be influenced by affect in a more direct fashion, for example through anticipated regret or anticipated affect, and that this is not sufficiently accounted for in

the TPB model. In a meta-analysis of 24 datasets, (Sandberg & Conner, 2008) found that the inclusion of anticipated affect accounted for an additional 7% of the variance in intentions and 1% in behaviour. Ajzen (2011) replied that expectations of regret or other positive or negative emotion are expressed through behavioural beliefs within the model and that the issue does not lie with the model *per se*, rather with the way that researchers draw out through elicitation studies, the instrumental consequences of a behaviour over the affective consequences. Ajzen (2011) concludes that instrumental and affective attitudes have a place within the model, can be considered subcomponents of the same construct and can usefully and independently predict intention. Therefore, attitudes towards driving should comprise an appraisal of the instrumental (e.g. beneficial/harmful) and affective (e.g. like/dislike) consequences of driving (Ajzen, 1991) and an evaluation of the consequences (e.g. greater convenience, flexibility, mobility and independence).

The 'risk as feelings' hypothesis (Loewenstein *et al.*, 2001) highlights the role of affect at the point of decision making and suggests that there may be a direct link between automatic decision making processes and behaviour. If this hypothesis is applied to the theory of planned behaviour, it suggests that affect may also have the capacity to independently influence behaviour.

Perceived behavioural control (PBC) is another target for this intervention and it too has subcomponents within the TPB model. Ajzen (1991) proposed that PBC consists of an individual's perception of the ease or difficulty of performing a behaviour but also suggested that it is compatible with Bandura's (1977) concept of self-efficacy. That is, the 'confidence in one's own ability to carry out a behaviour' (Armitage & Conner, 1999 p.75). Thus, PBC may be considered in terms of self-efficacy, or perceived ease/difficulty of the task performance. Given the findings in the formative research regarding the importance of self-efficacy in determining driving avoidance behaviours, the dual components of PBC are considered here.

The TPB provides a structured and explicit causal framework for behaviour change, which suggests that underlying salient beliefs (i.e. those which are readily accessible in memory) determine an individual's intention to change (Ajzen, 1991, 2002a). According to Ajzen (2002a), to change behaviour, we must change beliefs. Changes in underlying beliefs regarding attitudes (i.e. behavioural beliefs), subjective norms (i.e. normative beliefs') or perceptions of behavioural control (i.e. control beliefs') should in turn produce changes in behavioural intention. In order to change beliefs, Ajzen (2002a) suggests that accessible beliefs are changed by altering belief strength or outcome evaluation, or by introducing a new belief. In terms of driving behaviour, examples might include persuading an anxious driver that their crash risk is lower than they envisage (changing belief strength), or that while avoiding driving may reduce crash risk, it also has implications for mental health and social engagement (changing outcome evaluation). The relative effectiveness of each of these options in terms of changing beliefs has not been proven (Ajzen, 2002a). Further, Ajzen (2002a) makes no comment on which might be the most appropriate method for altering beliefs. This presents an obstacle for TPB research since limited guidance is available on how to use the model to change beliefs (Norman & Conner, 2005). Further, since only a limited number of studies have used the TPB to develop a behavioural change intervention through specifically targeted TPB constructs (Darker, French, Eves & Sniehotta, 2010) there is little precedent for the present study to follow.

In their systematic review of 30 papers describing 24 health intervention studies, Hardeman *et al.*, (2002) identified 12 studies that used the TPB to develop a behaviour change intervention. Of these, seven were found to change self-reported behaviour but only two (Beale & Manstead, 1991; Bowen, 1996) used mediation analysis to establish whether the effects of the intervention on behaviour were mediated by TPB constructs. Beale and Manstead (1991) reported that targeting a specific behavioural belief resulted in a change of attitude which correlated with a change in mothers' intention not to give their infants sugary drinks or foods between meals. Bowen (1996) found that change in condom use was mediated by intention and PBC measured at baseline. Since Hardeman *et al.*, 's (2002) review, two further studies

(Chatzisarantis & Hagger, 2005; Darker *et al.*, 2010) have examined whether the TPB constructs mediate the effects of interventions on behaviour. Chatzisarantis and Hagger, (2005) developed two persuasive communications to promote physical activity in young people (N=83), one targeting salient behavioural beliefs and the other targeting non-salient behavioural beliefs. Path analysis revealed that the effects of the persuasive communications on intentions were mediated by attitudes but not by PBC or subjective norms. While Darker *et al.*, (2010) in an intervention study (N=130) comprising three strategies (action planning, coping planning and facilitative planning) to promoting walking amongst the general population increased PBC, intentions and objectively measured behaviour - minutes spent walking (using a pedometer) from 20 to 32 minutes per day. The effects of the intervention on intentions and behaviour were mediated by PBC but not by control beliefs. The findings from mediation analyses in the present study will therefore add to the literature on the causal relationships between TPB constructs.

Within their systematic review, Hardeman *et al.*, (2002) identified that the most common methods of promoting behaviour change involved the provision of information, persuasive messages, goal setting, skill rehearsal, modelling, planning/implementation and social encouragement/support. However, due to a lack of specificity in research methods, they were unable to determine which interventions were most effective in altering targeted TPB constructs, intentions and behaviour.

Previous (non-theory based) education campaigns in older drivers have also focused on the provision of information and risk advice. However, evaluation studies (e.g. Bedard *et al.*, 2005; Nasvadi, 2007; Owsley *et al.*, 2004) suggest that while they are effective in increasing awareness and knowledge, they have only limited success in changing driving practices.

Two interventions relevant to the driving field have been moderately successful. A longitudinal, mass media advertising campaign shaped by the TPB constructs to reduce the incidence of speeding in Scotland (Stead *et al.*, 2005) reported that an advertisement designed to challenge attitudes towards speeding did influence affective beliefs about speeding but counterpart adverts designed to alter

subjective norms and PBC were less successful. Further, the intervention showed no changes in behavioural intention or reported behaviour. One limitation of this study was that the adverts were not based on specific belief components from the target population (men aged between 22 and 44 years). Rather, salient beliefs were identified through literature review and mixed gender focus groups of participants aged 18 to 44 years.

Similarly, a video-based intervention in a laboratory setting (N ranged between 41 and 50) using four short films designed to target beliefs about speeding (Parker, Stradling & Manstead, 1996) resulted in anticipated changes in normative beliefs but changes in a contrary direction in control beliefs. Again, no changes were found for behavioural beliefs or intention.

In the absence of proven, face-to-face targeted intervention techniques, a commonly used extension to the TPB model incorporating planning behaviours is proposed for this study. This extension has been successful in promoting walking behaviour (Darker *et al.*, 2010) and health behaviour compliance and involves the formation of implementation intentions, i.e. specific plans about when, where and how the behaviour in question is to be performed (Gollwitzer, 1993). One of the criticisms of the TPB is that while it often explains a high proportion of the variance in intentions, it is a weaker predictor of actual behaviour (Ajzen, 2011). This means that despite holding positive intentions, people may not go on to perform the desired behaviour (Armitage & Conner, 2001; Sheeran, 2005), the so called ‘intention-behaviour gap’.

The reasons people fail to translate goal intentions into goal attainment are varied but broadly can be categorised into two areas – ‘failing to get started’, i.e. forgetting to act, failing to seize an opportune moment to act or having second thoughts at the critical moment and ‘becoming derailed’, i.e. becoming distracted by enticing stimuli, falling prey to bad habits and becoming overwhelmed by negative self-states such as distress (Gollwitzer & Sheeran, 2006; Gollwitzer, Parks-Stamm, Jaudas & Sheeran, 2008).

This suggests a need for an additional step in the model to enable the translation of intentions into actions. Thus, Gollwitzer's (1993) model distinguishes between the motivational and volitional stages of behavioural enactment. Whereas the TPB model describes how an individual forms an intention, i.e. decides to perform a behaviour, Gollwitzer (1993) describes an additional volitional stage, whereby the individual forms specific plans to achieve that behaviour, e.g. where, when, how and with whom to act (i.e. action planning). It is considered that the formation of implementation intentions strengthens the intention-behaviour relationship by linking the desired behaviour to a specific environmental cue (i.e. if situation X is encountered then I will perform behaviour Y) which in turn means that initiation of the behaviour is delegated and becomes an automatic response (Gollwitzer, Bayer & McCulloch, 2005) to the cue rather than requiring a conscious intent (Gollwitzer, Bayer and McCulloch, 2005). Figure 4 shows an adapted and extended version of the TPB model (Ajzen, 1991) incorporating the hypothesised additional automated stage of behaviour initiation as well as the previously suggested independent effect of affective attitudes on behaviour.



**Figure 4: Adapted and extended TPB model incorporating a direct effect of affect on behaviour and automated volitional stage of behaviour initiation (after Ajzen, 1991).**

Simple planning interventions such as these have been shown to be effective across a range of health behaviours, e.g. attendance at cervical screening (Sheeran & Orbell, 2000), exercise habits (Ziegelmann, Luszczynska, Lippke & Schwarzer, 2007), reductions in alcohol consumption (Murgraff, Abraham & McDermott, 2007) and increases in fruit and vegetable consumption (Armitage, 2007; Gratton, Povey & Clark-Carter, 2007; Kellar & Abraham, 2005). Indeed, a meta-analysis of 94 studies by Gollwitzer & Sheeran (2006) revealed that implementation intention formation had a medium to large effect ( $d=.65$ ) on goal attainment. This is in addition to goal implementation facilitated by goal intention alone (Webb & Sheeran, 2006).

Other planning behaviours may also facilitate behaviour change. In their taxonomy of behavioural intervention techniques, Abraham and Michie (2008) describe action planning along with barrier identification (coping planning). Sniehotta *et al.*, (2005) also differentiate between action planning and coping planning with coping planning referring to the practice of identifying situations in which the target behaviour would be difficult (i.e. barriers to goal attainment) and anticipating how to overcome those barriers (i.e. inhibiting distractions). In their study of cardiac rehabilitation patients, Sniehotta *et al.*, (2005) found that while action planning was influential early in the rehabilitation process, participants who formed coping plans demonstrated the highest level of increase in exercise and leisure time activities two months after discharge. The authors describe that coping planning is specific to an individual and grounded in their personal experience since only that individual will understand the likely obstacles to their achieving the desired behaviour.

Given the paucity of evidence relating to the effectiveness of behavioural change techniques on specific TPB constructs, the present intervention was designed to promote self-regulation in its wider sense as a means of planning and preparing carefully for challenging driving circumstances. The targeted TPB constructs determined during the formative model building research were attitudes, specifically affective attitudes and perceived behavioural control. Given the success of one previous intervention method (Darker *et al.*, 2010) on changing PBC, the intervention was based on the TPB constructs and extended to

incorporate the post-intentional, volitional processes of goal setting, including action planning and coping planning with an agreed behavioural contract designed to provide a written record of the participants resolution to change (Abraham & Michie, 2008).

**Aim:** Although the ultimate benefit of this work would be to reduce premature driving cessation and over-regulation in drivers, the aim of the present study was to determine whether established driving behaviours could be positively influenced by an ‘extended’ TPB intervention designed to change attitudes and improve PBC through the adoption of self-regulation planning behaviours. The study also explores the causal nature of the TPB model in self-regulation. In accordance with Ajzen (1991), the following hypotheses were tested:

- 23:** That the intervention will result in an increase in behavioural beliefs towards self-regulation.
- 24:** That the intervention will result in an increase in control beliefs towards self-regulation.
- 25:** That the intervention will result in an increase in positive attitudes towards self-regulation.
- 26:** That the intervention will result in an increase in perceived behavioural control.
- 27:** That the intervention will result in an increase in intention to self-regulate, mediated by the TPB constructs (attitude, subjective norm, PBC).
- 28:** That the intervention will lead to a change in self-regulation behaviours (as measured using the self-regulation index – SRI, see Chapter 5) mediated by a change in intention or in PBC.

## **6.2. Methods**

### **6.2.1. Participants**

The sample (N=81) consisted of 53 women (65.4%) and 28 men (43.6%), aged between 18 and 83 years ( $M = 46.40$  years,  $S.D. = 20.58$ ). Participants' duration of driving experience ranged from 3 months to 66 years ( $M = 26.26$  years,  $S.D. = 19.03$ ). Participants drove between 0 and 35,000 miles per year ( $M = 7335.94$  miles,  $S.D. = 6552.60$ ) and reported that they spent on average 7.56 hours ( $S.D. = 6.16$ ) in the car per week. The majority of participants were married or in a civil partnership (60.5%), around a quarter of participants (25.9%) were single, some lived with their partner (9.9%) and the remainder reported their relationship status as divorced (1.2%), separated (1.2%) or widowed (1.2%).

Some participants were sourced from the Aston University staff and student population. Participants from the wider community were sourced through advertising on social networking sites and via social clubs. Older participants were specifically targeted through the Aston Research Centre for Healthy Ageing (ARCHA) programme and local social clubs. The only pre-determined criteria for inclusion were that participants had to be over 17 years of age, hold a full driving licence, be practising drivers and have access to a car within the next month. Participants received a payment of £7.50 when they had completed the pre- and post-intervention questionnaires.

### **6.2.2. Design**

The study used a randomised controlled trial procedure. In order to increase the representativeness of the sample (Shaughnessy, Zechmeister & Zeichmeister, 2009) and ensure that the control and intervention groups both contained drivers across the lifespan, a stratified sampling procedure was employed. Participants were stratified by age into three groups – younger drivers, aged 17 to 25, middle-years' drivers, aged 26 to 64 years and older drivers, aged over 65 years. Forty participants were recruited to each stratum. After Aston University ethics committee approval and informed consent were obtained,

participants were randomly allocated to one of two conditions – the control or intervention group - using a random numbers generator.

Prior to data collection, *a priori* power analyses were conducted to determine the necessary sample size. Power calculations indicated that the necessary sample size for 80% power to detect a moderate-large effect was 38 participants per group (Soper, 2006). To address driving behaviours across the lifespan, relatively equal numbers of drivers across the three age groups (young, middle-years and older) were required. To account for attrition, extra participants were recruited to the study. Although 120 participants were recruited (60 to each condition), 8 participants chose not to take part after they had been allocated to the intervention condition and 31 failed to return all necessary information, despite a follow up contact (email, letter or telephone call) to all participants. Therefore the final sample (N=81) reflected a 67.5% response rate. Of these 35 participants were allocated to the control condition and 46 were in the intervention condition.

### **6.2.3. Procedure**

In order to provide social support and generate discussion, participants were invited in groups to Aston University to take part in the study. Group sizes varied between 4 and 7 participants. All interventions took place in a laboratory setting. Participants were issued with a unique reference number to ensure anonymity as well as pre- and post-intervention data matching. All participants received one face-to-face session.

#### **6.2.3.1. Control Group**

Participants received an information pack containing Questionnaire A, Questionnaire B, a copy of the ‘DriveSafe’ handy pack (See Appendix C) and a short review questionnaire for the DriveSafe book. They were asked to complete the baseline (Time 1) questionnaire (Questionnaire A) before the filler task. The same questionnaire (renamed Questionnaire B) was used as the post-intervention measure (Time 2). The

questionnaire assessed self-reported, self-regulation behaviour and contained a full TPB questionnaire (see Appendix B). Next they were asked to complete a filler task which took a similar length of time to the intervention group's task. This consisted of briefly reviewing the 'DriveSafe' book and completing a short questionnaire (8 items) eliciting their views on the general layout, design and attractiveness of the book. The session took approximately one hour to complete.

### **6.2.3.2. Intervention Group**

Participants in the intervention condition received the same information pack incorporating Questionnaire A, Questionnaire B, a copy of the 'DriveSafe' handy pack (See Appendix C) and a short review questionnaire for the DriveSafe book. They were asked to complete the baseline (Time 1) questionnaire (Questionnaire A) before the intervention. Participants in this group also received the motivational and volitional components of the intervention.

#### **6.2.3.2.1. Intervention Components**

In the absence of evidence relating to the effectiveness of specific behavioural change techniques on specific TPB constructs, the intervention was designed to assist participants to change their behaviour using a variety of techniques (for a review see Abraham & Michie, 2008). The principal components included prompting specific goal setting with action planning and barrier identification (coping planning). Goal setting was carried out using an agreed behavioural contract. Participants were guided to develop behavioural change plans using the following process.

1. To change attitudes, participants were provided with persuasive information about the links between driving cessation/over-regulation and health effects such as loss of mobility and depression. The facilitator then prompted goal setting by asking them whether they would like to set a general goal to change their driving behaviour when driving in challenging circumstances through a short series of goal setting and action planning tasks. At this stage, participants were

not required to define how they would achieve that goal. Goal theories suggest that participants with some choice over their goal will be more successful in achieving their target (Gollwitzer, 1993) and therefore, participants were given complete freedom to choose which area of their driving behaviour they intended to change. However, examples were given to participants with an emphasis on self-regulation planning behaviours, e.g. route planning, planning to drive with a co-pilot, planning breaks on a long journey, planning strategies to manage road rage incidents etc.

2. Next, participants took part in an exercise to improve feelings of control over driving and increase self-efficacy (i.e. PBC) using what has generally been proposed as the strongest method - mastery experience (Bandura, 1997). This motivational phase focused on prior instances of successful driving in difficult or challenging circumstances. Participants were asked to describe a situation where they had successfully driven in difficult circumstances, e.g. in unfamiliar towns, on busy roads, on motorways, at rush hour or at night (see Appendix B). They were then asked which factors were most important in contributing to their success, e.g. route planning, driving slowly, taking regular breaks, etc and to note them down.
3. Using this information, participants were then asked to set a maximum of three conditional goals relating to changing their self-regulation planning behaviours, e.g. 'I will plan my journey on the motorway next week to include at least one 15 minute break every 2 hours' or 'I will use a route finder programme on the internet and plan my route carefully'.
4. Participants were next asked to develop their action plans, i.e. specify when, where, how and with whom they would act (Gollwitzer, 1997; Gollwitzer and Sheeran, 2006). Thus, the action plan required participants to report their goal with specific intentions, i.e. the frequency with which they would undertake the behaviour (e.g. once a week), where they would undertake their behaviour (e.g. on the motorway) and the duration of the behaviour. Duration tended to be reported in terms of distance travelled (e.g. between two junctions of the motorway) rather than a specific time period. Further, participants were asked to report whether they would involve someone else in their plan for social support, e.g. a trusted passenger.

5. Next, participants were asked to develop their coping plans (Sniehotta, 2009; Sniehotta *et al.*, 2005) by identifying potential barriers to behaviour change and anticipating ways of overcoming them so that they could still achieve their goal. For example, a participant might report that their goal was to drive on the motorway. However, they might identify that they would be unlikely to drive alone on the motorway in bad weather. The coping plan might therefore entail travelling with a trusted passenger or waiting for the weather to improve before travelling.
6. To promote social comparison and group interaction, participants were encouraged to discuss and clarify their goals and action plans with the facilitator and each other.
7. Finally, participants were asked to agree their behavioural contract by signing their personal action plans in front of the group and facilitator and committing to change their driving on at least one occasion in the next month.

#### **6.2.3.2.2. Post-intervention measure**

The post-intervention measure was taken one calendar month after the intervention/filler task. All participants completed the same questionnaire taken at Time 1 - Questionnaire A which was renamed Questionnaire B. Participants retained all information until the end of the study when questionnaires were returned to the researcher in pre-paid, addressed envelopes. Both intervention and control participants could choose to complete the post-intervention/filler task questionnaire (B) on line, after 4 weeks, if they preferred using their unique reference number. Participants in the intervention condition also answered an additional set of questions to monitor the extent to which they had achieved their goals (Ajzen, 2002a).

## **6.2.4. Materials**

### **6.2.4.1. Questionnaire**

The questionnaire comprised four sections – demographic information, the engagement scale (described in Chapter 5), the self-regulation index (SRI, described in Chapter 5) and a newly constructed TPB questionnaire designed to measure intention to self-regulate.

The first section included demographic information (age, gender, relationship status), driving experience (length of time an individual had been in possession of a full driving licence), driving patterns (annual mileage and hours spent driving per week), driver status (whether participants were the main or only driver in the household, whether they drove regularly or alone) and whether participants believed that they were a confident (yes/no) or an anxious driver (yes/no). The second section consisted of the seven item risk, vulnerability and engagement scale described in Chapter 5 (Cronbach's  $\alpha= 0.89$ ). The third section assessed self-regulation behaviours using the self-regulation index (SRI) also described in Chapter 5. This consisted of nine items measuring planning behaviours (Cronbach's  $\alpha=0.76$ ) and six items focused on avoidance (Cronbach's  $\alpha= 0.75$ ). The SRI was used as a dependent variable in some analyses as a self-report measure of self-regulation behaviour. The final section consisted of a newly constructed TPB questionnaire designed to measure intention to self-regulate, i.e. drive a car in challenging circumstances.

### **6.2.4.2. TPB Questionnaire**

The target behaviour was self-regulation. The TPB questionnaire (see Appendix B) was modelled on the recommendations of (Ajzen, 1991, 2002a) and Francis *et al.*, (2004). It consisted of 35 items. The questionnaire included direct measures of attitude, subjective norm and perceived behavioural control as well as belief based measures including behavioural beliefs, normative beliefs and control beliefs. All appropriate measures included a context and timeframe (Ajzen, 1991), for example, measures were

constructed with reference to driving in challenging circumstances, e.g. in unfamiliar towns, on busy roads, at rush hour, at night, in the previous/forthcoming year. The number of items relating to each TPB construct and results of internal consistency analysis using Cronbach's alpha are shown in Table 39, along with an example item for each construct.

Intention and past behaviour were both measured using a single variable. However, self-reported self-regulation behaviour was also assessed using the SRI (described in Chapter 5) at Times 1 and 2. Direct measures of attitudes were taken using mixed, i.e. instrumental (e.g. useful/worthless) and affective (pleasant/unpleasant) bipolar adjectives (Francis *et al.*, 2004). Given the findings in Chapter 3 that affective attitude was an important predictor of self-regulation behaviour, additional measures of attitudinal subcomponents, i.e. affective and instrumental attitude were also taken. Attitudinal items demonstrated an appropriate level of internal consistency,  $\alpha > 0.7$  (Kline, 1994).

Subjective norm was measured using two items. The reliability for this factor was below the recommended level of reliability  $\alpha > 0.7$  (Kline, 1994) and given that this scale consisted of only two items, the alpha could not be improved by removing items from the scale. Cortina (1993) suggests that the "acceptability" of alpha levels is treated with caution. Given that alpha is a function of the number of test items, the coefficient can be increased by augmenting the number of items in the scale. Therefore Cortina (1993) suggests that alpha scores pertaining to scales with few items (<12) should not be judged as harshly as those containing higher numbers of items. Since subjective norm was not a critical component in the intervention, the low alpha was noted and it was determined that future versions of the questionnaire should incorporate additional direct measures of subjective norm.

PBC was measured using 2 items. The first measured self-efficacy while the second measured perceived ease/difficulty. Trafimow *et al.*, (2002) suggests that PBC is a multidimensional construct composed of 'perceived difficulty', i.e. how easy or difficult a behaviour is to perform and 'perceived control', i.e. the extent to which the behaviour is under voluntary control and therefore an additional item measuring

perceived control was included in the questionnaire. However, a correlation analyses of the three PBC subcomponents revealed that while self-efficacy and perceived ease/difficulty were strongly, positively correlated at the 0.01 significance level ( $p=0.55$ ), the control item was not associated with the other subcomponents ( $p=.01$ ) and therefore it was excluded from further analysis. Internal consistency analysis of the remaining two items demonstrated an acceptable level of reliability (Kline, 1994).

**Table 39: Construction of the TPB questionnaire measuring self-regulation**

Factor	Items	Alpha	Scale	Item example
Intention	1	-	1-7	I intend to drive a car in challenging circumstances regularly in the forthcoming year.
Past behaviour	1	-	1-7	In the course of the last year, how often have you driven a car in challenging circumstances?
<i>Direct measures</i>				
Attitude	8	0.76	1-7	For me to drive a car in challenging circumstances is...foolish/wise
Affective Attitude	3	0.72	1-7	I am apprehensive about driving a car in challenging circumstances ....
Instrumental Attitude	3	0.87	1-7	Being able to drive a car under challenging circumstances..... is important to me.
Subjective norm	2	0.47	1-7	Most people who are important to me think I should drive in challenging circumstances...
PBC (self-efficacy/ease)	2	0.71	1-7	
PBC (self-efficacy)	1	-	1-7	I am confident that I could drive in challenging circumstances...if I wanted to.
PBC (ease)	1	-	1-7	For me to drive in challenging circumstances is ...easy/difficult
PBC(controllability)	1	-	1-7	I have control over whether I drive in challenging circumstances...
<i>Indirect measures</i>				
Behavioural beliefs	3	0.51	1-7	Driving a car under challenging circumstances... makes things more convenient for me.
Outcome evaluations	3	0.39	1-7	Having convenience is...extremely desirable/extremely undesirable
Normative beliefs	1	-	1-7	My family, friends or work colleagues approve of my driving in challenging circumstances...
Motivation to comply	1	-	1-7	My family, friends or work colleagues approval is important to me.
Control belief strength	3	0.64	1-7	Journey planning is important when driving in challenging circumstances...
Control belief power	3	0.78	1-7	I would be more likely to drive in challenging circumstances...if I had carefully planned my journey.

Consistent with Ajzen (2002a) all direct measure items were measured using seven-point scales. In order to alleviate response bias (Anastasia & Urbina, 1997) scale end-points were mixed between positive and negative endpoints. Authors (Francis *et al.*, 2004) suggest that items should be re-coded during analysis to have positively worded endpoints on the right so that higher numbers always reflect a positive attitude to target behaviour. Although this was done, the re-coding results in high scores reflecting a positive attitude toward driving in challenging circumstances, which may be counter-intuitive to those who think of self-regulation in driving avoidance terms. The aim of this research is to facilitate safe mobility and sensible self-regulation in drivers. Therefore, a positive evaluation of self-regulation (i.e. complete driving independence) is appropriate since the intention to drive in all circumstances is likely to improve drivers' mobility and engagement. An index of each direct TPB construct was calculated and the mean score determined to give the scale score.

Belief based measures, i.e. behavioural, normative and control beliefs are normally developed from pilot research which often takes the form of a single qualitative, elicitation study (Ajzen, 2002a; Francis *et al.*, 2004). In this research, the measures were not generated through a single formal elicitation study. Rather, behavioural beliefs and outcome evaluations were based on views about risk perception and feelings of vulnerability obtained throughout the model building phase of this thesis. Normative beliefs and information on referent groups (e.g. family, friends and work colleagues) were obtained from the formative research (focus groups) described in Chapter 4. While control beliefs were associated with the self-regulation planning behaviours described in Chapter 5.

For the belief based measures, composite scale scores were obtained by multiplying the respective belief, i.e. behavioural/normative/control with their counterpart, i.e. outcome evaluations/motivation to comply/control belief power and summing the results across the relevant factor items. Ajzen (2002a, 2010) suggests that in order to achieve the optimal scaling for indirect measures, seven point belief scales such as belief strength and outcome evaluation can be scored in either a unipolar (i.e. range from 1 to 7) or bipolar (i.e. range from -3 to +3) manner. The choice of scale can affect the correlation between the

belief composite and its counterpart direct measure. At present there is no theory based method to determine the most appropriate and optimal scaling method. Ajzen (2010) suggests that the scaling scheme that produces the best results is adopted while Francis *et al.*, (2004) proposes a combined scaling method which enables the relative contribution of each belief to be estimated relative to the size of other beliefs. In order to achieve the optimal scaling in this study, three alternatives were tested in preliminary analyses. Firstly unipolar scales (1-7), secondly bipolar scales (-3 to +3) and finally a combined scale was tested. The strongest correlations between variables were found using the unipolar scales and therefore, this scheme was adopted and used for analyses.

As participants can hold both positive, negative or ambivalent evaluations about specific behaviours, the belief based measures do not necessarily need to be highly reliable, i.e. have high internal consistency (Ajzen, 2010). Although Cronbach's alphas are reported for consistency in Table 39, the moderate values are not of concern.

#### **6.2.4.3. Post-intervention measure**

The post-intervention measure (Ajzen, 2002) consisted of two questions. The first asked participants to write their goal down in a free text box and the second asked them to what extent they had achieved their goal. Participants responded to the question 'I have achieved my goal' on a five point scale from 'not at all' to 'completely'. The questions were repeated for each of the three potential goals.

#### **6.2.4.4. DriveSafe Handypack**

Participants were given a copy of the 'DriveSafe Handypack' (See Appendix C). This is a printed book designed to offer motorists practical advice on driving. The book aims to:

- Raise actual risk awareness by publishing statistics relating to crash and incident rates, e.g. p1, 'Almost 10% of all fatal and serious road accidents happen on slippery roads due to the weather'.

- Provide vicarious ‘real’ examples of appropriate planning self-regulation, e.g. p14 ‘*I planned the whole day giving myself an extra hour*’.
- Encourage perceived control over driving behaviour, e.g. p2 ‘Remember, you are free to choose the time you set off and how fast you go!’

#### **6.2.4.4.1. Statement of Collaboration**

The DriveSafe Handypack was initially authored by Fay Goodman and Mark Wolski in 2004. During the duration of this present research under an ESRC CASE PhD studentship, the book was edited and revised to a) incorporate evidence for the general statements made and b) include unique research findings from the present research. Copyright for this book rests with the original author Fay Goodman.

#### **6.2.4.4.2. Views on the DriveSafe Handypack**

Of those who reviewed the book (N=65), 95.4% believed that it was easy to understand and clear, 76.2% thought that it was attractive, 89.2% believed that it was helpful and 86% said that it would be useful to them.

#### **6.2.5. Ethical Considerations**

Under no circumstances were people being encouraged to drive in circumstances beyond their capabilities. They were not encouraged to take risks. Instead, they were asked to plan and prepare more carefully for the driving that they would normally undertake with the aim that they would improve their driving confidence and safety. The aim was that with additional planning and preparation, participants would safely extend the range of circumstances and places that they were confident to drive in. During each session, the facilitator emphasised that all of the plans were for the participants own benefit and that individuals should not drive in circumstances beyond their personal confidence and competence level.

### 6.2.6. Analysis

All data were coded and entered for statistical analyses using the IBM SPSS Statistics version 19. Preliminary analyses were conducted by age and gender to determine whether randomisation had been successful. Descriptive analyses were performed on demographic information and goal achievement data. A series of t-tests, chi-square tests for independence and ANOVAs were conducted on a variety of demographic factors including age and gender. Analyses then focused on two areas. Firstly, the utility and efficiency of the TPB model to predict intention and self-reported, self-regulation behaviour was tested. The significance of the associations between TPB constructs and intention, and TPB and self-reported behaviour were explored using bivariate correlations. Scores for avoidance and planning behaviours from the SRI (Chapter 5) were used as dependent variables. These were carried out separately for men and women to determine any gender specific effects in relationships. Hierarchical multiple regression modelling was used to determine the best predictors of intention and behaviour across the sample, by gender and finally by age in female drivers.

Next, to test Hypotheses 22-26, analyses were conducted to compare those that received the intervention with those participants in the control group. A series of 2 x 2 repeated measures ANOVAs were performed on the direct measures (attitudes, subjective norm and PBC), intention and self-regulation behaviour (planning and avoidance). Time (pre- or post-intervention) was the repeated measures factor and experimental condition (intervention versus control) was the between subject factor. Partial  $\eta^2$  was used to calculate effect size. An ANCOVA was used to examine the effect of the intervention on participant engagement, measured using the engagement scale described in Chapter 5.

To examine Hypotheses 27 and 28, mediation analyses were conducted to test the causal relationships derived from Ajzen (1991) using an SPSS macro for the bootstrapped sampling distribution model (Preacher & Hayes, 2008). Bootstrapping is a nonparametric re-sampling procedure with replacement which is done many times, i.e. 1000 times. From each of these samples, the indirect effect of variables is

computed and a sampling distribution generated. Using the distribution, a confidence interval can be calculated. Assuming that the interval does not cross zero, it can be concluded that there is a significant effect of mediation, i.e. the direct effect is different from zero. Bootstrapping has been widely advocated as a more accurate method of assessing the indirect effects of variables. It overcomes some of the limitations associated with Baron & Kenny's (1986) four-steps method, i.e. low power to detect mediated effects especially in the case of complete mediation (MacKinnon *et al.*, 2007; Preacher & Hayes, 2004; Shrout & Bolger, 2002). Further, bootstrapping does not impose assumptions of normality on the data (Shrout & Bolger, 2002). Mediation analyses of the effects of attitude, subjective norm and PBC on intention were conducted on the TPB measures taken at end of Time 1. The effects of intention, attitudes, subjective norm, PBC and action planning were conducted on SRI scores at the end of Time 2 in the intervention group.

Finally, an analysis of self-reported goal achievement was undertaken. Multiple regression modelling was used to determine the best TPB construct predictors of goal achievement across the sample.

## **6.3. Results**

### **6.3.1. Preliminary Analyses - Randomisation of Groups**

In order to establish whether randomisation had been successful and to establish whether there were any differences between the samples which would confound the results, preliminary analyses were conducted by age, gender, TPB constructs (intention, attitude, subjective norm, PBC, behavioural beliefs, normative beliefs and control beliefs) and measures of self-reported self-regulation behaviour using the SRI (see Chapter 5).

A Chi-square test for independence (with Yates Continuity Correction) indicated that there were no significant differences between the samples in terms of gender,  $\chi^2 = (1, n = 81) = 0.44, p = 0.51, \phi = .1$ .

The control group (N=35) ranged in age from 20-77 years ( $M= 48.06, SD= 18.63$ ). The experimental group (N=46) ranged in age from 18 - 83 years ( $M = 45.15, SD = 22.16$ ). An independent t-test was carried out to establish whether there were significant differences between the samples in terms of age profile. A comparison of ages did not reveal any significant differences between groups,  $t(79) = 0.63, p=0.53$ .

Independent t tests were carried out to determine whether there were any significant differences between the two groups in terms of TPB constructs. No significant differences were noted. Results are reported in Table 40.

**Table 40: TPB Constructs by experimental group at Time 1.**

Item	<i>t</i>	<i>df</i>	<i>p</i>	Control		Intervention	
				<i>Mean</i>	<i>S.D.</i>	<i>Mean</i>	<i>S.D.</i>
Intention	-0.57	79	0.57	4.80	2.15	5.06	2.04
<i>Direct measures</i>							
Attitude	-0.64	75	0.52	4.16	0.77	4.28	0.79
Subjective norm <sup>1</sup>	-0.24	79	0.81	4.49	1.27	4.57	1.62
PBC	0.68	79	0.49	4.96	1.38	4.75	1.32
<i>Indirect measures</i>							
Behavioural beliefs	0.19	79	0.85	23.90	7.09	23.55	9.03
Normative beliefs	1.29	78	0.20	16.08	10.93	13.00	10.36
Control beliefs	-0.39	78	0.70	55.08	15.44	56.44	15.58

*Note: Control N ranges from 32-35, Intervention N ranges from 45-46. <sup>1</sup>Given the low internal consistency on the subjective norm factor, independent t tests were also conducted separately for the two subjective norm items. No significant differences were found between groups.*

Similarly, independent t tests were carried out to determine whether there were any significant differences between the two groups in terms of responses to questions on the SRI. No significant differences were noted. Results are reported in Table 41.

**Table 41: SRI Constructs by experimental group at Time 1.**

Item	<i>t</i>	<i>df</i>	<i>p</i>	Control		Intervention	
				<i>Mean</i>	<i>S.D.</i>	<i>Mean</i>	<i>S.D.</i>
Avoidance	-1.11	77	0.27	13.94	4.09	15.13	5.14
Planning	-1.29	77	0.20	32.65	4.94	34.07	4.79

*Note: Control N =34, Intervention N =45*

These findings suggest that randomisation of the groups was successful and as such differences between groups post-intervention could be attributed to the intervention.

### 6.3.2. Preliminary Analyses - Baseline Data

The first phases of the analyses were conducted to ensure that the TPB variables had the potential to explain intention and self-reported behaviour.

#### 6.3.2.1. Correlation Analyses

The first stage of the analysis involved examining the baseline (i.e. Time 1) relationships between the components of the TPB model and intention using bivariate correlations.

Based on the correlation analyses of the entire sample and supporting the choice of TPB constructs to target within the intervention, there were statistically significant positive relationships between the direct measures of the TPB constructs of attitudes ( $r = .44$   $df = 77$ ,  $p < 0.01$ ), PBC ( $r = .37$   $df = 81$ ,  $p < 0.01$ ) and intention. The attitudinal subcomponents, affective ( $r = .29$   $df = 77$ ,  $p < 0.05$ ) and instrumental attitudes ( $r = .59$   $df = 80$ ,  $p < 0.01$ ) also proved to be positively associated with intention, suggesting that participants with fewer worries about driving and a greater reliance on their car are more likely to drive under challenging circumstances. Of the indirect measures, only normative beliefs ( $r = .23$   $df = 81$ ,  $p < 0.01$ ) were associated with intention.

Intention was positively associated with the TPB measure of past behaviour ( $r = .71$   $df = 80$ ,  $p < 0.01$ ) suggesting that those participants who avoid driving in challenging circumstances are more likely to do so again in the future. Complementing this, was the finding that intention to drive in all challenging circumstances was negatively associated with self-reported avoidance behaviours ( $r = -.33$   $df = 79$ ,  $p < 0.01$ ). No significant associations were noted between intention and planning behaviours.

Given that previous research has established differences between men and women in terms of their adoption of self-regulation behaviours (Bauer *et al.*, 2003; Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005) correlation analyses were also carried out separately by gender. The results are presented in Tables 42 and 43 respectively.

**Table 42: Correlations between TPB constructs, intention and behaviour in male drivers**

	1	2	3	4	5	6	7	8	9	10	11	12
1 Intention	1											
2 Past behaviour	0.75**	1										
3 Attitude	0.58**	0.32	1									
4 Affective Attitude	0.40*	0.41*	0.39	1								
5 Instrumental Attitude	0.57**	0.66**	0.39*	0.30	1							
6 Subjective Norm	-0.13	-0.20	0.13	-0.12	-0.27	1						
7 PBC	0.55**	0.57**	0.43*	0.46*	0.19	0.04	1					
8 Behavioural Beliefs	0.24	0.31	0.39*	0.54**	0.43*	0.09	0.12	1				
9 Normative Beliefs	0.08	-0.03	-0.08	0.05	-0.11	-0.05	-0.10	-0.43*	1			
10 Control Beliefs	-0.00	-0.02	0.11	0.06	0.30	0.03	-0.28	0.31	0.03	1		
11 Planning behaviour	0.12	0.29	0.20	0.03	0.20	-0.14	0.24	0.17	0.05	0.07	1	
12 Avoidance behaviour	-0.43*	-0.61**	-0.22	-0.57**	-0.29	0.24	-0.70**	-0.10	0.16	0.23	0.10	1

*N ranges from 27-28.*

**Table 43: Correlations between TPB constructs, intention and behaviour in female drivers**

	1	2	3	4	5	6	7	8	9	10	11	12
1 Intention	1											
2 Past behaviour	0.70**	1										
3 Attitude	0.35*	0.07	1									
4 Affective Attitude	0.22	0.44**	0.46**	1								
5 Instrumental Attitude	0.55**	0.57**	0.43**	0.32*	1							
6 Subjective Norm	-0.18	-0.15	-0.10	0.07	-0.44**	1						
7 PBC	0.26	0.50**	0.36*	0.56**	0.30*	0.02	1					
8 Behavioural Beliefs	0.18	0.14	0.30*	0.12	0.38**	-0.11	0.08	1				
9 Normative Beliefs	0.31*	-0.03	0.07	-0.18	0.29*	-0.25	-0.27*	-0.04	1			
10 Control Beliefs	-0.19	-0.28*	-0.14	-0.32*	-0.19	-0.20	-0.22	-0.07	-0.04	1		
11 Planning behaviour	-0.11	-0.07	-0.09	-0.05	-0.09	-0.10	-0.08	-0.10	-0.05	0.41**	1	
12 Avoidance behaviour	-0.27	-0.62**	-0.17	-0.63**	-0.21	-0.09	-0.60**	-0.11	0.18	0.32*	0.07	1

*N ranges from 49-53*

Replicating the findings in the entire sample, intention was positively correlated with past behaviour and direct measures of attitudes as well as the subcomponent instrumental attitude in both genders suggesting that those with practical beliefs about driving are more likely to drive in challenging circumstances. However, relationships of affective attitudes and PBC with intention were only determined in men. In the case of male drivers, fewer worries about driving and greater feelings of control are associated with the intention to drive in all situations. Intention was also significantly negatively correlated with avoidance behaviour in male drivers and while the relationship was in the same direction for female drivers, the relationship was not significant. This provides some evidence for the causal nature of the TPB model and suggests that intention is important in determining behaviour. Normative beliefs were moderately correlated with intention in female drivers, suggesting that the approval of family and friends is significant in female motorists' choices about whether to drive in difficult conditions.

Self-reported planning behaviours were associated with control beliefs in women drivers only, suggesting that perceptions of control are important in female drivers' decisions about whether to drive in difficult circumstances. Supporting the whole sample findings, self-reported avoidance behaviours were negatively associated with the TPB measure of past behaviour. Further, affective attitudes and PBC were negatively associated with avoidance in both genders, suggesting that worries about driving and low feelings of self-efficacy result in driving avoidance. An additional positive relationship between self-reported avoidance and control beliefs was noted in female drivers.

Given the low internal consistency of the subjective norm factor, separate correlations by gender were carried out for each item. The item 'Most people who are important to me think I should drive in challenging circumstances...' was positively associated with affective attitude ( $r = .39$   $df = 27$ ,  $p < 0.05$ ) and negatively with instrumental attitude ( $r = -.43$   $df = 28$ ,  $p < 0.05$ ) in men and negatively with both attitude ( $r = -.41$   $df = 50$ ,  $p < 0.01$ ) and instrumental attitude ( $r = -.48$   $df = 52$ ,  $p < 0.01$ ) in

women. The item 'I feel under pressure to drive in challenging circumstances' was positively correlated with attitude ( $r = .40$   $df = 27$ ,  $p < 0.05$ ) and negatively with instrumental attitude ( $r = -.43$   $df = 28$ ,  $p < 0.05$ ) in men and positively with affective attitude ( $r = .29$   $df = 53$ ,  $p < 0.05$ ) in women. The two subjective norm items were also significantly correlated in women drivers only ( $r = .31$   $df = 53$ ,  $p < 0.01$ ). These findings suggest that beliefs about family and friends views are significant in establishing attitudes towards driving in difficult conditions.

### **6.3.2.2. Predicting intention**

Two hierarchical regression analyses were conducted to assess the ability of direct measures (attitude, affective attitude, instrumental attitude, PBC and subjective norm) and then belief based measures (behavioural beliefs, normative beliefs and control beliefs) to predict intention after controlling for the effects of age and gender. The entry criteria were set at  $\alpha = .05$ .

The model constructed using the direct measures explained 34% of the variance in intention once age and gender were controlled for. Age and gender were entered at Step 1 and explained 5.2% of the variance in intention. After entry of the three standard TPB constructs (attitudes, subjective norm and PBC) and the sub-components of attitude (affective and instrumental attitude) at Step 2, the total variance explained by the model as a whole was 40%,  $F(7,75) = 6.37$   $p < 0.001$ . In the final model, the only significant predictor of intention was instrumental attitude ( $\beta = 0.42$ ). The results were not affected by re-running the analysis using separate subjective norm items. Given this finding, follow-on regression analyses used a single factor measure of subjective norm.

The model constructed using the indirect measures explained 11% of the variance in intention once age and gender were controlled for. Age and gender were entered at Step 1, explaining 5.2% of the variance. After entry of the three belief based measures (behavioural beliefs, normative beliefs and control beliefs), the total variance explained was 16%,  $F(5,79) = 2.81$   $p = 0.02$ . In the final model,

there were two significant predictors of intention, with normative beliefs recording a slightly higher beta value ( $\beta = 0.26$ ) than behavioural beliefs ( $\beta = 0.25$ ). Results are shown in Table 44.

**Table 44: Predicting intention using direct and indirect measures of TPB constructs.**

Index	Step	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
<i>Direct measures</i> <i>N=75</i>	1	Age	-0.21	0.05	0.05	1.99
		Gender	-0.15			
	2	Age	-0.09	0.40	0.34	6.37**
		Gender	-0.02			
		Attitude	0.19			
		Affective attitude	-0.07			
		Instrumental attitude	0.42**			
		Subjective norm	0.02			
<i>Indirect measures</i> <i>N=79</i>	1	Age	-0.21	0.05	0.05	2.10
		Gender	-0.15			
	2	Age	-0.12	0.16	0.11	2.81*
		Gender	-0.12			
		Behavioural beliefs	0.25*			
		Normative beliefs	0.26*			
		Control beliefs	-0.12			

### 6.3.2.3. Predicting intention for men and women

Given that there are differences in male and female intention to drive in challenging circumstances, separate regression analyses were conducted to examine whether different mechanisms motivated men and women. Since indirect measures explained less variance than the direct constructs of the TPB in the previous regression models, only direct measures were used in these analyses. The results are presented in Table 45. Here, the TPB constructs explained 60% and 33% of the variance in intention among men and women respectively after controlling for age. Age was significant in predicting intention in women only ( $\beta=-0.10$ ,  $p<0.05$ ). After controlling for age, instrumental attitude was the sole significant predictor of intention in both genders ( $\beta= 0.37$ ,  $p<0.05$  for men and  $\beta= 0.45$ ,  $p<0.01$  for women).

**Table 45: Predicting intentions for men and women.**

Index	Step	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
<i>Men</i> <i>N</i> =26	1	Age	0.02	0.001	0.001	0.01
	2	Age	-0.19	0.60	0.60	4.75**
		Attitude	0.31			
		Affective attitude	0.00			
		Instrumental attitude	0.37*			
		Subjective norm	-0.06			
		PBC	0.39			
<i>Women</i> <i>N</i> =49	1	Age	-0.31*	0.09	0.09	4.82*
	2	Age	-0.10*	0.33	0.24	3.49**
		Attitude	0.19			
		Affective attitude	-0.10			
		Instrumental attitude	0.45*			
		Subjective norm	0.12			
		PBC	0.09			

\* $p < 0.05$  \*\* $p < 0.01$

#### 6.3.2.4. Predicting intention for women across the lifespan

Given the finding that age was a significant predictor of intention in women, despite the low sample size, three final regression analyses were conducted to predict intentions in female drivers across the stratified age groups and to determine whether different mechanisms motivated differently aged groups of women to self-regulate. In Table 46 it can be seen that the TPB constructs explained 62%, 26% and 54 % of the variance in intentions among women drivers in the youngest, middle-years and older groups respectively. However, none of the models achieved significance. Among the TPB components only attitude ( $\beta = -0.56$   $p = 0.05$ ) exerted a significant effect on intentions to self-regulate among younger women drivers.

**Table 46: Predicting intentions to self-regulate for women across the lifespan**

Index	Variable	<i>B</i>	<i>R</i> <sup>2</sup>	<i>R</i> <sup>2</sup> change	<i>F</i>
<i>Aged 18 to 25 years</i> <i>N=14</i>	Attitude	0.56*	0.62	0.62	2.60
	Affective attitude	-0.54			
	Instrumental attitude	0.40			
	Subjective norm	0.28			
	PBC	0.47			
<i>Aged 26 to 64 years</i> <i>N=24</i>	Attitude	0.07	0.26	0.26	1.27
	Affective attitude	0.29			
	Instrumental attitude	0.44			
	Subjective norm	0.07			
	PBC	-0.24			
<i>Aged over 65 years</i> <i>N=11</i>	Attitude	-0.75	0.54	0.54	1.17
	Affective attitude	-0.14			
	Instrumental attitude	0.94			
	Subjective norm	0.47			
	PBC	0.25			

\**p*<0.05

In summary, the results shown in this section demonstrate that the TPB-based, self-regulation questionnaire has sufficient potential to explain intention to self-regulate in drivers across the lifespan and demonstrates as anticipated that the predictive patterns of self-regulation intention are different in men and women.

### 6.3.3. Investigating the Study Hypotheses - Effects of the Intervention

#### 6.3.3.1. Repeated measures ANOVA

A series of 2 x 2 repeated measures ANOVAs were conducted to explore the effect of the intervention on TPB variables including intention over time. The results of the repeated measures ANOVAs are presented in Table 47 with the mean pre- and post-intervention scores for both experimental groups.

Contrary to Hypotheses 23 and 24, no effects of group or time were seen on behavioural or control beliefs, suggesting that these constructs were not altered by the intervention. However, there was a

significant reduction in normative beliefs  $F(1,159) = 4.57, p = 0.03, \eta^2 = 0.03$  in the intervention group.

Contrary to Hypothesis 26, no effects of experimental group or time were seen on the direct measures of TPB constructs - attitudes, subjective norm (as a factor or separate items) or PBC, suggesting that the intervention had no effects on these variables. Thus, all subsequent analyses considered subjective norm as a single factor rather than two separate items. However, partially supporting Hypothesis 25, there was an effect of experimental group on one of the subcomponents of attitude. Results showed an increase in affective attitude in the intervention group,  $F(1,159) = 3.84, p \leq 0.05, \eta^2 = 0.02$ . This finding suggests that the intervention resulted in more positive affective attitudes towards driving in challenging circumstances.

There was no effect of the intervention on intention to self-regulate. However, a significant effect of experimental condition was found in self-reported planning behaviours,  $F(1,158) = 5.66, p = 0.02, \eta^2 = 0.04$ . The intervention resulted in an increase in planning scores as recorded by participants using the self-regulation index. No interaction effects were determined. The effect sizes for all changes were small (Cohen, 1992).

**Table 47: Mean scores of direct and indirect TPB measures at Times 1 and 2 of the intervention with repeated measures ANOVA findings.**

	Time 1		Intervention		Time 2		Intervention		Time		Partial		Partial		Partial		
	Control		Intervention		Control		Intervention		F	p	$\eta^2$	Group		$\eta^2$	Interaction		$\eta^2$
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p	$\eta^2$	F	p	$\eta^2$	F	p	$\eta^2$
Intention	4.80	2.15	5.07	2.04	5.11	2.11	5.20	1.97	0.46	>0.05	0.00	0.28	>0.05	0.00	0.08	>0.05	0.00
<i>Direct measures</i>																	
Attitude	4.16	0.77	4.28	0.80	4.23	0.64	4.54	0.91	1.65	>0.05	0.01	2.69	>0.05	0.02	0.46	>0.05	0.00
- Affective	3.94	1.29	3.43	1.34	4.11	1.39	3.79	1.29	1.56	>0.05	0.01	3.84	0.05	0.02	0.20	>0.05	0.00
- Instrumental	5.24	1.67	5.42	1.40	5.62	1.46	5.50	1.36	0.97	>0.05	0.01	0.02	>0.05	0.00	0.43	>0.05	0.00
Subjective norm	4.49	1.27	4.57	1.62	4.72	1.49	4.47	1.82	0.07	>0.05	0.00	0.11	>0.05	0.00	0.42	>0.05	0.00
PBC	4.96	1.38	5.16	1.33	4.75	1.32	5.20	1.25	2.32	>0.05	0.01	0.16	>0.05	0.00	0.34	>0.05	0.00
<i>Beliefs</i>																	
Behavioural	23.90	7.09	23.55	9.03	23.86	8.61	24.99	9.10	0.26	>0.05	0.00	0.08	>0.05	0.00	0.30	>0.05	0.00
Normative	16.09	10.93	13.00	10.36	15.24	8.90	11.71	8.36	0.48	>0.05	0.00	4.57	0.03	0.03	0.02	>0.05	0.00
Control	55.09	15.44	56.44	15.58	56.00	13.93	55.93	14.30	0.01	>0.05	0.00	0.07	>0.05	0.00	0.09	>0.05	0.00
<i>Behaviour</i>																	
Planning	32.65	4.94	34.07	4.80	32.06	5.84	34.59	5.11	0.00	>0.05	0.00	5.66	0.02	0.04	0.45	>0.05	0.00
Avoidance	13.94	4.10	15.13	5.14	13.91	4.20	15.26	4.73	0.00	>0.05	0.00	2.97	>0.05	0.02	0.01	>0.05	0.00

### 6.3.3.2. Mediation Analyses

Mediation analyses were conducted to test Hypotheses 26 and 27, using 1000 bootstrap re-samples of the data with replacement and alpha was set at .05. A larger resample size (5000) had no effect on the results. First, analyses were conducted to assess whether the effects of the intervention on intention were mediated by direct measures of attitude, subjective norm and PBC or by indirect measures of behavioural beliefs, normative beliefs and control beliefs. No significant effects were found. Next, analyses examined whether the effects of the intervention on behaviours were mediated by the same variables. No significant effects were determined. These findings failed to support Hypotheses 27 and 28. Results can be found in Table 48.

**Table 48: Results of analyses exploring the mediating effects of TPB constructs on the relationship between intervention and intention, and intervention and behaviours (planning and avoidance).**

Outcome variable	Mediating variables	Effect	95% Confidence Limits	
			Lower limit	Upper limit
Intention N=70	Attitude	0.17	-0.03	0.74
	Subjective norm	0.09	-0.08	0.43
	PBC	0.12	-0.25	0.42
Intention N=74	Behavioural beliefs	0.05	-0.25	0.35
	Normative beliefs	-0.01	-0.17	0.18
	Control beliefs	0.01	-0.13	0.13
Planning behaviour N=68	Attitude	-0.04	-0.73	0.44
	Subjective norm	0.02	-0.82	1.01
	PBC	-0.02	-0.59	0.81
Planning behaviour N=72	Behavioural beliefs	0.26	-0.21	1.65
	Normative beliefs	-0.15	-0.82	0.24
	Control beliefs	-0.05	-0.73	0.4
Avoidance behaviour N=70	Attitude	-0.07	-0.75	0.59
	Subjective norm	-0.14	-1.17	0.67
	PBC	-0.2	-0.87	0.24
Avoidance behaviour N=74	Behavioural beliefs	-0.39	-0.62	0.4
	Normative beliefs	-0.12	-0.8	0.32
	Control beliefs	-0.08	-0.7	0.56

### 6.3.4. Goal Achievement

The next analysis reviewed the participants' own views on their goal achievement. As anticipated, participants set themselves a wide range of goals. Of the principal goals (i.e. Goal 1), many involved self-regulation planning behaviours such as setting off on a journey earlier (N=3), pre-planning journeys and rest stops (N=4), sharing the driving (N=4) and using navigational aids such as satellite navigation (N=2). Others involved planning for new challenges, for example driving new routes (N=6) or on motorways (N=9). Some participants planned to maintain their speed within the legal limits (N=4) while others prepared action plans to manage feelings of impatience and annoyance with other road users (N=6). Two participants planned to take additional driver training.

Descriptive analyses were conducted on self-reported goal achievement. The results are shown in Table 49. Results suggest that 93.4% of participants partially or completely achieved their first goal, 97.3% of participants partially or completely achieved their second goal and 87.6% of participants partially or completely achieved their third goal.

**Table 49: Percentage of intervention participants reporting goal achievement**

Did you achieve your goal?	Goal 1 (N=45)	Goal 2 (N=36)	Goal 3 (N=16)
5 Completely	51.1	41.7	37.5
4	28.9	30.6	31.3
3	6.7	16.7	12.5
2	6.7	8.3	6.3
1 Not at all	6.7	2.8	12.5

#### 6.3.4.1. Goal achievement – regression analyses.

Given these findings, hierarchical multiple regression analyses were conducted to determine whether the TPB variables (intention, attitude, affective attitude, instrumental attitude, PBC and subjective norm) predicted goal achievement for the primary goal after controlling for the effects of age and gender. The entry criteria were set at  $\alpha = .05$ . The model explained 34% of the variance in goal achievement once age and gender were controlled for. Age and gender were entered at Step

1 and explained 1% of the variance in goal achievement. After entry of the three standard TPB constructs (attitudes, subjective norm and PBC) and the sub-components of attitude (affective and instrumental attitude) at Step 2, the total variance explained by the model as a whole was 34%,  $F(6,34) = 2.18$   $p=0.05$ . In the final model, the only significant predictor of goal achievement was attitude ( $beta = 0.44$ ). Results are shown in Table 50.

**Table 50: Predicting goal achievement using direct measures of TPB constructs.**

Model	Step	Variable	<i>B</i>	$R^2$	$R^2$ change	<i>F</i>
Goal achievement	1	Age	0.12	0.01	0.01	0.29
		Gender	0.00			
	2	Age	0.22	0.34	0.33	2.18*
		Gender	0.06			
		Intention	-0.34			
		Attitude	0.44*			
		Affective attitude	0.34			
		Instrumental attitude	0.10			
		Subjective norm	-0.15			
		PBC	-0.33			

\* $p < 0.05$

### 6.3.5. Engagement

To determine whether the intervention had any effect on engagement, a one way analysis of covariance (ANCOVA) was conducted. The independent variable was the experimental group (control/intervention) and the dependent variable was the engagement scale score (see Chapter 5) at Time 2. Participants' scores for engagement at Time 1 were used as the covariate. Preliminary checks ensured that there was no violation of the assumptions of normality, linearity, homogeneity of variances, homogeneity of regression slopes and reliable measures of the covariate (Pallant, 2007). After adjusting for pre-intervention scores, there were no significant differences between groups in terms of engagement,  $F(1, 75) = 0.47$ ,  $p=0.49$ , partial  $\eta^2 = 0.006$ . However, there was a strong relationship between the pre- and post-intervention scores for engagement, as indicated by a partial  $\eta^2$  of 0.87.

#### **6.4. Discussion**

The aim of this study was to determine whether established driving behaviours could be positively influenced by an extended TPB intervention designed to change attitudes and improve PBC through the adoption of self-regulation planning behaviours. The results of this intervention only partially support the study hypotheses proposed at the outset and derived from the TPB (Ajzen, 1991). Critically, the intervention resulted in a change in self-regulation planning behaviour such that Hypothesis 27 could be partially supported. However, this change was not mediated by a change in intention or in PBC. Further, there was no change in the precursor to behaviour change, intention, and consequently Hypothesis 26 could not be supported.

The intervention did not result in a change in direct measures of TPB constructs (Hypothesis 25 not supported) with the exception of one subcomponent of attitude – affective attitude, a finding which partially supports Hypothesis 24. The self-regulation study (Gwyther & Holland, 2012) reported in Chapter 3, determined that a negative affective attitude was a significant predictor of driving avoidance. Thus, improving affective attitude could be beneficial to drivers in terms of reducing over-regulation behaviours and enabling greater mobility and independence. However, in such cases, a balance needs to be achieved between encouraging mobility and ensuring safety.

No changes in behavioural or control beliefs were noted as a result of the intervention meaning that Hypotheses 22 and 23 respectively could not be supported. However, there was an unanticipated reduction in normative beliefs. Normative beliefs stem from perceptions about significant others' approval of driving in challenging conditions and personal motivation to comply. In the correlation analyses at baseline, normative beliefs were significantly associated with intention to drive, suggesting that perceptions of approval and motivation to comply influenced choices about driving in challenging circumstances. Although the fall in normative beliefs is unanticipated, it may well reflect a positive outcome regarding safe mobility. If drivers are less susceptible to normative

beliefs, then they may be less likely to drive in risky circumstances simply because they believe others approve of their doing so.

Given that mediation analyses failed to find any mediating effects of the intervention on intention via TPB constructs (Hypothesis 26) or on behaviour via intention and PBC (Hypothesis 27), few inferences can be drawn from this study about the causal nature of the TPB model, i.e. that behavioural change is initiated by changes in behavioural, normative or control beliefs (Ajzen, 1991). This is not unique to this study. Other researchers (e.g. Chatzisarantis & Hagger, 2005; Stead *et al.*, 2005) have also drawn incomplete links between the TPB constructs, intention and behaviour.

Participants in the intervention group of this randomised controlled trial reported that they had successfully achieved their mobility goals, whether these were related to driving in new circumstances or reducing feelings of vulnerability when coping with aggressive drivers. While the findings from the TPB intervention are of theoretical interest, this finding is of practical interest. Goal theories recognise that enactment of a particular intention may depend on its relative goal priority and on specific planning (Gollwitzer & Sheeran, 2006; Gollwitzer, 1993). By enabling participants to choose their own goal within the scope of the intervention, participants' motivations for driving were acknowledged (Hatakka *et al.*, 2002) and perhaps given greater priority. Together, the results of the motivational and volitional phases of the research provide evidence that the intervention was successful in facilitating change in self-reported behaviour.

This study had some limitations. Despite the strength of using a theory informed intervention and the recruitment of sufficient participants based on power analyses, the attrition rate meant that the final sample of control participants was slightly smaller than optimal. However, the stratified sampling procedure resulted in a diverse range of participants representing drivers across the lifespan. The gender balance was such that women were slightly better represented than men, particularly in the intervention group. Since the focus of this research is on women and that women

are an under-researched subgroup in driver behaviour studies, and that other work has suggested that women are more likely to over-regulate when driving (e.g. Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005), the findings are of value.

Another potential criticism of this work is that it uses a self-report measure of self-regulation behaviour. Self-report measures may be prone to socially desirable responding (Anastasi and Urbina, 1997) and some authors have suggested that there is a tendency to over-report avoidance behaviours on questionnaires in comparison with actual behaviour (Blanchard and Myers, 2010). However, this present research did not find any improvement in avoidance behaviours and so perhaps, the difficulty of over-reporting is not so pertinent. The self-report measure means that the only conclusion which can be drawn is that the intervention increased planning behaviour as assessed by participants. One way of guarding against such difficulties in the future is through the use of trip logs or objective measures of self-regulation. Although trip logs/daily diaries of driving behaviour were considered as a potential means of validating the TPB questionnaire and self-regulation index (SRI) in this study, these are often prone to under-reporting behaviour (Blanchard and Myers, 2010) perhaps due to forgetfulness or apathy. One means of objectively measuring self-regulation behaviour would be to use in-car instrumentation which has significant cost implications and is outside the scope of this present work. However, this is a consideration for future research.

Given the 'extended' nature of this intervention, the effects cannot be directly attributed to either the TPB intervention, or to the use of action planning or coping planning techniques. Future research with a larger sample could perhaps review the effects of the various components in separate groups to establish which component had the greater effect on actual driver behaviour. Nevertheless, the results support previous findings (e.g. Armitage, 2007; Gratton *et al.*, 2007; Kellar & Abraham, 2005) that planning interventions have the capacity to effect goal attainment.

This study only examined effects at baseline and at one month post-intervention. Although initial results are promising in terms of cognitive and behavioural changes, there was no opportunity to assess the longer term implications of the intervention on driving behaviour and whether these changes were maintained over a significant period. According to Ajzen (1991), initiation of cognitive and behavioural change is a prerequisite to sustained behavioural change. Critically, follow up work is required to determine whether initiation of cognitive and behavioural changes leads to sustained behavioural change in this model and whether action or coping planning was particularly influential at different time points (e.g. Sniehotta *et al.*, 2005).

The analyses of the engagement measure demonstrated that there were no significant differences pre- and post-intervention in engagement. However, the time period between measures was relatively short (one month) and as such, gave little scope for large changes in social and economic engagement, e.g. changing jobs, attendance at social events, etc. There are two potential remedies for this, either the question time-scale could be altered such that participants were asked about their social and economic engagement within a specific time period, i.e. the previous month or a greater time lapse between baseline and intervention could be employed. Alternatively, a greater impact could perhaps have been determined by asking participants directly whether the achievement of their goals had made a difference in terms of their ability to go to the places that they wanted to.

Baseline analyses demonstrated that the indices constructed with the direct measures of TPB constructs made a large contribution to the prediction of drivers' intention to self-regulate while the indices constructed with belief based measures made a much smaller contribution. Wallen Warner and Aberg (2008) suggest that this can result from the precise nature of belief based items meaning that fewer beliefs are embraced as a whole and thus, less variance is accounted for. In contrast, more general measures of the direct constructs require fewer items to cover a greater proportion of the variance. Although, beliefs about driving in challenging circumstances were extracted during formative research, given the low level of explained variance in the belief based regression, the

intervention may have benefited from an additional, specific elicitation study to identify a more extensive range of salient beliefs about self-regulation in driving.

As anticipated, the correlation analyses and regression models at baseline revealed that the associations between TPB constructs and predictive patterns of variance of intention to self-regulate were slightly different in men and women. The regression model accounted for a greater proportion of the variance in men's intention to drive in challenging circumstances as opposed to women's. Further, age was a significant predictor of intention to drive in women but not in men. The subsequent comparison of regressions by age group in women drivers suggests that some gender differences may be due to low affective attitude in younger female drivers. Given that the intervention positively affects affective attitude, the campaign may also assist younger female drivers in terms of improving engagement and mobility. However, care should be taken that improving affective attitude and confidence does not increase risk potential (Marottoli & Richardson, 1998). Unfortunately, given the relatively small sample size, it was not possible to undertake analyses separately by age or gender on the effects of the intervention. This is a potential area for further research.

The reliability (internal consistency) for the subjective norm factor was low. Ajzen (2006) reports that items measuring subjective norm often have low variability and recommends that questions should be included that capture descriptive norms, i.e. whether significant others perform the behaviour. It is considered that future studies using this TPB questionnaire should include additional descriptive norm items.

One final potential area for criticism of this study is that both the control group and intervention group received the 'DriveSafe' handypack. This pack was designed to provide tips and safety advice on driving. Although it could be argued that giving the drivers in both groups the same book meant that they were receiving almost the same intervention, this was not the case. Drivers in the

control group were simply asked for their views on the general layout, design and usefulness of the book. They did not receive advice on developing their action or coping plans and they were not asked to review the book for content. However, it is accepted that it would have been preferable to give the control group a non-driving related filler task.

Despite the limitations, the findings of the present research are of both practical and theoretical significance. This study suggests that it would be prudent for future mobility interventions to adopt a wider definition of self-regulation to incorporate planning behaviours and to address individual goal setting (Gollwitzer, 1993) and coping planning behaviours (Sniehotta *et al.*, 2005) as well as the constructs identified by the theory of planned behaviour (Ajzen, 1991). The reasonable retention rate of intervention group participants (90%), the relatively high uptake by women and the mean age of the sample (46.40 years,  $SD = 20.65$ ) suggest that in practice this intervention is of interest and use to drivers, specifically those at most risk of premature driving cessation. Finally, this intervention could be easily administered using the 'DriveSafe' handypack. Under these circumstances, it would be relatively inexpensive to reproduce and disseminate. However, further work would need to be done to determine whether a publication type intervention would achieve the same effects as a face-to-face study.

## **6.5. Conclusions**

This study provides evidence for the role of affective attitudes and normative beliefs in encouraging wider mobility in drivers across the lifespan, and for an extended, TPB based intervention developed using formative research that produced changes in self-regulation planning behaviours. Despite the study's limitations, the results offer promise for self-regulation planning as a tool to assist drivers in achieving their mobility goals and promoting safer driving across the lifespan.

## CHAPTER SEVEN

## **7. General Discussion**

This final chapter summarises the research and outlines the general limitations. It describes the general findings and conclusions as well as making suggestions for future research. Specific findings and limitations pertaining to individual studies are not re-iterated in this chapter. The chapter describes the aspirational future of the self-regulation index (SRI) as well as the potential application of the 'DriveSafe' Handypack to administer the extended TPB intervention. The implications of the research are described and suggestions made for future campaigns aimed at enabling and extending safe mobility in the ageing population.

Maintaining safe mobility and social engagement is critical for the quality of life and wellbeing of the ageing population. This thesis examined the effect of risk perception and feelings of vulnerability on women's driving behaviour across the lifespan. It also developed and tested a modified theory of planned behaviour (TPB: Ajzen, 1991) intervention designed to positively affect driving habits by reducing over-regulation and extending safe mobility in drivers. Such research had not previously been conducted. The research was split into two phases. Firstly the model-building phase examined how risk perception and feelings of vulnerability affected driver behaviour. Then the understanding gained from the model-building phase was used in the intervention phase to design and evaluate a behaviour change package aimed specifically at female drivers.

Within the model building phase, the initial study explored through a self-report questionnaire those driving behaviours affected by risk perception and feelings of vulnerability. It determined that driving avoidance (i.e. the traditional concept of 'self-regulation') was significantly related to feelings of vulnerability in drivers below 65 years of age (but not above). This study established that feelings of vulnerability do indeed affect driving behaviour. The second study further explored self-regulation, again conceptualised as avoidance, as a potential basis for a behavioural change intervention. This study revealed that self-regulation was used by drivers across the lifespan and determined a link between anxiety and over-regulation. The findings suggested that interventions designed to reduce anxiety and feelings of vulnerability could be successful in reducing over-regulation and extending safe mobility, and consequently provided a framework for follow-on studies to explore self-regulation further. This study comprised an original paper (Gwyther & Holland, 2012). The third study described an elicitation study to generate a range of wider self-regulation coping strategies to manage feelings of vulnerability to risk. The extracted themes were reflected in the 'DriveSafe' handy pack, a short, printed book designed to offer motorists practical advice on driving, and in the novel self-regulation index (SRI). The next study reported the development and preliminary validation of the SRI, comparing self-report data with an objective

measure of driving behaviour using a simulated driving task. The findings suggested that there was sufficient value in the tool to use it as a basis for the measurement of self-regulation in a wider context to include planning and avoidance coping strategies. This study also established that perception of risk and feelings of vulnerability affect social and economic engagement in drivers. Moving into the intervention phase of the research, the final study reported a test of an extended theory of planned behaviour (TPB) intervention to promote wider self-regulation behaviour, measured using the previously validated SRI. The intervention achieved moderate success with changes in some TPB components, i.e. affective attitude and normative beliefs as well as planning behaviours. These studies are summarised in Table 51.

**Table 51: Summary of Studies**

Study	Sample	Aim	Measures	Results	Conclusion
Chapter 2: Perception of risk and feelings of vulnerability in driving as a function of gender	395 drivers 267 women, 128 men 18-78 years	To investigate whether perception of risk and feelings of vulnerability affect driving behaviour	Self-report questionnaire administered on-line.	Women report greater perceptions of risk (PoR) and feelings of vulnerability (FOV) than men. FOV associated with maladaptive driving styles. FOV associated with driving avoidance (effect is greater in women) Self-reported driving avoidance predicts FOV in younger and middle-years drivers.	PoR and FOV have the potential to constrain driving behaviour in drivers across the lifespan.
Chapter 3: The effects of age, gender and attitudes on self-regulation in driving.	395 drivers 267 women, 128 men 18-78 years	To examine self-regulation as a potential risk management strategy in drivers across the lifespan and to identify the characteristics of those who self-regulate.	Self-report questionnaire administered on-line.	Self-regulation avoidance is common across the lifespan Quadratic effect of age on avoidance such that younger and older drivers self-regulate more than middle-years drivers. When experience is controlled for, avoidance increases with age. Affective attitude mediates the effect of age on self-regulation behaviours Anxious driving style and low affective attitude to driving are predictive of self-regulation avoidance	Self-regulation is used across the lifespan and is associated with low affect and anxiety. Interventions designed to reduce anxiety may be successful in reducing over-regulation.
Chapter 4: Feelings of vulnerability and effects on driving behaviour – a qualitative study.	48 drivers 40 female, 8 male 18 to 75 years	To examine the range and nature of feelings of vulnerability in drivers across the lifespan and to determine the range of coping strategies adopted in response to those feelings.	Thematic analysis of focus group data.	Four themes were identified – FOV in response to triggering events and challenging circumstances, personal risk biases in FOV and influence of passengers and co-pilots. Coping behaviours adopted included a wide range of safety related strategies, planning and preparation techniques and use of a co-pilot.	Demonstrates a link between risk sensitivity and decisions about driver coping behaviour. Potential for intervention study to assist participants to select appropriate coping strategy.

Chapter 5: Development and preliminary validation of a novel self-regulation index (SRI) using an objective measure of driving behaviour.	64 drivers 36 women, 28 men 18 to 80 years	To construct and undertake preliminary reliability and validity testing on a short self-report index to measure self-regulation behaviours and to use the index to explore some of the complex relationships between self-regulation, PoR, FOV, self-efficacy and social and economic engagement.	Self-report demographic questionnaire, engagement index and novel instrument, the SRI. Objective measure of driving behaviour using simulated driving task.	SRI capable of differentiating between certain demographic and attitudinal groups, specifically different age groups and anxious drivers. Internal consistency acceptable. Construct validity established. Some evidence of criterion validity.	SRI and associated engagement scale are valid and reliable measures and have the potential to be used as a means of measuring wider self-regulation behaviour in drivers across the lifespan.
Chapter 6: Intervention Study	81 drivers 53 women, 28 men 18 to 83 years	To determine whether established driving behaviours could be positively influenced by an extended TPB intervention.	Self-report demographic questionnaire, SRI and engagement scale and extended TPB questionnaire.	Intervention reduced normative beliefs, increased affective attitudes and increased self-reported planning behaviours.	Intervention was moderately successful in changing planning behaviour. However, no evidence of the causal effect of the TPB model was noted.

## **7.1. Summary of Findings**

### **7.1.1. Perception of risk and feelings of vulnerability**

The aim of this thesis was to examine the effects of perception of risk and feelings of vulnerability on women's driving behaviour across the lifespan. In pursuit of this aim, the model building phase of this research examined the effects of risk perception and feelings of vulnerability on two aspects of driving behaviour, first an integrative multidimensional measure of driving style (MDSI: Taubman-Ben-Ari *et al.*, 2004) that incorporated both cognitive and emotion based decisions in driving and second, the process of self-regulation, initially conceptualised as driving avoidance. Driving avoidance provided a simple, direct measure of constrained behaviour.

Supporting findings from the fear of crime literature (e.g. Akers *et al.*, 1987; Pantazis, 2000; Reid & Konrad, 2004; Warr, 1984), studies revealed that women consistently reported greater perceived levels of risk to vehicle related crimes and greater feelings of vulnerability when driving in a range of challenging circumstances than men. Also consistent with the fear of crime literature (e.g. Ferraro, 1995; Liska *et al.*, 1988), feelings of vulnerability were associated with constrained driving behaviours, and significantly, and further supporting the fear of crime literature (e.g. Gordon & Riger, 1989; Scott, 2003), these constraints were of greater magnitude in women. These findings suggest that women and men do indeed respond differently to perceived risk in driving and that emotional responses to risk, i.e. feelings of vulnerability, could be implicated in decisions regarding driver behaviour, notably restrictive driving practices.

While the gender associations determined in the model building phase were reasonably straightforward, the relationships between age, perception of risk and feelings of vulnerability were, as expected, more convoluted and confounded by wider factors, including gender. Feelings of vulnerability were associated with age in female drivers only and with driving avoidance in drivers below 65 years of age. These relationships were not in the anticipated

direction, i.e. increasing with age. In fact, feelings of vulnerability appeared to reduce with age, suggesting that younger women feel more vulnerable than older women when driving in challenging circumstances. This finding is unusual since it might be expected that older women would feel more vulnerable, given that they are potentially frailer and more prone to serious injury or death in the event of a crash (Gandolfi, 2010). Further analyses highlighted that the relationship between age and driving avoidance was confounded by driving experience and that once experience was controlled for, the relationship was in the anticipated direction.

In terms of their effects on driving style, feelings of vulnerability were consistently associated with maladaptive driving styles in both genders, specifically anxious and dissociative styles. However, no effects of risk perception were noted. The relationships between feelings of vulnerability and the adoption of maladaptive driving styles are of concern. A dissociative style reflects a driver's distractibility and tendency to commit errors due to distraction, while an anxious style reflects a tendency towards anxiety, distress and reduced confidence in the driving task and both styles are linked with reduced self-esteem and high trait anxiety (Taubman-Ben-Ari *et al.*, 2004). A dissociative driving style has also been linked with a higher incidence of crashes and driving offences (Taubman-Ben-Ari *et al.*, 2004). As such, drivers who feel vulnerable may in fact, be at greater risk by adopting these habitual driving styles. These findings suggested that vulnerable drivers could benefit from the adoption of more adaptive driving style techniques such as planning and preparation. The implication here is that encouraging vulnerable drivers to plan and develop appropriate coping strategies is preferable to them driving using habitual maladaptive driving styles. It counters arguments that the present research is encouraging nervous drivers to drive beyond their confidence, rather these strategies encourage nervous but practicing drivers to adopt safer behaviours.

Thus, a wider spectrum of self-regulation behaviours (Lyman *et al.*, 2001) were explored as a potential basis for a theory based intervention. The findings revealed that although feelings of vulnerability frequently went unacknowledged, drivers displayed a complex array of safety related coping strategies in their everyday driving. The literature suggests that coping

behaviours in driving are usually employed in response to stress (Matthews *et al.*, 1992; Westerman & Haigney, 2000); fear (Taylor *et al.*, 2002, 2007) and anxiety (Taylor *et al.*, 2007). Since feelings of vulnerability can be conceptualised by feelings of fear and worry, it was hypothesised that the coping strategies adopted in response to these feelings would be similar to those adopted in relation to other emotional responses.

This was indeed the case with maladaptive dimensions of driver stress behaviour (Matthews, 2002) being noted, e.g. aggression including confrontive coping and dislike/fear of driving manifesting as dissociative driving (Taubman-Ben-Ari *et al.*, 2004) and driving avoidance (Ehlers *et al.*, 1994). However, adaptive means of driver coping were also reported from simple safety strategies, such as locking car doors and carrying a mobile phone, to more complex journey planning and preparation techniques. In addition, collaborative coping techniques such as the use of a passenger for social support (Cutrona & Russell, 1990; Lazarus & Folkman, 1984) and the ‘co-pilot’ phenomenon (e.g. Miller Polgar & Shaw, 2003; Shua-Haim *et al.*, 1999) were offered as a method of reducing feelings of vulnerability. These had not previously been advocated as a means of reducing driving fear or stress. These findings suggested that a wider definition of self-regulation could be used as a mechanism to incorporate adaptive coping strategies into daily driving habits. Subsequently, a novel self-regulation index was developed and tested for validity and reliability. The results suggested that there was sufficient value in the tool to use it as a basis for measuring the new, wider concept of self-regulation incorporating both planning and avoidance behaviours.

The findings from the model building phase suggested that perception of risk and feelings of vulnerability did significantly affect driving behaviour in women drivers across the lifespan and that an intervention to change behaviour through the adoption of more adaptive driving behaviours such as planning and preparation could be successful in reducing risk potential and promoting independent mobility in later life, particularly in female drivers.

### **7.1.2. The TPB intervention**

The intervention reported in this thesis is the first study to use the theory of planned behaviour (TPB: Ajzen, 1991) to influence non-compliance related aspects of driver behaviour. In fact, the intervention focused on improving adaptive aspects of self-regulation behaviour. The intervention was based on the formative research conducted in the model building phase, along with a literature review. To some extent this study should be considered a pilot intervention since the beliefs people hold in relation to feelings of vulnerability, self-regulation and driving were not formally gathered through a single elicitation study. Since no research had been conducted on this topic, there was a lack of previously identified suitable psychological constructs for modification. Recommendations about which specific TPB constructs the intervention should target were similarly lacking. However, findings from the model building phase of the present research suggested that affective attitudes (i.e. feelings of vulnerability) and self-efficacy were strongly associated with driving avoidance behaviours, particularly in female drivers. These findings provided a specific target for the intervention. The intervention used an extended TPB intervention technique incorporating a volitional phase of intention implementation (Gollwitzer, 1993) and coping planning (Sniehotta *et al.*, 2005). Contrary to the proposed hypotheses and the causal mechanisms of the TPB (Ajzen, 2002a), the intervention did not result in changes in control beliefs, perceived behavioural control or intention. However, it did result in an improvement in affective attitudes and an increase in self-reported planning behaviours, as well as having an unanticipated effect on normative beliefs.

### **7.2. Alternative Models**

Although the Theory of Planned Behaviour (Ajzen, 1991) can be usefully employed to explain the underlying and controlling factors of driver self-regulation behaviours, two alternative models warrant mention as potential alternatives.

Firstly, the health action process approach (HAPA: Schwarzer, 1992) is a model of health behaviour change which proposes a two-stage process of change and has been suggested as a suitable alternative to the TPB (Sutton, 2008). Unlike the TPB (Ajzen, 1991) which proposes a direct, causal relationship between intention and planned behaviour, the HAPA suggests that post-intentional factors can cause a discrepancy between intention and behaviour, the so-called 'intention-behaviour gap' and as such intentions need to be supplemented by other factors to ensure that they are translated into action. Thus the model proposes two phases of change, pre-intentional processes that lead to intention to change (the motivational phase) and post-intentional, volitional processes that lead to actual behaviour change (the volitional phase). The latter phase can be further subdivided into planning, action and maintenance phases.

Of particular interest to the present research is the explicit incorporation of risk perception, along with self-efficacy and outcome expectancy, as a 'pre-intender', that is, a predictor of behavioural intention in the motivational phase of the model. The inclusion of risk perception in this model, demonstrates promise as a potential candidate for exploring female driver's risk perceptions and feelings of vulnerability in driving. In fact, the role of risk perception in the model is somewhat marginalised. Schwarzer (2008, p6) states that "risk perception is insufficient to enable a person to form an intention. Rather it sets the stage for a contemplation process and further elaboration about consequences and competencies". The view that risk perception alone is insufficient to provoke behavioural intention is in direct contrast to the 'risk as feelings' hypothesis which suggests that risk perception can have a direct effect on behavioural choices (Loewenstein *et al.*, 2001) and as such could result in immediate behavioural constraints such as over-regulation, driving restriction and avoidance.

Certainly while the HAPA model benefits over the TPB in terms of the addition of volitional factors such as strategic planning techniques (action and coping planning), it may not have sufficient power, as presently described, to explain the role of risk perception in influencing women's driving behaviour. Irrespective, it would be theoretically interesting in future interventions to compare and contrast the effectiveness of the two models.

Secondly, the Risk Allostasis Theory (RAT: Fuller, McHugh & Pender, 2008) developed alongside the accompanying Task-Capacity Interface (TCI) model (Fuller, 2005) endorses the role of feelings in driver behaviour and decision making. This model proposes that for safe driving, a driver's capabilities have to match or exceed the demands of a traffic situation (Fuller, 2005) and that a feeling of risk, as an indicator of task difficulty, is the main determinant of driver behaviour. That is, a driver has a preferred range of risk and will seek to maintain that level during the driving task by altering their behaviour accordingly. For example, if the task is perceived as too easy, either consciously or sub-consciously, then the driver may take on additional workload, e.g. by increasing speed, while if it becomes too difficult then loss of control occurs (Fuller, 2005, 2011; Fuller *et al.*, 2008). The 'acceptable' level of risk will vary dependent on personal motivations and capabilities and is fluid. Fuller (2011) suggests that drivers constantly monitor these permanently present feelings of risk in order to inform their decision making but that they are only consciously aware of doing so once a threshold is reached, perhaps when they are operating outside of their preferred risk range.

The relevance of the RAT model to this research is that it suggests that feelings of risk may provide an individual driver with the motivational basis for avoiding taking on a level of task difficulty which is too high to be accommodated. Thus, a poor self-assessment of driving capabilities, or a low personal risk threshold, may manifest in individual drivers as over-regulation behaviours such as driving avoidance (e.g. in poor weather conditions or on busy roads) or as an attempt to influence task demand by reducing task difficulty through the employment of exaggerated safety behaviours, e.g. maintaining excessive distances, driving at exceptionally slow speeds or giving way unnecessarily (e.g. Koch & Taylor, 1995).

### **7.3. Limitations**

Despite the present research's strengths, there are some general limitations which need to be acknowledged.

Sampling bias may have been present. People who volunteer to take part in driving studies may be more confident than age matched counterparts (Blanchard & Myers, 2010) or have fewer cognitive, motor or attention deficits (Molnar & Eby, 2008). Thus, the research may over-estimate driving confidence and under-estimate feelings of vulnerability or anxiety in driving.

Further, a number of the studies were not balanced by gender with women being better represented than men. However, since women were the target population of the research and other work has suggested that women are more likely to be over-regulators (Hakamies-Blomqvist & Siren, 2003; Jette & Branch, 1992; Siren & Hakamies-Blomqvist, 2005), the findings are of value. Additionally, a number of the older women in the model building and intervention phases were military wives and as such are habitually used to driving. Given that this group may self-regulate less than the general population of older women drivers, they may be more comparable with middle-years' women drivers in terms of habituation to driving and consequently there are difficulties in generalising some of the findings to a wider population. Future research should aim to establish whether the findings identified here apply more generally to a wider selection of the general public. Despite these concerns, the present research adds to the literature on female driving behaviour.

A substantial limitation of the present research was that, with the exception of the SRI validation study using objective simulated driving tasks, it used self-report data. Self-report measures may be prone to socially desirable responding (Anastasia & Urbina, 1997) and some authors have suggested that there is a tendency to over-report avoidance behaviours on questionnaires in comparison with actual behaviour (Blanchard & Myers, 2010). Although alternative methods for validating self-report questionnaires were considered (e.g. diaries and trip logs), these are also prone to reporting (often under-reporting) issues (Blanchard & Myers, 2010) and may have placed an additional burden on participants for little benefit. For practical and financial reasons, objective measures of data using in-car instrumentation were not obtained from participants.

#### **7.4. The future of the self-regulation index**

The self-regulation index detects individual differences in emotional responses to risk and is a reasonably reliable and valid tool to measure avoidance and planning behaviours in drivers across the lifespan. Although, the tool did not consistently discriminate between self-regulation behaviours across all age and gender groups, there is sufficient value in it for it to be developed for use in future studies examining self-regulation behaviours. The tool would benefit from another validation study reviewing behaviours across a larger sample and incorporating a greater number of anxious drivers, specifically men. Given the associated engagement scale as a useful predictor of over-regulation behaviours, the SRI could also be used to determine those at most risk of the health and social problems associated with driving restriction and premature cessation. It is hoped that more studies will note the benefit of planning as a potential means of enabling mobility in older drivers and incorporate it into their definition of self-regulation in driving.

#### **7.5. The future of DriveSafe and the self-regulation TPB intervention**

The TPB intervention could easily be administered using the 'DriveSafe' Handypack and as such it would be relatively inexpensive to reproduce and disseminate. However, further research would need to be done to determine whether a publication type intervention would achieve the same effects as a face-to-face study. At present, funding applications are in progress to allow a large scale print run of the revised 'DriveSafe' Handypack incorporating details of the TPB intervention. This would enable the document to be given away free. The aim would be to ask participants to complete a short demographic questionnaire and the SRI (including the engagement scale) on-line, pre- and post-intervention. The collated data could then be analysed and compared with existing findings. Participants could potentially receive feedback on their risk of over-regulation through an automatically generated report.

## **7.6. Suggestions for future research**

Based on the findings of this research, several areas have been identified as areas for future research. First and foremost, a test of the printed intervention using the ‘DriveSafe’ Handypack would be beneficial, with data collected longitudinally and measures taken at for example, one month, six months and one year, post-intervention. This would provide data about the relative effectiveness of the face-to-face and printed interventions as well as information on the longer term efficacy of the extended TPB intervention. It would also be useful to review the effects of the separate components of the intervention in a much larger randomized controlled trial using different groups, e.g. control group, intervention group, i.e. TPB only, and intervention with volitional component group, i.e. TPB plus goal setting, intention implementation and coping planning.

There are some measurement issues within the TPB intervention questionnaire and SRI index that future studies could improve. Incorporating an objective measure of self-regulation behaviour (e.g. in-vehicle instrumentation) into any future interventions would significantly improve the value of the study, further improve the criterion validity of the SRI and ensure that any behavioural changes reported were real rather than perceived. The SRI would benefit from additional reliability testing (e.g. test-retest reliability), using a larger sample that included anxious drivers. This would need to be done separately from the examination of the effectiveness of the printed intervention since there are some difficulties associated with test-retest reliability (Shaughnessy *et al.*, 2009) and genuine changes in response to the intervention may affect participants’ responses on the SRI responses. Future applications of the TPB questionnaire would need to address the issues of low internal consistency for the subjective norm measure. One final constructive study would be to compare crash frequencies in a control group of drivers with those undergoing the intervention to determine whether the extended TPB intervention has any effect on driver safety.

## 7.7. Implications of the research

The present research has a number of implications for safe driving and mobility campaigns, particularly in older drivers. Given that older adults are the fastest growing demographic within the driver population (Department for Transport, 2010), there is a rapidly growing need amongst policy makers to find a method of balancing the potential risks of an ageing driving population with the specific mobility needs of individuals. Although older drivers are less ‘risky’ than other demographic groups (Berry, 2011), the Parliamentary Advisory Council for Transport Safety (PACTS) recently stated that reductions in deaths and serious injuries in those aged over 60 years have not matched those seen in other age groups (Parliamentary Advisory Council for Transport Safety, 2011) and so attention has converged on this age group.

Self-regulation, i.e. risk based avoidance, has been advocated as “the only viable option for producing safer, older drivers without undermining mobility and well-being” (Berry, 2011 p8.). However, the findings from this research would suggest that governmental policy ‘nudges’ to promote avoidance strategies exclusively as a means of safely extending mobility are unlikely to be successful. Certainly, findings from previous campaigns (Nasvadi, 2007; Owsley *et al.*, 2004) have shown little effect. Further, campaigns designed to increase driving avoidance rates appear to have little or no impact on older adults’ crash rates (Nasvadi & Vavrik, 2007) and in some cases, significantly reducing driving frequency (below 2000 miles per annum) may in some subgroups of older drivers, specifically those aged over 80 years, actually increase crash rates per mile driven by reducing task familiarity and driving skill (Box *et al.*, 2011).

This present research suggests that rather than promoting driving avoidance, future campaigns should adopt a wider definition of ‘self-regulation’ to ensure that older drivers’ individual motivations and goals for driving (Hatakka *et al.*, 2002) are addressed. While there is still a place for sensible risk-related avoidance, future focus should be on incorporating planning behaviours (e.g. route planning, planning to drive with a co-pilot, sharing driving, planning breaks in long journeys etc.) into daily driving habits. Addressing barriers to safe mobility and

developing appropriate, personalised coping plans should also assist older drivers to self-regulate more effectively. The findings from this research suggest that extended TPB interventions promoting wider self-regulation behaviours hold significant promise as a mechanism for facilitating longer term behavioural change and ensuring that older drivers remain independently mobile without undermining personal safety.

## **7.8. Conclusions**

The aim of this research was to determine whether women's driving behaviour across the lifespan was affected by risk perception and feelings of vulnerability and if so, to develop a theoretically based intervention to positively affect driving habits. The results of the model building phase suggest that emotional responses to risk have the power to constrain driving behaviour through the adoption of avoidant driving practices, particularly in women drivers. Further, that avoidance behaviours are not as previously believed, constrained to older and more specifically older female drivers. In fact, driving avoidance as a coping response to feelings of vulnerability is present across the lifespan and appears to be linked to feelings of anxiety and low confidence or self-efficacy in the driving task. The results also reveal that emotional responses to risk have the power to significantly affect life choices and decisions about social and economic engagement, suggesting that a more diverse population of drivers may be at risk of the negative health and social consequences of driving restriction than previously considered. Findings from this phase also suggest that men adopt more positive coping strategies than women do. The intervention phase of the study provided evidence of the role of affective attitudes and normative beliefs in encouraging wider mobility in drivers across the lifespan. The results offer some promise for self-regulation - in a wider sense incorporating a spectrum of planning and coping behaviours - to be used as a mechanism to assist drivers in achieving their personal mobility goals whilst promoting safe driving. The study also suggests that further investigation is needed into the role of affect at the point of behavioural decision making to determine whether affective attitudes have the capacity to independently or automatically influence behaviour. It is hoped that this intervention can be developed and applied across a

wider population to assist in reducing unnecessary over-regulation and extending safe mobility in older drivers, specifically older women drivers.

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## APPENDIX A – MODEL BUILDING QUESTIONNAIRE

## SECTION 1: ABOUT YOU

This questionnaire is about your attitudes towards driving. Please follow the instructions carefully and give your honest views. Your answers will be treated in the strictest confidence. No personal information will be made available to anyone other than the researchers.

1. How old are you? \_\_\_\_\_
2. Gender Male [ ] Female [ ]
3. How long have you had a driving licence? \_\_\_\_\_
4. Are you the main driver in your household?  
YES [ ] NO [ ]
5. Please indicate under which circumstances **you** normally drive (tick all that apply)  
For work purposes [ ]  
For personal business (e.g. banking, post office, doctors visits) [ ]  
For educational reasons (take children to school, get to college) [ ]  
For leisure (e.g. going on holiday, trips out) [ ]  
Only when nobody else is available to drive [ ]  
I never drive [ ]
6. Do you consider yourself to be a professional driver (e.g. jobs such as taxi driver, driving instructor, police officer, sales person, delivery driver).  
YES [ ] NO [ ]
7. As an estimate, how many hours do you spend driving each week?  
0 [ ] 1-5 [ ] 6-10 [ ] 11-15 [ ] 16-20 [ ] 20+ [ ]
8. As an estimate, how many miles do you spend driving each week?  
0 [ ] 1-50 [ ] 51-100 [ ] 101-150 [ ] 151-200 [ ] 200+ [ ]
9. Do you have a medical condition or mobility issue, which affects your driving?  
YES [ ] NO [ ]

If yes, please give details \_\_\_\_\_

10. Do you keep any of the following in your car? (tick all that apply)

- |                                  |                          |                     |                          |
|----------------------------------|--------------------------|---------------------|--------------------------|
| High visibility jacket/waistcoat | <input type="checkbox"/> | Ice Scraper/De-Icer | <input type="checkbox"/> |
| First Aid Kit                    | <input type="checkbox"/> | Blanket             | <input type="checkbox"/> |
| Fire extinguisher                | <input type="checkbox"/> | Tyre Pressure Gauge | <input type="checkbox"/> |
| Tools                            | <input type="checkbox"/> | Foot pump           | <input type="checkbox"/> |
| Jack                             | <input type="checkbox"/> | Torch               | <input type="checkbox"/> |
| Warning triangle                 | <input type="checkbox"/> | Tow Rope            | <input type="checkbox"/> |
| Jump Leads                       | <input type="checkbox"/> | Spare Change        | <input type="checkbox"/> |
| Sunglasses                       | <input type="checkbox"/> | Spare Fuel          | <input type="checkbox"/> |
| Warm clothes                     | <input type="checkbox"/> | Water               | <input type="checkbox"/> |
| Walking/running shoes            | <input type="checkbox"/> | Oil                 | <input type="checkbox"/> |
| Brake fluid                      | <input type="checkbox"/> | Sat nav             | <input type="checkbox"/> |
| Spare light bulbs                | <input type="checkbox"/> | Mobile phone        | <input type="checkbox"/> |
| Window breaker tool              | <input type="checkbox"/> | Map                 | <input type="checkbox"/> |
| Emergency breakdown number       | <input type="checkbox"/> |                     |                          |

Other (please specify)

## SECTION 2: INCIDENT HISTORY

This section asks questions about the number of car accidents, near misses, vehicle crimes and personal attacks you have experienced as a driver or as a witness.

11. How many car accidents have you been involved in? \_\_\_\_\_

12. Have you ever been a victim of road rage? Tick all that apply.

Extreme road rage (including physical assault or ramming) YES  NO

Moderate road rage (including shouting or cutting in) YES  NO

Mild road rage (including gesticulating, flashing lights or hooting) YES  NO

13. Have you ever experienced carjacking (where someone forcibly steals your car from you, while you are in it)

YES  NO

14. How many times has your car been stolen? \_\_\_\_\_

15. Has your car ever been vandalised? YES  NO

16. How many times have you had something stolen from your car?

- a. When you were in it \_\_\_\_\_
- b. While it was left unattended \_\_\_\_\_

17. How many times have you been attacked or injured in a car park? \_\_\_\_\_

### SECTION 3: DRIVING STYLE

This section asks you to think about your driving style and rate the extent each statement fits with your feelings, thoughts and behaviour when driving on a scale ranging from 1 'not at all' to 5 'always'. (Scales are not shown in this example due to space constraints)

18. I do relaxing activities when driving
19. I purposely tailgate other drivers
20. I blow my horn or flash the car in front as a way of expressing my frustration
21. I drive through traffic lights that have just turned red
22. I enjoy the sensation of driving on the limit (dangerously)
23. On a clear motorway I drive at or below the speed limit
24. While driving I try to relax myself
25. When I am in a traffic jam and the lane next to mine starts to move, I try to move into that lane as soon as possible
26. Driving makes me feel frustrated
27. I daydream to pass the time
28. I swear at other drivers
29. When a traffic light turns green and the car in front of me doesn't get going I just wait until it moves
30. I drive cautiously
31. Lost in thought or distracted, I fail to notice someone waiting at a pedestrian crossing
32. In a traffic jam, I think about ways to get through the traffic faster
33. When a traffic light turns green and the car in front of me doesn't get going immediately I try to urge the driver on
34. At a crossroads where I have to give right of way to oncoming traffic, I simply wait patiently for my turn
35. When someone tries to drive in front of me on the road I drive in an assertive way in order to prevent it
36. I fix my hair and/or make up while driving
37. I am often distracted or preoccupied and suddenly realise that the vehicle in front has slowed down and I have to slam on the brakes to avoid a collision
38. I like to take risks when driving
39. I base my behaviour on the motto "better safe than sorry".

40. I like the thrill of flirting with death and disaster
41. It worries me when driving in bad weather
42. I meditate when driving
43. Lost in thoughts I forget that my lights are on full beam until flashed by another motorist
44. When someone does something on the road that annoys me I flash them with the high beams
45. I get a thrill out of breaking the law
46. I misjudge the speed of oncoming traffic when passing
47. I feel nervous while driving
48. I get impatient during rush hour
49. I feel distressed while driving
50. I intend to switch on the windscreen wipers but switch on the lights instead, or vice versa
51. I attempt to drive away from traffic lights in the wrong gear
52. I plan my route badly so that I hit traffic I could have avoided
53. I use muscle relaxation techniques while driving
54. I plan long journeys in advance
55. I nearly (or actually) hit something due to misjudging the gap in a car park
56. I feel comfortable when driving
57. I am always ready to react to unexpected actions by other drivers
58. I tend to drive cautiously
59. I honk my horn at others
60. I usually enjoy the excitement of dangerous driving

#### SECTION 4: ATTITUDES TOWARDS DRIVING

This section asks you to think about your attitudes towards driving and rate the extent that each statement fits with your feelings, thoughts and behaviour when driving on a scale ranging from 1 'strongly disagree' to 5 'strongly agree'. Scales are not shown due to space constraints.

61. Driving a car is central to my independence
62. Being able to drive is important to me
63. Being able to drive is important to my work or family life.
64. Driving is necessary to my life to give me the flexibility I need
65. Driving a car is pleasurable
66. I am concerned about the unsafe and aggressive behaviours of other drivers
67. I avoid driving on the motorway
68. I avoid driving in bad weather, e.g. heavy rain, snow or ice
69. I would be anxious driving an unfamiliar route
70. I worry about getting lost when I drive
71. I am happy to overtake other vehicles
72. I avoid changing lanes or overtaking on a motorway
73. I avoid driving in heavy traffic, e.g. at rush hour
74. I feel comfortable when driving
75. I avoid making right hand turns at busy junctions
76. I am happy to drive in the dark
77. I worry about breaking down or getting a puncture

#### SECTION 5: FEELINGS OF VULNERABILITY

This section asks you to think about the places you would feel most vulnerable. Do you feel vulnerable when driving in the following circumstances? If you do not drive regularly or at all, please answer as though you had to drive in those situations.

- |                                |     |     |    |     |
|--------------------------------|-----|-----|----|-----|
| 78. Driving alone              | YES | [ ] | NO | [ ] |
| 79. Driving with a passenger   | YES | [ ] | NO | [ ] |
| 80. Driving in your local area | YES | [ ] | NO | [ ] |
| 81. Driving unfamiliar routes  | YES | [ ] | NO | [ ] |



## APPENDIX B – INTERVENTION QUESTIONNAIRE



**These questions ask whether your feelings about driving have ever affected what you do, where you go and where you work.**

16. I have not applied for, or taken a job because it would mean driving further than I am comfortable with.

Strongly disagree      1      2      3      4      5      Strongly agree

17. I have missed social events because I would have to drive further than I am comfortable with.

Strongly disagree      1      2      3      4      5      Strongly agree

18. I rarely shop where I would prefer because it would mean driving further than I am comfortable with.

Strongly disagree      1      2      3      4      5      Strongly agree

19. I have stayed in rather than go out if it would mean driving further than I am comfortable with.

Strongly disagree      1      2      3      4      5      Strongly agree

20. It is harder for me to get to places because I am uncomfortable with driving.

Strongly disagree      1      2      3      4      5      Strongly agree

21. I believe that I am at risk when driving.

Strongly disagree      1      2      3      4      5      Strongly agree

22. I feel vulnerable when driving.

Strongly disagree      1      2      3      4      5      Strongly agree

## SECTION 2: DRIVING ATTITUDES (TPB)

This section asks about your attitudes towards driving, particularly in difficult or challenging situations. It also asks what you think that your friends, family and work colleagues might say about you driving under those circumstances.

1. In the course of the last year, how often have you driven in challenging circumstances, e.g. in unfamiliar towns, in bad weather, on busy roads, on motorways, at rush hour, at night?

Never	1	2	3	4	5	6	7	Regularly
-------	---	---	---	---	---	---	---	-----------

2. I intend to drive a car in challenging circumstances, e.g. in unfamiliar towns, in bad weather, on busy roads, on motorways, at rush hour, at night regularly in the forthcoming year.

Disagree	1	2	3	4	5	6	7	Agree
----------	---	---	---	---	---	---	---	-------

3. For me to drive a car in challenging circumstances, e.g. in unfamiliar towns, in bad weather, on busy roads, on motorways, at rush hour, at night, is:

a. Harmful	1	2	3	4	5	6	7	Beneficial
b. Pleasant	1	2	3	4	5	6	7	Unpleasant
c. Good	1	2	3	4	5	6	7	Bad
d. Worthless	1	2	3	4	5	6	7	Useful
e. Unsafe	1	2	3	4	5	6	7	Safe
f. Foolish	1	2	3	4	5	6	7	Wise
g. Enjoyable	1	2	3	4	5	6	7	Unenjoyable
h. Reckless	1	2	3	4	5	6	7	Cautious

4. I am apprehensive about driving a car in challenging circumstances, e.g. in unfamiliar towns, in bad weather, on busy roads, at rush hour, at night

Very True	1	2	3	4	5	6	7	Very False
-----------	---	---	---	---	---	---	---	------------

5. I am concerned about the unsafe and aggressive behaviours of other drivers when driving under challenging circumstances, e.g. in unfamiliar towns, in bad weather, on busy roads, at rush hour, at night

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

6. I am happy to drive under challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

7. Being able to drive a car under challenging circumstances e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night, is central to my independence

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

8. Being able to drive a car under challenging circumstances e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night is important to me

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

9. Driving a car under challenging circumstances e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night is necessary to my life to give me the flexibility I need

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

10. Driving in challenging circumstances (e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night) makes things more convenient for me

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

11. Driving in challenging circumstances (e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night) increases my risk of accidents

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

12. Driving in challenging circumstances (e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night) makes me feel vulnerable

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

13. Having convenience is

Extremely Undesirable	1	2	3	4	5	6	7	Extremely Desirable
-----------------------	---	---	---	---	---	---	---	---------------------

14. Increasing my accident risk is

Extremely Undesirable	1	2	3	4	5	6	7	Extremely Desirable
-----------------------	---	---	---	---	---	---	---	---------------------

15. Feeling vulnerable is

Extremely Undesirable	1	2	3	4	5	6	7	Extremely Desirable
-----------------------	---	---	---	---	---	---	---	---------------------

16. Most people who are important to me think that I should drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

17. I feel under pressure (e.g. from family members, friends or work) to drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

18. My family, friends or work colleagues approve of my driving in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

19. My family, friends or work colleagues approval is important to me

Not at all	1	2	3	4	5	6	7	Very much
------------	---	---	---	---	---	---	---	-----------

20. I am confident that I could drive in challenging circumstances e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night, if I wanted to

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

21. For me to drive in challenging circumstances e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night is

Easy	1	2	3	4	5	6	7	Difficult
------	---	---	---	---	---	---	---	-----------

22. I have control over whether I drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

23. A helpful passenger is a comfort when driving in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

24. Journey planning is important when driving in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

25. Being well prepared and carrying emergency equipment is necessary when driving in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

26. I would be more likely to drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, at rush hour, at night if I had a helpful passenger

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

27. I would be more likely to drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, on motorways, at rush hour, at night if I had carefully planned my journey

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

28. I would be more likely to drive in challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, on motorways, at rush hour, at night if I was well prepared and carrying emergency equipment.

Strongly Agree	1	2	3	4	5	6	7	Strongly Disagree
----------------	---	---	---	---	---	---	---	-------------------

### SECTION 3: SELF REGULATION AND COPING

This section asks about how you think about your driving beforehand or as you go along. Please tick the statement which most accurately applies to your driving.

1. When I'm making a long journey, I plan rest breaks ahead.  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
2. I don't really think I need to adjust my driving in bad weather  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
3. I have specific strategies to cope when I get tired driving  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
4. I take care to plan the best time of day to make a journey  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
5. I think about my route before I set off  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
6. When I'm making a long journey, I check traffic news before setting off  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
7. I'd rather just get going and work out my route as I go along  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
8. I avoid driving on the motorway  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
9. I drive in the dark  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
10. I prefer to have a trusted friend or family member with me, when driving in difficult situations.  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
11. I avoid making right hand turns at busy junctions  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------
  
12. When making long or unusual journeys, I use a map or satellite navigation system.  

Strongly disagree	1	2	3	4	5	Strongly agree
-------------------	---	---	---	---	---	----------------

13. When I'm making a long or unusual journey, I allow extra time before setting off.

Strongly disagree      1      2      3      4      5      Strongly agree

14. I avoid driving in heavy traffic, e.g. at rush hour

Strongly disagree      1      2      3      4      5      Strongly agree

15. When I'm making a long or unusual journey, I check my car (e.g. oil, water, tyres) before setting off.

Strongly disagree      1      2      3      4      5      Strongly agree

16. I keep my car doors locked when driving.

Strongly disagree      1      2      3      4      5      Strongly agree

17. I avoid changing lanes or overtaking on the motorway

Strongly disagree      1      2      3      4      5      Strongly agree

18. I tell someone my whereabouts when making a long or unusual journey.

Strongly disagree      1      2      3      4      5      Strongly agree

## APPENDIX C – DRIVESAFE HANDYPACK



# DriveSafe

DriveSafe - An Essential Guide for Motorists

Fay Goodman

## **An Essential Guide for Motorists**

by Fay Goodman and Holly Gwyther

*Dear Motorist...*

*I have been driving for some years and, during this time, I have experienced most things from being involved in an accident, dealing with an emergency, helping with first aid and even scoring penalty points!*

*Yes, we can all be subject to difficult experiences when driving. What I have learnt is to really plan and prepare for my journey so that I can be ready for the unexpected and as a consequence react in the safest way possible. We cannot control other drivers' behaviour but we can control our own actions. So, I continue to look at ways in which I can improve my safety as well as my driving skills, knowledge and abilities.*

*Given the importance of safe driving, DriveSafe has worked with researchers at Aston University to provide you with a document based soundly on driver behaviour research. We hope this book will help you not only stay safe on the roads but also enjoy your driving experience. We want you to feel more in control of the issues that you may be concerned about.*

*DriveSafe came about because I realised, through personal experience, that there was so much more we can do to improve our safety and encourage more courtesy on the roads. By talking to other motorists I realised other drivers felt the same and so I was encouraged to share my experiences. With the DriveSafe Handy Pack, I hope we can all start to feel more secure, safe, comfortable and confident when driving.*

*Happy Driving!*

A handwritten signature in black ink, appearing to read 'Fay Goodman'. The signature is stylized with a large 'F' and a long, sweeping underline.

*Fay Goodman  
Author*

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## Safe Driving

As drivers we need to consider three things to keep safe.

1. The environment: weather conditions, the surrounding traffic and road layout.
2. Our car: design and safety features, as well as how well it is maintained.
3. Ourselves: our experience, training, health and even our mood.

### 1. The Environment

We can usually drive well in daylight and on dry roads but things can become more difficult when faced with bad weather. British weather can be unpredictable and highly changeable and this can cause accidents if drivers fail to prepare or adapt properly to the driving conditions. Almost 10% of all fatal and serious road accidents happen on slippery roads due to the weather<sup>[1]</sup>.

With careful advance planning and sensible driving we can take on the *weather with confidence.*

## 1.1 Planning your journey

1. Check the weather forecast before you go. Listen to the radio, watch TV or check the internet. The Met Office website, gives up-to-date forecasts for the UK. If the weather is severe, it may be safer to cancel or postpone your journey.

[www.metoffice.com](http://www.metoffice.com)

2. Do some basic maintenance checks before you go:
  - a. Check fluids, e.g. fuel, oil, water, screen-wash reservoir.
  - b. Check your tyre pressures, brakes, lights, exhaust, hoses and belts.
3. Plan your route carefully. Take a map or sat nav system with you. Make sure that you have planned alternative routes in case of road closures or traffic jams.
4. Reduce stress by setting off in plenty of time - especially if you are expecting heavy traffic or bad weather.

Remember, you are free to choose the time you set off and how fast you go!

## 1.2 Emergency Items



Even with good preparation, problems can still occur, so always pack a few basics:

- ▶ Food and hot drinks
- ▶ Blankets or rugs
- ▶ Torch
- ▶ Safety vest or high visibility clothing

Most people also like to carry<sup>21</sup>:

- ▶ Mobile phone
- ▶ Windscreen ice scraper and washer fluid
- ▶ Breakdown service details

"My partner's mum often sends us off with a bar of chocolate. It came in really handy when he got stuck in Birmingham city centre, in bad snow, for 6 hours" - Joanne

In our research, we found that men tend to worry less about driving in difficult weather conditions than women and it may be because they are better prepared! Many of the men questioned confirmed that they carried specific emergency items such as those listed above whilst women tended not to<sup>[1]</sup>.

So, in order to feel less anxious about driving **in difficult conditions**, do a little planning and **preparation**.

### 1.3 Mobile phones



Although mobile phones are an asset to your safety, it is illegal to use a hand-held phone whilst driving and you will be fined if caught. At the moment, you can expect to receive an automatic fixed penalty of three penalty points on your licence and a £60 fine, or worse if the matter goes

"I don't go anywhere without my mobile phone. It's the one thing that makes me feel safe in any situation. You can call breakdown cover, call your parents, call anyone who can help you. I think that's the most important thing for me in the car" - Sue

to court. Making or taking calls, or sending text messages is a distraction and you are four times more likely to crash if you use a mobile phone when driving<sup>[1]</sup>.

Although using a hands-free phone is not illegal, it is NOT advised whilst driving. Few need no physical interaction at all, and you still risk prosecution for 'failing to have proper control of a vehicle' if your driving is affected or you are involved in an accident.

**Tip: Turn your phone to silent or off and let voicemail take your messages and listen to them when it is safe to do with the engine switched off.**

Drivers who use a phone, whether hand-held or hands-free, are distracted by having a conversation at the same time as driving<sup>[4]</sup> and:

- ▶ Are less aware of their surroundings
- ▶ Fail to see road signs
- ▶ Fail to maintain proper road position and speed
- ▶ Take longer to react and brake

Talking to a passenger is different as they are aware of the traffic and will stop talking when you need them to.

## **1.4 Managing the weather**

### **1.4.1 Your tyres**

When you need to stop quickly on wet roads, you need tyres that grip. Check:

- ▶ That all your tyres are "all-season" rated. This means they have a tread designed to give you better traction in the wet and snow.
- ▶ That they are inflated to the correct pressures. If not, you risk damage, less grip on the road and you increase your risk of accidents<sup>[1]</sup>.



Sudden braking, acceleration or steering changes can all cause skidding or loss of control in snowy or icy conditions. To maintain control of the vehicle, always accelerate gently and turn gradually. Brake very gently, especially when stopping. If your wheels are spinning or sliding, your vehicle is out of control and your risk of an accident increases by almost 40%<sup>[1]</sup>. To maintain traction in slippery conditions, keep engine revs low by using a higher gear than usual.

### **1.4.2 Rain**

- ▶ Take extra care when it's raining. Rain and spray reduce your visibility and make your tyres work harder. You should also be careful after a heavy downpour; the road will still be slippery.
- ▶ Spray - Keep a greater distance from the car or vehicle in front and make sure that your

windscreen wipers can cope with the water so that you can see. If the spray from the car in front blinds you, you are too close! Keep your foot off the brake but cover it in case you need to brake when your view clears.

- ▶ Aquaplaning – This happens when you are going too fast for your tyres to cope with the water on the road surface. If you are aquaplaning you are out of control and will lose control of your steering and speed. **DO NOT BRAKE!** Ease off the pedals and give your car a chance to recover. Watch your speed.
- ▶ Avoid going through puddles – deep ones could hide potholes and flood the brakes. If that happens, dry them by driving slowly with the brake pedal down until they start working again.

Remember, it's fine to slow down and keep good distance in heavy rain or spray conditions. Other drivers will understand and may even follow your lead.

### 1.4.3 Snow

When driving in snow, there are some basic precautions to take. Make sure that:

- ▶ You keep a safe distance from the car in front.
- ▶ Your windscreen is clear and your windscreen washer is working.
- ▶ Carry spare windscreen wash, you use a lot when the roads are slushy.
- ▶ Your rear windscreen is clean.
- ▶ Your headlamps are clean and working.
- ▶ Keep something in the car to unblock the squirter nozzles which can become frozen and blocked. Warm water and a pin are useful.

"My worst case is heavy rain and doing speeds on the motorway. It makes me nervous, not knowing what's ahead and not being able to see. So I come off at the next services and try not to worry about where I've got to get to. I just wait for the rain to ease off - it's safer that way" - Kathy

- ▶ Disengage ESP when driving in snow

Falling snow can reduce visibility and make the road more slippery. In this situation, as well as slowing down and keeping a safe distance, you should also take corners more carefully. Snow that has settled, may ice up the road and so you should be gentle when braking. It may also be helpful to use your engine to break. Go down through the gears, rather than stamping on the brake pedal.

When driving out of snow, clear a path for several feet in front of the wheels, straighten the front wheels to make it easier for the car to move, use second gear and gentle acceleration to ease out of the space without spinning the wheels. Placing

"Just take everything very slowly. Don't panic if there are a few extra wheel spins. It's when you panic that everything goes wrong." - Chris

something rough e.g. sand or an old piece of carpet placed under a spinning tyre can help to give it some grip. If all fails, try "rocking" the vehicle out of the rut.

**Tip: Keep a couple of pieces of old carpet in the boot**

#### 1.4.4 Ice

- ▶ Ice, especially black ice can be almost invisible. It is extremely dangerous and motorists can be easily caught unawares. So, drive cautiously on cold



and frosty mornings.

- ▶ Ice is more likely to form under bridges, below overpasses and in the shade.
- ▶ When driving on icy roads, drive slowly and gently. Avoid braking and be very cautious when accelerating.
- ▶ If you skid, take your foot off the pedals and gently turn in the direction you want the car to go. DO NOT BRAKE!

**Tip: Keep an ice scraper and de-icer in the car**

#### 1.4.5 Fog

Fog can be very dangerous as it seriously restricts visibility and can suddenly appear out of nowhere. If possible, it is probably better not to travel when it's foggy. However, it is very common in Britain and we may find ourselves already on our journey when confronted with mist or fog. Below are some tips we can consider to help us feel more confident.

- ▶ Slow right down!
- ▶ Keep a safe distance from the car in front.
- ▶ In daylight, avoid using your

main beam as this may reduce visibility even more. Instead use dipped headlights and front fog lights.

- ▶ Use your rear fog lights only if visibility is less than 100 metres (328 feet). You are legally required to switch them off when visibility improves; failure to do so could dazzle other drivers and cause an accident and leave you open to prosecution.
- ▶ If necessary pull over and stop. Choose a safe place, preferably off the road, well out of the driveline of other vehicles.
- ▶ If the fog is very thick and you can clearly see the rear lights of the vehicle ahead, then

"I think the worst is if it's really icy. I have a four-year old cousin who comes to our house a lot. If I was dropping her back home and it was really icy, I'd worry about her. But to cope I'd just drive a lot slower and make sure someone knows I'm in the car with her" - Lauren

you are probably too close to stop in an emergency!

#### **1.4.6 Hot weather and sunshine**

Surprisingly, hot weather and sunshine can also be a problem for motorists. Bright sunlight can restrict people's vision and hot weather can lead to dehydration and poor concentration. Here are some basic tips which may help.

- ▶ Drink plenty of water. Dehydration can affect driving abilities<sup>[5]</sup>.
- ▶ Take regular breaks to avoid becoming overtired. The Highway Code<sup>[6]</sup> recommends that drivers should take a 15 minute break every two hours.
- ▶ Keep your car well ventilated.
- ▶ Glare from bright sunlight is very dangerous and can affect our visibility and concentration. Wearing good sunglasses or getting an extra sun visor fitted to your normal car visor can reduce glare substantially.
- ▶ Be aware of changing road conditions. Tarmac softens in hot weather, which creates

problems when braking and cornering.

- ▶ A summer shower or storm can make the road surface very slippery. Shower water mixing with the rubber and diesel built up on the road surface during a hot dry spell can be dangerous. Drive with care!
- ▶ Don't overload your car – check your handbook to see the total recommended vehicle weight. Include yourself and your passengers in this. Secure all items in your boot and on your roof rack properly. If you brake suddenly, an unsecured suitcase can become a lethal missile.

"I'm very aware that things can fly about in the car. I don't think about me you see, I think about my child. Everything's tied down!" - Jackie

**Tip: Keep water and sunglasses in the car when the weather is warm!**



### 1.5 Night driving

Driving at night can be particularly hazardous. Firstly, people can be more sleepy at night and this makes their driving more variable<sup>[7]</sup>. Secondly, vision is compromised in the dark<sup>[8]</sup>. At night, our vision is not as sharp and we lose colour recognition<sup>[9-11]</sup>, depth perception<sup>[12]</sup> and take longer to see and react to things<sup>[13]</sup>. These problems are worse if we're short-sighted and glare is often an additional problem for older people<sup>[14]</sup>. To help with difficulties when driving at night, you can:

- ▶ Make sure your windscreen, headlights and indicators are clean.
- ▶ Make sure your headlights are properly aimed, they should point downwards and not into oncoming traffic.
- ▶ Use your lights from the onset of dusk, dipped headlights are normally sufficient in towns and cities until it goes dark.
- ▶ Only use high beams when there is no oncoming traffic. Although they may extend the time you have to react to hazards, they can also dazzle another driver.

- ▶ Try not to look at headlights approaching you. If you are dazzled, slow down or stop, and let your eyes recover.
- ▶ Keep your distance. This will reduce glare for the car in front. You choose how close you follow, so keep your distance!

"If I have to drive at night, to make myself feel safer, I try and keep to main roads because they're better lit. I find the glare and the oncoming traffic headlights, difficult." - Pat

- ▶ Slow down and pay extra attention in areas where there may be pedestrians or cyclists, they are harder to see and are involved in more accidents in the dark<sup>[15]</sup>. You do not have to be pressured

by tailgaters! Their driving is their responsibility, not yours!

- ▶ Be aware that you may encounter wildlife on unlit roads.
- ▶ If you become tired, find somewhere safe to pull off the road and rest. Plan a fifteen-minute break for every 2 hours of driving<sup>[16]</sup>.
- ▶ Be aware that you are most likely to be sleepy between midnight and 6 am<sup>[17]</sup>

Tip: If you find it difficult to see and read road signs at night, consider asking a friend or family member for help, or buy a satellite navigation system. This will give you verbal instructions which may be easier for you to follow.

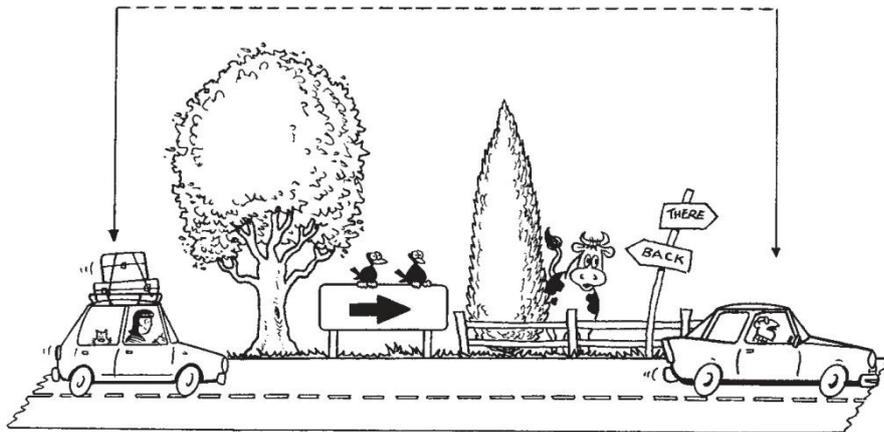
## 2. Your Route

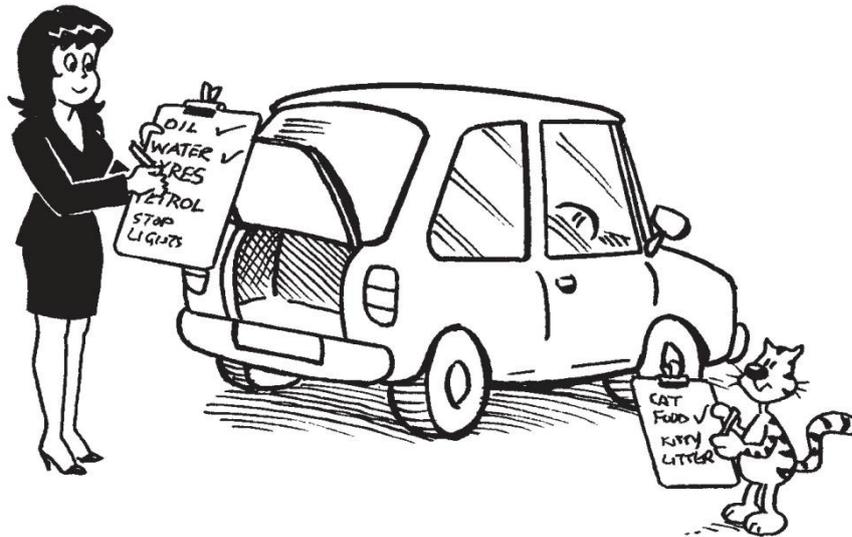
There are lots of challenges for you as a driver including the kind of journeys and roads you drive on. Some people think of motorways as dangerous or frightening places and yet only 6% of fatal accidents happen on motorways, with 34% occurring on urban roads and 60% happening on rural roads<sup>[18]</sup>.

There are many factors that contribute to accidents but failing to look properly, following too close and slippery roads are the three most common<sup>[1]</sup>. In this section, we look at the different types of roads and how to make sure you stay safe on them.

### 2.1 Motorways and busy roads

- ▶ Jot down the motorway junction you need to exit from on a post-it and stick it to your dashboard.
- ▶ Tailor your speed to the conditions, within the speed limit. Ignore tailgaters who may urge you to speed, your driving is your responsibility!
- ▶ Remember to indicate and check your blind spot every time you change lanes.
- ▶ Keep a safe distance from the vehicle in front of you. Use the **two-second rule** (this is the minimum, we should increase to 4 even 6 seconds when road conditions are difficult).





"I actually find motorways easier than normal roads because you're going in one direction. You don't have to worry about cars coming the other way and there are no pedestrians, cyclists" - Chris

Watch the vehicle in front of you pass a landmark such as a sign or tree. As it does so, at a normal pace say "Only a fool breaks the two second rule". If you pass the same landmark before you finish the sentence, you are following too close. Increase your distance and repeat using another landmark to make sure your distance is correct.

- ▶ If the road is wet or visibility is poor, you should increase your distance from the vehicle in front to at least four seconds. Do this by repeating the two second rule twice or counting "One thousand, two thousand, three thousand, four thousand".
- ▶ Be observant and drive defensively. Look ahead, around and use your mirrors regularly. When looking ahead, look two seconds ahead, four seconds ahead and twelve seconds ahead. This way, you will be able to anticipate what is coming and be aware of what is going on around you.

- ▶ Try to be aware of a safe place to move to in case someone pulls out unexpectedly in front of you.
- ▶ Take extra care when travelling behind trucks and large vehicles. Unless you can see their mirrors, they can't see you!
- ▶ Tiredness can kill so take a 15 minute break every 2 hours. It is so easy to fall asleep and it can happen within seconds. Up to one fifth of accidents on motorways may be caused by drivers falling asleep<sup>[17]</sup>.
- ▶ If you feel tired, or notice symptoms of sleepiness (yawning, heavy eyes, and difficulty concentrating), pull over somewhere safe, drink an energy or caffeine drink and nap for 10-15 minutes until the caffeine takes effect<sup>[16]</sup>. You can then continue on your journey but be aware that the effects of caffeine are short lived.

**Tip: Keep an energy drink in the car for long journeys!**

## 2.2 Rural roads

There is sometimes a perception that it is safer to drive on rural roads. Unfortunately this can lead to a temptation to drive much faster and risk overtaking slow moving traffic such as tractors, caravans and horses.

- ▶ Tailor your speed to the conditions, within the speed limit! Don't assume that it's safe to speed just because there is less traffic.
- ▶ Be aware that there may be dangerous hazards, such as narrow roads, blind corners, high hedges, animals on the road and slow moving farm vehicles.
- ▶ Be aware of pedestrians, dog walkers, cyclists and horse riders. The lack of pavement means that they will most likely be in the road. Give them plenty of room and only pass them when it is safe to do so.

"I know the roads around me well. They're all really windy but I just drive slowly and quite a distance from the car in front" - Jenny

- ▶ Drive slowly around bends and adopt a road position that gives you maximum visibility.
- ▶ Only overtake when you have a clear view of the road ahead.
- ▶ Slow down when driving through villages.
- ▶ Take extra care at night and be aware that other drivers' headlights could temporarily blind you.
- ▶ If you rely solely on satellite navigation for directions, make sure that the maps are up-to-date and check to ensure that you won't be sent down impassable roads.
- ▶ Allow extra time. When planning your journey, include rest stops at two-hour intervals and break for at least 15 minutes.

## 2.3 Planning & preparation

### Route and breaks

- ▶ Thoroughly plan your journeys using an up-to-date map or the internet. The AA and RAC websites have route planning services and "Google" maps are another useful tool.

"I remember the first time I drove a long way by myself. My boyfriend was with me. I planned the whole day giving myself an extra hour even though we didn't need to be anywhere at a specific time. This was in case something happened. And I made sure we'd got food and drink!" - Nicki

### Emergency extras

- ▶ Make sure you have change or tickets for tolls en route and for parking when you arrive.
- ▶ Make sure that you are carrying essential emergency equipment.
- ▶ If possible, tell someone where you are going, your expected route and your estimated time of arrival.

### Maintenance and breakdowns

- ▶ Check oil, water, tyres and tyre pressure (including the spare) on a regular basis, particularly before a long journey.
- ▶ Maintain your car properly and ensure that it is serviced regularly.
- ▶ Join a breakdown service.



#### 2.4 Unfamiliar routes

- ▶ Thoroughly plan your journey using an up-to-date road map, a satellite navigation system or the internet.
- ▶ Jot some basic route details down and stick them on post-its to your dashboard.
- ▶ Consider taking a passenger with you to help with directions and map reading<sup>21</sup>

#### 2.5 Parking

Plan where to park before you go. Parkmark<sup>®</sup> car parks are vetted by the police to make sure that they meet certain safety criteria for you and your car. There are

almost 5000 Parkmark<sup>®</sup> car parks nationwide and you can find out if there is one near you by checking on the internet.

[www.parkmark.co.uk](http://www.parkmark.co.uk)

- ▶ Park as close as possible to the place you are visiting.
- ▶ Use attended and secure car parks wherever possible.
- ▶ Familiarise yourself with your surroundings before you park.
- ▶ Avoid parking where it is dark or unlit.
- ▶ Using a landmark, make a mental note of where you have parked so that you can find your car easily.

- ▶ Reverse into your space, so you can drive away quickly if necessary. This is a good safety precaution and should be a routine feature of good driving.

### 2.6 Walking to your car

Personal safety awareness is important especially when walking to or from our car. Often fear of crime is greater than the reality of being a victim but incidents can happen and so being prepared to get into our car quickly and safely is good planning. Effective personal safety training could provide a range of skills and techniques such as reading body language, verbal skills and diffusion strategies which could help if you got into difficulties.

- ▶ Project confidence! Keep your head up, shoulders back and actively look around when

walking to and from your car.

- ▶ Have your keys to hand before approaching your vehicle.
- ▶ Be observant of what and who, is around you.
- ▶ Place valuables out of sight – preferably in the boot before getting into your vehicle.
- ▶ Lock the car doors as soon as you get in.
- ▶ If you feel unsafe approaching your parked car, ask a friend or colleague to accompany you.
- ▶ If you are approached, speak calmly and clearly, and with a friendly tone.
- ▶ Be careful when choosing your words, do not swear as this can intimidate and invite aggression.
- ▶ Try not to raise your voice as this can be interpreted as anger.





### **Avoid**

- ▶ Approaching your car if someone is hanging around and/or looks suspicious
- ▶ Taking risks. Go back to a safe environment such as your home or office and get help.
- ▶ Leaving valuables such as laptops, mobiles or sat nav visible.

### **2.7 Stopping for fuel**

- ▶ Make sure that you lock your doors and shut your windows before refuelling.
- ▶ Take your handbag and any

small valuables into the garage with you.

- ▶ Lock any large valuables away in the boot.
- ▶ Remember to set your car alarm.
- ▶ Most thieves are opportunists and a couple of minutes are all it takes.

### **Physical diffusion skills**

Hopefully you will never have to resort to any form of physical defence but if you do, remember that it must be a minimal amount to enable you to escape to a safe place. Self-defence must be always be 'reasonable' in the eyes of the law.



## Personal Safety Tips

- \* Be aware of who and what is around you.
- \* **Project confidence!** Shoulders back and head held high!
- \* Reverse into your parking space for a quick getaway.
- \* Make sure your car doors and windows are locked at all times.
- \* Try not to leave valuable items on display in the car.
- \* When walking to and from your car, keep your keys handy.
- \* Carry a personal alarm.

"I usually carry a personal alarm and keep my keys in my hand because you can use them as a weapon or get in the car really quickly if something happens" - Mai



## 2.8 European travel

It is now much easier to travel across Europe by car. However, it is important to be mindful that traffic regulations vary between countries. So, do a little pre-journey planning and make sure that you know your destinations' legal requirements and local laws. Here are a few tips to help you on your way!

- ▶ Carry the right documents – driving licence, international driving permit (if necessary), insurance certificate and passport.
- ▶ Make sure that you have European breakdown cover and that your insurance is valid abroad.
- ▶ A GB sticker is compulsory unless you have a 'Europlate', a number plate with incorporated GB sticker.
- ▶ Carrying a reflective jacket and warning triangle is now compulsory in many countries. Check before you go!
- ▶ Adapt your headlamps so that you do not dazzle drivers. You can get a headlamp adapter kit from most car dealers and retailers.
- ▶ Avoid drinking and driving. Laws vary so the safest thing to do is not to drink and drive.
- ▶ Service your car and check your tyres, oil and water before you go.
- ▶ Check that your satellite navigation system covers Europe.
- ▶ Think right! It is easy to forget to drive on the right hand side of the road, especially when turning into or out of junctions or travelling around roundabouts. Be extra vigilant!
- ▶ Remember, that driving on the right hand side will not give you the same view as left hand drive cars, so be extra cautious with manoeuvres.
- ▶ It may seem obvious but don't forget to change your headlamps back when you get back to the UK. And don't forget to revert to driving on the left hand side!!

**Tips: Be aware, prepared and responsible – keep calm and DriveSafe!**

### 3. Car maintenance

Maintaining our car on a regular basis has many benefits in addition to safety. Regular servicing, for example, can ensure the car lasts much longer and it can maximise the re-sale value. To compliment this, routine car care such as checking tyres can reduce the chances of an accident<sup>(1)</sup> and only takes a moment to do if you know what you are doing and what to look for.

The word "POWDERS" may help you to remember some of the basic checks to carry out and whilst many of these checks seem obvious, when we are thinking of other things before a long journey such as checking our packing or making sure that the children and pets are ready, then this acronym could prove very useful.



**P**etrol Always make sure that you have enough fuel for the journey.

**O**il which is a lubricant that protects the engine. Lack of oil can seriously damage the engine. A simple check, especially before a long journey can prevent a breakdown.

**W**ater When the engine is cold, check that you have enough water in the radiator and also in the windscreen washer container.

**D**amage Check for any damage such as cracks in the windscreen, broken windscreen wipers or cracked/balding tyres.

**E**lectrics Check all the electrics such as the front and rear lights, indicators, break lights, horn, battery and any other electrical devices fitted to your car.

**R**ubber Keep tyres inflated to correct pressures. This will help maximise your fuel use. Keep tyres in good condition and have plenty of tread across the whole width.

**S**afety belts It is a legal requirement to ensure that your seat belts are functioning properly. Also check baby seats and harnesses to make certain that children can travel safely in our vehicle.

### 3.1 Maintenance checks

Vehicle defects such as poorly inflated tyres, broken lights, failing brakes, steering or broken mirrors are an issue in 3% of fatal accidents <sup>20</sup>. Reduce your risk by keeping on top of your car maintenance.

#### 3.1.1 Weekly maintenance

Always refer to your vehicle handbook before carrying out any maintenance, as procedures are often different between cars.

#### Tyres

- ▶ Check that tyre walls are free from cuts and bulges.
- ▶ Remove any stones or glass to avoid damage to the tread.
- ▶ Make sure that tyres are inflated to the recommended pressures when cool.



#### Lights

- ▶ Check that lights are clean and working properly.
- ▶ Ask someone to look at them while you operate the pedal or check them in an enclosed, dark garage or back up to a light coloured wall so that you can see their glare.
- ▶ Keep a couple of spare bulbs and fuses handy.

#### Oil

- ▶ Check the level and top up regularly.
- ▶ To check your oil, ensure your vehicle is on a flat surface and that the engine has cooled down. Locate your dipstick, pull it out and wipe it clean. Fully replace it, remove again and check the level is between the minimum and maximum marks. If you need to top up, check which type of oil you need. Use the type recommended in your handbook. Never over fill your oil container. Add a cupful and wait for it to go down. Then check the level again. If it is still low, add some more. Replace the dipstick and close the oil filler cap firmly.



### ***Windscreen, windscreen wipers and washer fluid***

- ▶ Keep all windows clean so that you have a clear view.
- ▶ Regularly check for any chips or cracks.
- ▶ Inspect your wiper blades. Replace damaged, worn or defective blades
- ▶ Clean the edges of the rubber blade with a paper towel and window cleaner.
- ▶ Regularly top up your windscreen washer fluid. Open the reservoir lid, top up with special washer liquid (to prevent freezing in cold weather) or tap water with a squirt of washing up liquid.

### ***Bodywork and number plate***

- ▶ Check that they are clean and chip free.

**Note: It is illegal not to have your number plate visible.**

### ***Brakes***

- ▶ Never ignore any problem with the brakes.
- ▶ If brakes feel spongy, or need to be pushed down or pulled up further than before, there may be a problem and you should get them checked!
- ▶ When the brake warning light comes on, it often means that the brake pads need replacing. Do not continue to drive. See to it that the

pads are replaced as soon as possible.

- ▶ Many reputable garages offer a free brake inspection.

#### ***Brake fluid***

- ▶ Check that the brake fluid is between the minimum and maximum markings on the reservoir.
- ▶ If low, use an approved type of fluid to fill up. Do not overfill.
- ▶ If you detect a leak, take the car straight to a mechanic. For a severe leak, contact your breakdown service and do not drive anywhere.

#### ***Oil changes***

- ▶ You will need to change the oil from time to time. This can be done by your mechanic at your annual service. Ask your mechanic to change the oil filter at the same time.

#### ***Air filter***

- ▶ If the air filter is impregnated with dust and grime replace it immediately. Your mechanic will change this for you during your service if you ask.

#### ***Exhaust system***

- ▶ Look underneath the vehicle for loose or broken clamps and supports.
- ▶ Check for holes in the silencer or catalytic converter parts or pipes.
- ▶ Replace any rusted or damaged parts.
- ▶ If you detect any fault, or see any leaks, blockages, undue wear, glazing or fraying, take the car to a mechanic without delay.
- ▶ Most reputable exhaust centres will check this free of charge.

#### ***Power steering fluid level***

- ▶ Check the power-steering fluid level but only when the engine is switched OFF!
- ▶ Ensure that the level is between the minimum and maximum mark. If the level is down, top up and ask your mechanic to check it.

#### ***Coolant system and radiator***

- ▶ Coolant keeps the engine at the correct temperature. It is made up of water and antifreeze. It is important

that the levels are topped up and that the correct ratio of antifreeze to water is maintained.

- ▶ Check coolant levels annually and particularly just before winter.

### **Cam belt**

- ▶ Look at the belts and hoses in the engine and check for wear.
- ▶ It is important that the camshaft drive belt is replaced at the manufacturer's recommended intervals.

**Note: If the cam belt breaks, serious engine damage can result requiring extensive and expensive repairs.**

### **Battery**

- ▶ Most modern batteries are sealed for life and don't require any maintenance.
- ▶ All batteries eventually fail. Some vehicles have lights indicating when the battery is low, others will notice that the starter motor falters or the engine fails to turn over.
- ▶ If you need a jump start, check

that the jump leads used are suitable for your vehicle. If charging is not effective for more than a short time, you will need to replace the battery.

### **Steering**

- ▶ Excessive movement in the steering wheel may indicate a fault with the steering. If you feel or hear knocking or rattling noises, you should seek qualified advice straight away.
- ▶ If you feel vibration in the steering as you reach a certain speed e.g. 50mph you may need to have the front wheels balanced. This can be done easily by a tyre fitter.

### **Horn**

- ▶ Regularly check that it makes a clear sound (in an appropriate time and place).

### **Servicing**

- ▶ Take your car to be serviced at the times specified in your handbook. This minimises the chances of a breakdown, reduces running costs, and maximises resale value.

# Dealing with Incidents

Incidents can happen at any time and sometimes when we least expect it! Sometimes the incident is caused by our own actions e.g. a breakdown or a wrong manoeuvre. On other occasions another driver is responsible. What is useful and important is to know is how to keep calm and deal with the situation in the safest possible way so we remain confident and feel less vulnerable.

If we witness a collision or experience a road rage outburst from another driver, we may be called upon to be a witness. Being a 'good' witness is very important to improve our confidence in society. If we are involved in a collision and no-one comes forward - even though they saw exactly what took place - we could feel very disappointed, vulnerable and disadvantaged. Knowing people will support each other and state what they saw honestly, helps to keep criminal activity down.

## 4. Crashes

This section looks at two scenarios, firstly, what to do if you are personally involved in a collision and secondly, what to do if you witness or arrive at the scene of a collision.

### 4.1 What to do if you are involved in a crash

#### 4.1.1 STOP!

You must stop if you have a collision with any of the following<sup>[6]</sup>:

- ▶ a person
- ▶ a vehicle
- ▶ a dog
- ▶ a farm animal
- ▶ property (such as buildings, gates, walls etc).

**If the collision is serious, immediately call '999'.**

In a minor collision, you don't have to call the police, but you must contact them if there is an injury to a person, or if the road is blocked.



If for any reason you don't stop – if, for example, you fear your car has been bumped deliberately by an aggressive driver – you must report the incident to the police as soon as possible; within 24 hours at most. When you report to the police, you must have your insurance certificate with you.

#### **4.1.2 Avoid discussing details**

After a collision, it is better to avoid admitting liability or offering a payment, even if you think the collision was your fault! If you do admit blame, you could be violating your insurance company's conditions, and they may not be able to support a claim. However, a kind word

to the other party such as "Are you OK?" can help to keep the situation calm and diffuse any potential anger, fear or shock.

#### **4.1.3 Record witness details**

Get any witnesses' details as quickly as possible. They are unlikely to stay at the scene for long and you may depend upon their goodwill and cooperation.

You will need to collect:

- ▶ Names
- ▶ Addresses
- ▶ Phone numbers

Also note down the registration numbers of any vehicles you see whose occupants may have seen what happened. Witnesses are very valuable. Just one independent witness can make the difference between a swiftly settled insurance claim and six months' argument and stress.

#### **4.1.4 Record details of the collision**

Note in writing:

- ▶ The time and date

- ▶ The state of the traffic (e.g., heavy, or slow-moving)
- ▶ The weather conditions and visibility
- ▶ Road surface conditions
- ▶ Any signals that were being made (or not made) by you or anybody else
- ▶ Information about the other vehicle(s) involved such as colour, whether they had their lights on and whether the vehicle looked roadworthy etc
- ▶ The identity numbers of any police officers on the scene
- ▶ What was said by other people, and by you.

#### **4.1.5 Draw a sketch map of the scene**

Your map should show:

- ▶ The road layout (including names, road widths and whether each road sloped, how much, etc.)
- ▶ The positions of vehicles after the collision, and the position and length of any skid marks
- ▶ The approximate speeds and direction of travel for all vehicles involved

- ▶ Any traffic signs or road markings
- ▶ Any obstructions to the view of drivers (sharp bend, parked cars)
- ▶ The positions of any witnesses; mark them by numbers on the map and then make a numbered list of the witnesses' names and contact details
- ▶ If you have a camera, take photos of the scene of the collision and of any damage.

#### **4.1.6 Record the details of drivers involved in the collision**

Note the other driver's:

- ▶ Name
- ▶ Address
- ▶ Phone number
- ▶ Insurance company
- ▶ Vehicle make
- ▶ Vehicle model
- ▶ Vehicle registration number

You should also give them your details.

**USE YOUR 'DRIVESAFE EXCHANGE CARD'**

The DriveSafe Exchange Card at the front of this book is a useful icebreaker. In the heat of the moment it is easy to be confused and forget to either provide or ask for relevant information. The card acts as a prompt for you to gather information such as insurance details and relevant information from the other driver. The card you give to the other driver will provide them with your details.

If the vehicle does not belong to the person involved, ask for the owner's name, address, phone number and insurance company.

**TIP: If you are involved in a crash, use the camera on your mobile phone to take a few snaps. It will only take seconds but in the event of a legal dispute your evidence may save you thousands of pounds!**

#### **4.1.7 After the collision**

- ▶ Get a mechanical check as soon as possible.
- ▶ Contact your insurance company. Normally your insurance policy will require you to report a collision, even

if you do not intend to make a claim.

#### **4.2 If you witness a crash**

If you are first at the scene of a crash, remember:

- ▶ Further collisions can, and do, happen.
- ▶ Both victims and helpers – that is you! – are exposed and in potential danger.
- ▶ Fire can be a major hazard.

#### **What to do:**

- ▶ If the incident is serious, dial '999'. It is better for them to receive too many calls than none at all. Give full details of the location and of any casualties.
- ▶ Switch on your hazard warning lights or other lights.
- ▶ Switch off your engine and warn other drivers to do the same.
- ▶ Put out any cigarettes or other fire hazards.
- ▶ Put out emergency warning triangles to warn other motorists, if safe to do so.
- ▶ Making an alarm signal by waving your arms, if possible

holding a brightly-coloured coat or cloth – but make sure you are in a safe position to do this.

#### **4.2.1 Dealing with those involved in the collision:**

- ▶ Do not move casualties unless they are in imminent danger and it is safe to do so. Be especially cautious if you believe they have a head/neck/back injury.
- ▶ If it is safe and appropriate to do so, carefully help uninjured people move to a place of safety. Keep as far back as you can from the road and behind the crash barriers.
- ▶ When an ambulance arrives, give the crew as many facts as you can.

#### **4.2.2 Passing the scene of an incident:**

- ▶ If you are not one of the first to arrive at the scene of an incident, and enough people have already stopped to give assistance, drive past carefully and do not be distracted.
- ▶ If the incident is on the other side of a dual carriageway or motorway, do not slow down to look or “rubber neck”, however much you are tempted. You may cause another incident on your side of the road.
- ▶ Always give way to the emergency vehicles. Watch out for their blue flashing lights, and listen for their warning sirens.



## 5. Road Rage

### 5.1 What is road rage?

'Road rage' is the term used to describe a range of angry, threatening and abusive acts<sup>[21]</sup>. These acts range from the mildest comment about another persons driving, perhaps even behind a closed window, to serious physical assault and confrontation<sup>[22]</sup>.

Aggressive driving is a contributory factor in many crashes on the road<sup>[22, 23]</sup> and it seems that some of us are more prone to angry driving than others. Researchers have shown that younger drivers and men

are more likely than others to carry out aggressive acts such as tailgating, making rude gestures and verbal abuse<sup>[24,27]</sup>.

### 5.2 Characteristics of an aggressive driver.

About 75%<sup>[2,28]</sup> of all drivers have experienced some form of road rage and so most of us will recognise the characteristics of an aggressive driver. They include:

- ▶ Making hand and facial gestures
- ▶ Shouting and screaming, making verbal threats.
- ▶ Hooting and flashing lights
- ▶ Driving at speeds far in excess of safety limits
- ▶ Failing to comply with road signs and traffic signals
- ▶ Swerving, cutting in, tailgating, blocking traffic on purpose
- ▶ Weaving in and out of traffic
- ▶ Breaking unnecessarily or without warning
- ▶ Causing physical injury to other drivers, passengers or pedestrians.

There are a number of successful strategies for avoiding conflict.

**Do!**

- ▶ Make sure that you allow plenty of time for your journey.
- ▶ Give way at busy junctions or where traffic lanes merge.
- ▶ Give yourself time and space to react to others' mistakes.
- ▶ Stop and think. Avoid jumping to conclusions and prejudging people. Was it a genuine mistake?
- ▶ Remember that not all drivers deliberately misbehave. There may have been circumstances which forced the manoeuvre.
- ▶ Remember that other drivers may not know the roads, or where they are going.
- ▶ Remain polite and courteous.
- ▶ Stay calm!

**Do not!**

- ▶ Do not retaliate! This may escalate the situation.
- ▶ Do not allow aggressive drivers to affect your judgement and compromise your safety.
- ▶ Do not make eye contact. It may be perceived as confrontational.

"I would definitely just move over if someone was right behind me. I would because I think it just adds to road rage if you prevent them, and you don't know if it's a Doctor who's dashing somewhere to save someone's life. I think well, hang on a minute, you've got plenty of time, so pull over" - Alice



"I never try to make things a bigger deal than they need to be. If they're going to be silly then I'll just ignore them" - Alex

- ▶ Do not make impolite hand and facial gestures. They may feel insignificant to you but could be the last straw for others.
- ▶ Do not respond by driving dangerously, sudden braking, accelerating or swerving will put you at risk.
- ▶ Do not carry any kind of defensive weapon as it could provoke an assailant in to using a weapon against you and you may end up on the wrong side of the law.
- ▶ Do not try to 'educate' or 'punish' poor driving, as it may result in unnecessary conflict.

You are in control of your response; you can choose not to react!

In the unlikely event that you feel physically threatened, stay in the car and lock the doors. Drive to the nearest police station or if you are unable to move, call for help on your mobile. Use the car's horn or headlights to attract attention from passers-by.

*Always put your own safety first.*

If you witness a particularly dangerous incident, try to take note of the angry drivers' number plate and car and pass the details on to the police.





## 6. Carjacking

### 6.1 What is carjacking?

Car-jacking is a term used to describe the crime of stealing your car, usually while you are still in it. Generally, the thief is armed and the driver is forced out of the car using threats, violence or intimidating behaviour<sup>[29]</sup>. Fortunately, car-jacking is rare in the United Kingdom<sup>[29]</sup>. In fact, it is so rare that the police do not record incidences in their own right, instead they are recorded

as robberies<sup>[30]</sup>. However, it is worth knowing a little bit about, particularly if you are travelling to other countries and hiring a car. Car-jacking is most common in the United States where there are around 38,000 incidents a year<sup>[31]</sup> and South Africa where there are around 10,000 incidents a year<sup>[32]</sup>. Most incidences of car-jacking happen at night and in particular areas of town<sup>[33]</sup>. So, if you are travelling, try to travel during the day time and check with a local which areas you should avoid.

## 6.2 Preventative measures

There are things you can do to reduce the risk of car-jacking.

### *When driving*

- ▶ Keep your doors locked, and the windows closed as much as possible, especially in the city or built-up areas, at traffic lights, in stop-go traffic and when travelling alone.
- ▶ When stopped in traffic, leave a gap in front of you so that you can escape if necessary.
- ▶ Keep handbags, briefcases or anything of value out of reach of open windows.
- ▶ If you are bumped, be suspicious and only stop if accompanied. Otherwise signal them to follow to a safe place such as a garage forecourt or police station.
- ▶ If a car travels alongside you at the same speed, slow down and allow them to pass. If the driver persists, drive to a busy public place and use a public or mobile phone to contact the police.
- ▶ If a car pulls up in front of you and you're forced to stop, keep the engine running.

- ▶ If the driver or passenger gets out and approaches you, and you believe it is with intent to cause harm or injury, turn on your hazard lights, reverse as far as you can and sound your horn continuously. The unlawful use of the horn will be overridden in such circumstances.

### *In a car park*

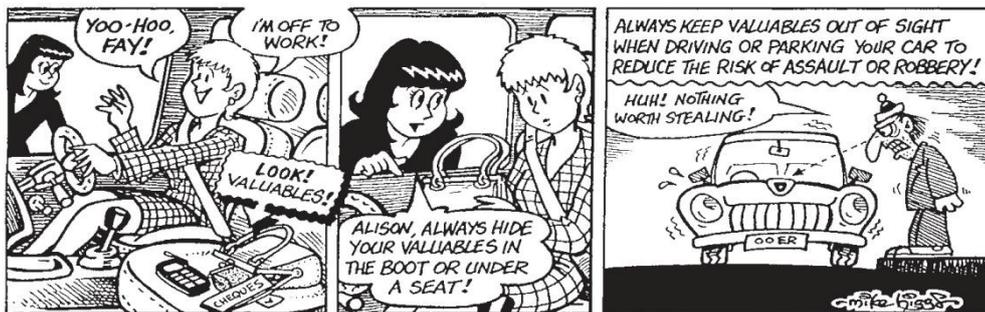
- ▶ Always park in well-lit and busy areas.
- ▶ Ask for a security escort if you are alone and afraid.
- ▶ Be suspicious of people hanging around in car parks.
- ▶ If someone approaches you, run away to a busy area or shout as loudly as possible to attract attention from passers-by. If safe, get into the car quickly and lock the doors.

*If you are ever confronted by a car jacker, put your own safety first. It is better to lose your car than your life.*

## 7. Car theft and vandalism

Car thefts and vandalism are relatively common but there are things you can do to avoid them. Your car is most likely to be stolen or vandalised in the evening or at night<sup>[34]</sup> so by keeping it secure, you will reduce your risk.

- ▶ Lock your car doors and close all the windows when you leave your car.
- ▶ At home, at night, park your car in a secure garage or on a driveway.
- ▶ If you do not have a garage, park in a well-lit place.
- ▶ When you are out and about, use attended car parks. Look for the Parkmark® scheme. These car parks are vetted by police approved assessors.
- ▶ Get an alarm fitted and set it!
- ▶ Use a crook lock or Thatcham-approved immobiliser on older cars.
- ▶ Remove the car stereo and valuables every time you leave your car, even just for a short time.
- ▶ Mark all your equipment (e.g. sat nav & car stereo) with the car registration number.
- ▶ Hide your spare car keys well. About 15% of car thefts are because house burglars steal car keys during the robbery.
- ▶ Try not to leave any valuables in your car. If it is unavoidable keep everything in a locked boot out of sight. Avoid covering items with a blanket or coat. Thieves will know that you are concealing valuables and try their luck.
- ▶ To minimise theft, it can sometimes be useful to carry your laptop in a rucksack or trolley case.



## 8. Feeling threatened

If you feel threatened, try to keep calm:

- ▶ Drive to a well-lit, busy area such as a petrol garage or police station.
- ▶ Stop the car and get out of the vehicle if it is safe to do so and seek assistance.
- ▶ If you do not want to stop or get out, it may be appropriate to alert other drivers to your plight by using your lights and horn. This tactic may discourage the driver who is in pursuit of you. When you are able to park, contact the police and advise them of your situation.

If a vehicle blocks you in and makes you stop, keep calm:

- ▶ Ensure that your doors and windows are locked.
- ▶ Keep the engine running.

- ▶ If you have a mobile phone, call the police immediately.
- ▶ If a driver approaches and you feel threatened try to reverse and seize the opportunity to drive away safely – do not run him/her over!
- ▶ Use your horn and headlights to attract attention – this may distract the perpetrator.

### *Courtesy on the road*

- ▶ Courtesy costs nothing, yet plays an important role in reducing our risk of conflict.
- ▶ Your manners can change a situation in an instant, so set a good example.
- ▶ Try to develop a tolerant, considerate and relaxed attitude towards other drivers and road users.
- ▶ Being courteous will keep you calm and you will be less likely to engage in conflict.





- ▶ Aggression is fuelled by aggression, so a simple smile or polite gesture can make a BIG difference.
- ▶ With traffic levels rising, more courtesy, not less, is required. Saying 'thank you' or 'sorry', with perhaps a hand-wave and smile, can make everyone's driving experience much more pleasant.
- ▶ In the event that you are on the receiving end of someone else's aggression, the safe option is to 'let it go', take a deep breath, stay calm and put your safety first.

Remember: Drivesafe and  
*Arrive Safe*

## 9. Breakdowns

### 9.1 When you break down

If you detect something is wrong with your vehicle, brake gently, indicate left and pull over somewhere safe away from other traffic.

If the fault affects the control of the vehicle:

- ▶ Try to keep as straight a line as possible by holding the steering wheel firmly
- ▶ Avoid braking severely
- ▶ Steer gently towards the side of the road as you decrease your speed.

If possible, get your car well off the road and:

- ▶ Put your hazard warning lights on to warn other drivers.
- ▶ Keep your side lights on, especially if it's dark, or visibility is poor.
- ▶ Do not stand behind your vehicle where you could obscure its lights.
- ▶ Put a warning triangle out, especially if you have broken down anywhere near a bend, or on the brow of a hill.
- ▶ Keep children and animals under control and away from the road.



- ▶ If your vehicle is causing an obstruction, first contact the police and then a breakdown service if you are unable to rectify the fault yourself.
- ▶ Position yourself in a safe place, well away from the road and behind any barriers.



- ▶ Avoid total dependence on your mobile. You might drive through an area where the reception is poor or your battery runs out. Carry spare change as a backup.

## 9.2 Motorways

If you are driving on the motorway and experience problems, stop as close to an emergency telephone as you can. They're usually positioned every 1,000 metres, and the nearest is indicated by arrows on the markers on the hard shoulder.

The Highway Code<sup>[6]</sup> says that when you break down on the motorway, you should:

- ▶ Park the car as far left as possible with the wheels turned to the left.
- ▶ Make sure that your hazard lights are on.
- ▶ Keep sidelights on if the visibility is poor.
- ▶ Leave the car by the passenger door.
- ▶ Leave animals in the car.

### Other useful advice:

- ▶ Remember to take your car keys with you.
- ▶ Use the motorway emergency phone rather than your mobile as they connect direct to the police and indicate your location. The controller will ask for your registration number and what the problem is.
- ▶ Tell the controller if you are a woman alone or travelling with children and/or animals. Priority is given when women and children are involved.
- ▶ Should someone stop close to you whilst you are on

the emergency phone, give the vehicle number and a description of the occupant(s) to the controller

- ▶ NEVER cross the carriageway.
- ▶ When the breakdown truck arrives, to make sure that they are genuine, ask the driver for identification and check that they know your name.

### 9.3 Dual carriageways

Breaking down on a dual carriageway or main road can be more dangerous than the motorway<sup>[1]</sup>, as there are no hard shoulders and very few lay-bys.

If you do break down:

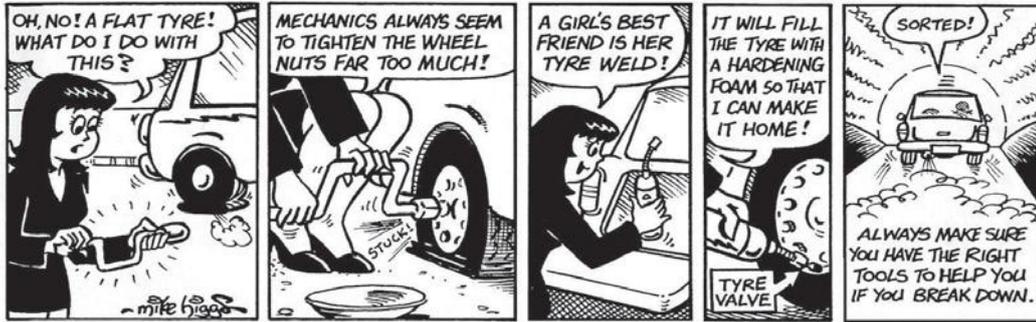
- ▶ Put on your hazard warning lights.
- ▶ Try to get your vehicle off the road and onto the grass verge or into a lay-by.
- ▶ Keep well away from the road.
- ▶ Get children out of the car, but leave animals inside.

### 9.4 Punctures and blow-outs

If your vehicle suddenly becomes unstable or you detect steering problems such as pulling to the side, you might have a puncture or a blow-out.

- ▶ Hold the steering wheel firmly and keep a straight course.





- ▶ Take your foot off the accelerator, move away from other traffic and stop gradually at the roadside.
- ▶ Avoid braking suddenly.
- ▶ Find a hard, level surface on which to park your car.
- ▶ Put on your hazard lights.

If you have to move the vehicle, do so very slowly to avoid further damage to the tyre and wheel.

### 9.5 Changing a wheel

If you need to change the wheel, do so only if you are capable of this operation and it's safe to do so. DO NOT expose yourself to danger. You can always call a breakdown service. Your user manual will tell you where the spare tyre, jack and wheel brace are located and give you guidance on how to go about changing it.



## 10. Fire

There were 44 deaths in car fires in 2008 but over 11,000 accidental car fires<sup>[35]</sup>. Nearly three quarters of the accidental fires were due to poor car maintenance<sup>[36]</sup>. You can reduce your chances of a fire with a little care and attention.

### *Be prepared*

- ▶ Keep your car maintained and serviced regularly.
- ▶ Check your wiring on a regular basis, looking out for wear and tear.

### 10.1 Managing in the event of a car fire.

If your car is on fire:

- ▶ Immediately pull over and turn off the engine.
- ▶ Get everyone out of the car and move as far away as possible. Try to find a safe location behind a barrier or on a motorway embankment.
- ▶ Bear in mind dangers from fast moving traffic, so take care when leaving the vehicle.
- ▶ Dial 999 and ask for the fire brigade and police.

### *Remember:*

- ▶ Do not take risks.
- ▶ Do not try to tackle the fire, let the experts take control.
- ▶ Fire can spread with alarming speed so get yourself and your passengers away to safety. Vehicles can always be replaced, people CANNOT!

*Although fires can happen, they do not happen very often. Knowing what to do and taking steps to prevent them, can help you feel safe and in control.*

# Practical advice

## 11. Driver fitness

Most of us just jump in the car and set off without too much thought but this section asks **ARE YOU FIT TO DRIVE?**

### 11.1 Eyesight

As a driver, good vision matters. It helps you to judge distances, see road signs and signals and avoid making mistakes. The legal requirement for the driving test is that you can read an old style number plate on a stationary



vehicle from 20.5 metre or a new style one from 20m<sup>[6]</sup>. If you need glasses to meet these requirements then you must wear them at all times when driving<sup>[6]</sup>.

Older drivers should also know that as you age, your eyesight is affected. This means that while your distance vision is fine, it may become more difficult to read the dashboard and speedometer<sup>[14]</sup> and you may need to wear varifocal glasses to drive. You may also find that glare from headlights can be a particular problem<sup>[14]</sup>.

If you are badly affected by glare or poor night vision, you may find it easier to reduce driving in poor visibility or at night. Try to plan your journeys so that you arrive home before it gets too dark.

### 11.2 Stress

Stress is not an illness; it is the adverse reaction people have when too much pressure is put on them<sup>[9]</sup>. However, if stress carries on for too long, illnesses can develop. Stress can develop from pressures at home, at work or even when driving. Being aware of how stress manifests itself is important for our overall health as well as our driving safety.

Some of the signs and symptoms of stress<sup>[9]</sup> are:

- ▶ Irritability
- ▶ Anger
- ▶ Anxiety
- ▶ Feeling down
- ▶ Drinking and smoking more
- ▶ Hyperactivity or lethargy
- ▶ Forgetfulness
- ▶ Poor concentration
- ▶ Headaches
- ▶ Nausea
- ▶ Insomnia
- ▶ Sexual problems

If you recognise any of these symptoms in yourself, you should take extra care when driving as feelings of stress can lead to drivers not paying attention properly and making bad or risky decisions<sup>[40, 41]</sup>.

Remember that even if you are feeling stressed, you can still choose to *drive carefully*.

You should also know that stressful events in your life such as marriage breakdowns, separations and divorces<sup>[42]</sup>, illness<sup>[43]</sup> and financial problems<sup>[44]</sup> can also increase your risk of being involved in a

crash and so you should try to take extra care during difficult times in your life. Sudden events such as family arguments, receiving bad news or being involved in an accident may also affect your ability to drive safely. It might be better to cancel your arrangements or wait until you feel better before jumping in the car.

Jane: If I'm feeling stressed, I like put Classic FM on.

### 11.3 Alcohol

Drink driving kills around 10 people per week and another 50 are injured<sup>[1]</sup>. Almost one third of all fatal accidents on the road involve drivers with alcohol in their system and one in five road deaths involves a driver over the legal drink drive limit<sup>[45]</sup>. Alcohol seriously impairs judgement and slows down our ability to react and function as normal<sup>[46]</sup>. The legal limit is 80 mg of alcohol per 100 ml of blood. However, drivers with much less than the legal limit (around 50 to 80 mg of alcohol per 100 ml blood) are around twice as likely to crash and six times more likely to be

in a fatal crash<sup>[46]</sup>. It is better not to drive at all if you have had a drink.

Any driver who has been found drinking whilst driving risks fines, disqualification and possible imprisonment, not to mention the risk of killing or maiming either themselves or others and possibly losing their livelihood.

If you intend to drink:

- ▶ DO NOT DRIVE
- ▶ Make alternative arrangements to get home. You could call a taxi, use public transport, get a lift with a friend or colleague who hasn't been drinking; or even arrange to stay overnight in a hotel or with a friend.
- ▶ Be aware that you may still be over the limit to drive even the following day.

Depending upon the degree of intoxication, alcohol can take up to 24 hours to clear your system.

**Remember: driving and alcohol can be a lethal cocktail.**

#### 11.4 Drugs

Although the number of drink driving offences is falling, drug driving incidences are increasing<sup>[1,45]</sup> and can be just as dangerous. Almost one fifth of people killed in road crashes have traces of illegal drugs in their system<sup>[46]</sup>. Drug driving is illegal and carries the same penalties as drink driving. Different drugs have different effects but some common effects<sup>[47]</sup> include:

- ▶ Slower reaction times
- ▶ Wandering concentration and attention



- ▶ Erratic and aggressive driving
- ▶ Nausea
- ▶ Hallucinations
- ▶ Paranoia and panic attacks
- ▶ Misjudged speed and distances

### 11.5 Prescription drugs

Prescribed medications may also affect a person's ability to drive. Medicines can affect the driver's ability to see, to concentrate, to remember, to make decisions and to take action<sup>[48-50]</sup>. In the worst case, some types of medicines have been linked with a higher rate of crashes, particularly in older drivers. For example, some drugs used to treat anxiety increase the risk of crashing by up to five times<sup>[48, p8]</sup>.

It is not just prescribed medicines that you need to be careful with as a driver. Over-the-counter drugs including antihistamines which are used to treat allergies and hay fever have also been linked with feeling drowsy<sup>[49]</sup>.

Generally, older people are more affected by medicines than younger drivers<sup>[48]</sup> and should take extra care when driving.



It can take longer for most medicines to "clear" the system as you get older<sup>[48]</sup> and this means that older drivers might need to think carefully about whether to drive, even the day after taking their medication.

Although medicines can make us feel better, if you are taking prescription or over-the-counter drugs, you should always check with your doctor or pharmacist that it is safe to drive. Even if the drugs do not have much of an effect alone, in combination with existing illnesses and other prescriptions, it might be worth while considering whether you are fit to drive<sup>[48]</sup>.



## 12. Family driving

### 12.1 Child safety

It is the driver's responsibility to ensure that children under 14 years of age wear a seat belt. Babies and young children should be secured in an appropriate car safety seat until they are either 135 cm in height or 12 years old<sup>11</sup>. After this, they should use the adult seat belt. Failure to do this can result in a fine of up to £500, or worse if the matter goes to court. The law also applies to people who transport the public such as private hire, taxi and coaches.

#### *Do:*

- ▶ Make sure that the child is the right size for the seat.
- ▶ Try car seats before you buy as not every seat fits every car.
- ▶ Ensure that the seat is properly fitted.
- ▶ Buy a seat and/or restraint to the latest standard (UN ECE Regulation 44.04) as they give better protection.
- ▶ Check that the restraint is securely fastened around the child. The belt should be tight but comfortable.
- ▶ By the age of two, many children will have worked out how to undo the seat

belt buckle but you can buy safe-clip products which are tamper proof.

**Tip:** Isofix is a method of fitting the child seat directly into your car without using a seat belt. It reduces the risk of incorrect fitting.

**Do not:**

- ▶ Do not use a second hand car seat unless you can guarantee that it has not been involved in an accident.
- ▶ Do not use a rear-facing infant carrier on the front seat with an active airbag.
- ▶ Never leave children alone in a car.

Children can get bored and irritable, particularly on long journeys, so take along some sensible toys and games to keep them occupied and remember to take regular breaks.



## 12.2 Expectant mums

Driving can be uncomfortable when you are pregnant. It can be difficult having to sit still for long periods of time and putting on a seat belt. You can ease any seatbelt discomfort by making sure your seat belt is correctly positioned. Place the lower strap over the hipbones below your bump and the upper strap above your bump and over your shoulder as normal. For extra comfort you could place a soft piece of cloth between your body and the seat belt.

## 12.3 Older drivers

As we age, it is normal for us to worry that our driving abilities may change. However, getting older does not necessarily mean that we have to give up driving. In fact, older drivers have far fewer crashes than younger drivers, but their increased frailty makes them more likely to be seriously injured<sup>[4]</sup>. Research shows that older drivers who give up driving too soon or without planning alternatives are at risk of restricting their mobility which may lead to loneliness and depression<sup>[52]</sup>. There are a few things that older drivers can

do to reduce their risks:

- ▶ Have regular eye-sight checks.
- ▶ Make sure that you can hear properly – otherwise you may miss emergency sirens and other important noises.
- ▶ Be aware that your medication or certain combinations of medication can affect your driving<sup>[48]</sup>. If in doubt, ask your doctor!
- ▶ Keep on top of your vehicle maintenance. Older people may take longer to react to hazards<sup>[53]</sup> and so having super sharp brakes could give you extra time.
- ▶ Change your driving habits! You could choose to travel on safer routes, or at safer times, for example between rush hours. You could also combine several trips into one longer journey<sup>[2]</sup>.
- ▶ If you struggle to read complicated road signs quickly enough, or with directions, take a helpful passenger with you to navigate<sup>[2]</sup>.
- ▶ Remember, planning your journey may help you to feel safer and stay in control!

## 13. First aid

This section is a simple guide to the essentials of first aid at an incident. We strongly advise that you attend a recognised First Aid Course to gain an appropriate qualification before carrying out first aid on members of the public. If you do carry out emergency first aid, you should have adequate insurance protection. In the event that you find a casualty, you are advised to contact the emergency services immediately or get competent help from a medical professional.



### 13.1 First aid kit

A first aid kit can come in very handy. Ready made kits come in different sizes ranging from compact wallets to plastic boxes. However, you can make your own easily but remember to carry it in a waterproof container.

Some essential items are:

- ▶ Sterile bandages
- ▶ Plasters
- ▶ Scissors
- ▶ Tape
- ▶ Safety pins
- ▶ Plastic gloves

Remember to replenish any items you use and safely dispose of used dressings. As an emergency first aider you must not administer medication.

### 13.2 Helping a casualty

If a person is injured, you must first carry out a primary assessment of the scene. This can be remembered using the phrase DR'S ABC<sup>154</sup>

**D**anger *Before diving in to help, you should assess the danger to yourself and others. You are your first*

priority as a first aider. The ambulance crew want as few patients as possible and so you should look out for potential problems or dangers. This might include glass, fire, other vehicles, or electrical hazards.

**R**esponse You need to check how your casualty is responding to you. Can they hear you? Are they talking? Will they respond if you ask them to open their eyes?

**S**hout! Get someone to help you. They may be needed to ring the emergency services.

**A**irway Check the casualty's airway. Look in their mouth for obvious obstructions such as chewing gum, false teeth, vomit or a tongue that has fallen back. Be gentle in removing any obstructions in case of head or neck injury. If they are unconscious, tilt their head back and lift their chin to open their airway.

**B**reathing Look, listen and feel for breathing. Does it sound normal? Or is it heavy, slow or laboured? If the casualty is conscious, ask them how their breathing feels. Keep checking on it until help arrives. It may change! If the casualty is not breathing, you need to ring 999 immediately and start CPR. If your casualty is conscious and breathing and you are dealing with other injuries, go back every two minutes to

check on your casualty's breathing.

**C**irculation Look for signs of bleeding. If someone is bleeding, apply firm pressure to their wound using a clean pad or bandage. Secure a pad with a bandage or length of cloth. If a limb is bleeding but not broken, lie the casualty down and raise it slightly above heart level. Keep an eye on your casualty for signs of shock.

#### **DO NOT:**

- ▶ Move a casualty unless absolutely necessary. This can complicate some injuries.
- ▶ Give medication.
- ▶ Give anything to eat or drink.

### **13.3 Reassurance**

As an untrained emergency first aider, possibly the most helpful thing you can do is to provide reassurance. You should:

- ▶ Avoid moving the casualty and instead sit with them and calmly reassure them.
- ▶ Keep the casualty comfortable and warm.
- ▶ Try to make sure that they are not left alone.



#### **14. Responsibilities**

It is important that you are aware that you have legal responsibilities when driving. You must:

- ▶ Be properly licensed and fit to drive
- ▶ Ensure that your vehicle is registered, insured, taxed and MOT'd
- ▶ Ensure that you drive with due care and consideration for other road users and in accordance with traffic rules and regulations



## Conclusion

*I hope that you have found DriveSafe useful for you and your family.*

*This book is based soundly on driver behaviour research conducted at Aston University and we hope that it will help you not only stay safe on the roads but also enjoy your driving experience and feel secure and in control of any difficulties you may encounter.*

*Although we hope you never have to use it, the driver exchange card in the front pocket, could prove helpful as a reminder of the information you need to collect in the event of an incident. You can download more copies from our website [www.drivesafe-staysafe.co.uk](http://www.drivesafe-staysafe.co.uk). If you have any comments on how we can improve DriveSafe or stories you'd like to share, we would love to hear from you!*

*DriveSafe!*

*Fay*

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## DriveSafe Research

A recent study at Aston University helped more than 90% of drivers who took part to change their driving for the better. Some drivers were concerned about driving in some circumstances such as on motorways or in busy traffic, others had lost confidence while some found that they were getting angry with other drivers and felt a little out of control. If you feel like this, perhaps you would also like some help to change. The exercises the group took part in are given below.

1. First review the 'DriveSafe' book at your leisure. This book contains factual information about driving risks and how you can improve your safety and driving confidence.
2. The next step is to think carefully about when you feel most vulnerable as a driver and to decide if there is anything that you can do to make yourself feel better. You may feel vulnerable in certain locations or when people are driving poorly around you. People often feel vulnerable when driving under challenging circumstances, e.g. in bad weather (snow, fog, ice, heavy rain), in unfamiliar towns, on busy roads, on motorways, at rush hour or at night.
3. Next, think of a situation where you have successfully driven when you felt vulnerable and then write down the factors that were most important in getting you to your destination safely. Example: You might have gone on holiday to a new place and had to find your way. The most important things might have been planning your route on the internet beforehand or programming a sat nav system. You might also have thought about taking regular breaks to make sure that you didn't get too tired.
4. Now decide if there is anything that you can do to make yourself feel better when driving. Examples: It may be that planning your

route before you set off would help. Or, you might like to take a friend or family member to help read maps if you are driving through a strange place. You may feel anxious when someone acts aggressively towards you and so you may want to try ignoring poor driving instead of reacting to it.

5. If there are things that you would like to change about your driving behaviour, please write them down here. Some examples of the goals you might set are below, but do make your own to fit your circumstances:
- a. I will drive on the motorway twice this month with a friend/family member.
  - b. I will ignore and not react to another driver's poor driving at least once this week.
  - c. When I visit a new place this month, I will plan the route properly before I set off.

## **My Goals**

### **About setting goals**

Under no circumstances should you set goals that over-stretch your capabilities. You should not attempt to do anything that you feel uncomfortable with, or that you consider may be dangerous for you. The idea of goal setting is to make you safer as a driver and not to put you at risk. Your goals should be beneficial to you.

It may help you to achieve your goals if you prepare an action plan. This states where, when and how you will achieve your goal(s). These plans are for your benefit and you can put as much or as little into them as you want.

**Step 1:** Think about your goal and write down when, where, how and with whom you will try to achieve it.

### Example

- Goal:** Drive on the motorway at least twice this month.
- When:** This Thursday and next Tuesday.
- Where:** On the way to work, between junction 3 and 4 of the M54.
- How:** I will let Angela drive until we get to the services before junction 4 where we can safely stop and swap over. I will drive between junction 4 and 3 of the M54 at a steady speed.
- With whom:** I will travel with Angela because she will be helpful and supportive.

**Step 2:** It may also help you to write down anything that might stop you from achieving your goal and how you will overcome these obstacles.

### Example:

Barriers	Strategy
Angela may not want to stop and swap over if we are running late.	I will speak to Angela on the telephone before hand to make arrangements and we will leave 10 minutes earlier than usual.
If it rains I would be too worried.	I will try again the following week when the weather is better.

Now think about your own goals and prepare your action plan.

**Goal:**

When:	
Where:	
How:	
With whom:	

Barriers	Strategy

*Good luck in reaching your driving goal!*



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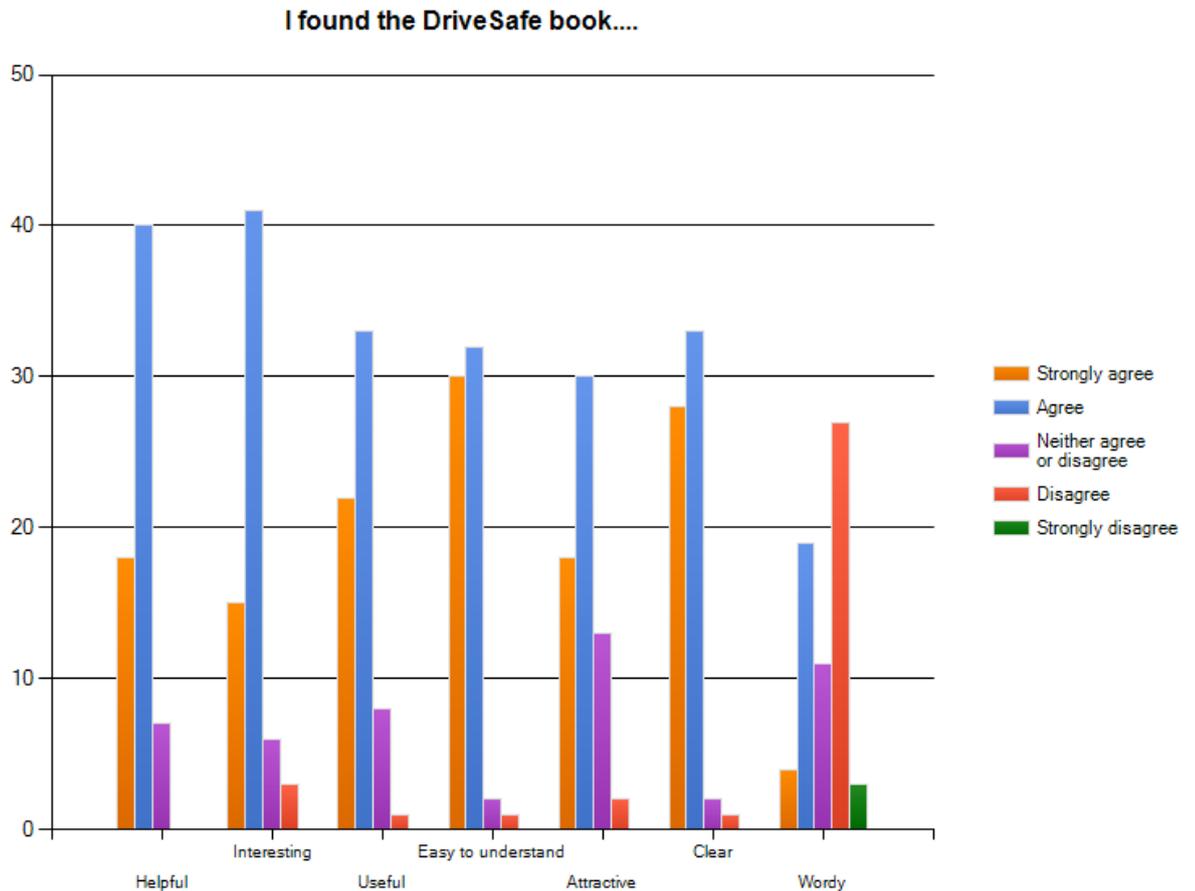
Aston University

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## APPENDIX D – DRIVESAFE FEEDBACK & AMENDMENTS

## DriveSafe Book Feedback

During the course of the intervention, participants were asked what they thought of the Drive Safe book. The results are shown in Figure 1. Values on the Y axis are the proportion (percentage) of the sample reporting that they agreed with each category.



Of the 65 people who reviewed the book, 89.2% believed that it was helpful, 86.2% thought that it was interesting, 86% said that it would be useful to them, 95.4% believed that it was easy to understand and clear, 76.2% thought that it was attractive, and 29.7% agreed that it was ‘wordy’ with another 46.9% suggesting that it was not.

### **Most Useful Section**

Participants were asked which part of the book they most liked. 56% said that they appreciated the section on dealing with incidents including accidents and aggression best, 8% said that the maintenance section was most useful and 8% said that information on managing the driving environment was best. The remaining 25% of participants were divided between family driving, first aid, driver fitness and your route or simply said that the whole book was very good.

### **Least Useful Section**

Next, participants were asked which part of the book they found least useful. Only 30 people answered this question. Of these, 10% found driver fitness least useful and 16% thought maintenance was not helpful (although some said that they were fully proficient anyway). The others believed that the section on European travel (16%) and family driving (10%) were least helpful. Again people suggested that these were just not relevant to them at the moment, that they did not travel abroad or did not have a family or young children.

### **Other Comments**

Finally, participants were asked whether they had any other comments about the book. With the exception of one comment, these were all very positive, stating that the book was informative, useful and helpful. A couple of participants made suggestions for additions to the book. The comments are listed below.

- All drivers should be issued with a guide like this!
- Very good, informative book
- Very good book! Maybe include a card to put current insurance and breakdown details on.
- Could perhaps give details of driving courses you can go on e.g. advanced driving. Can you do a course for driving in snow/ice? Names contacts of organisations that run courses
- Probably one of the best essential books I've read. I like the range of pictures and large text and layout. Its good because you can look at a glance and still gain info required or you can read it in depth yet without feeling tedious. I like the combination of character pics and its easy to remember these longer. I also liked the real life pictures as it makes you feel included.

- A good guide that is worthwhile but a bit repetitious and reads a bit like the highway code. Best parts are the checklists of dealing with aggressive drivers, what to do in accidents and personal safety.
- Funny book. Liked the cartoons.
- Very useful and complements other handbooks
- This book would be useful for people who've just passed their test. Maybe as well as a pass certificate, the examiner should give a copy of this book too.
- Good book for new/inexperienced drivers
- Very helpful
- Helpful book
- Drivesafe card in the pocket is particularly useful as a guide in an incident
- Very clear and easy to read
- Valuable book to keep in the car
- Car maintenance was least useful as I am fully versed and used to doing this
- Overall a useful guide. Covers points and important information which cannot be found in the theory test book or highway code
- I liked the print size even though my eyes are good! I didn't notice a section on observation. Excellent booklet!
- Add - disengage ESP when driving in snow. Will help to avoid skidding tendency.
- Having the card for information in a crash is very useful. Reminder lists are good. The book is nicely printed and easy to read. Cartoons are really cute and attractive. Perhaps a bit more information on signage would be good.
- Jolly good book!
- A lot of this was just reiterating what I learned a few years ago but it was good as a refresher
- Very well written in easy to understand language
- Thanks for the book!
- Interesting book and I'll be glad to keep it for reference
- Generally good guidance throughout the book
- Very well written
- A very clear and informative book
- A useful book to keep and read from time to time
- All quite useful
- All useful for inexperienced drivers
- Useful guide for new drivers
- Many of the tips are corny at best, or patronising at worst.

## **Proposed Amendments to the DriveSafe Book based on Feedback**

Page 6: Remove the design comment (“plus photo of boot with items in”) from TIP.

Page 5/6. Section 1.4.3. Snow. Add “Disengage ESP when driving in snow”.

### **Proposed Text of addition to the book regarding the driving intervention study**

A recent study at Aston University helped more than 90% of drivers who took part to change their driving for the better. Some drivers were concerned about driving in some circumstances such as on motorways or in busy traffic, others had lost confidence while some found that they were getting angry with other drivers and felt a little out of control. If you feel like this, perhaps you would also like some help to change. The exercises the group took part in are given below.

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3. The first step is to think of a situation where you have successfully driven when you felt vulnerable and then write down the factors that were most important in getting you to your destination safely. Example: You might have gone on holiday to a new place and had to find your way. The most important things might have been planning your route on the internet beforehand or programming a sat nav system. You might also have thought about taking regular breaks to make sure that you didn't get too tired. You can use this space to note down anything you think is important about your experience.

4. The second step is to decide if there is anything that you can do to make yourself feel better when driving. Examples: It may be that planning your route before you set off would help. Or, you might like to take a friend or family member to help read maps if you are driving through a strange place. You may feel anxious when someone acts aggressively towards you and so you may want to try ignoring poor driving instead of reacting to it.
5. If there are things that you would like to change about your driving behaviour, please write them down here. Some examples of the goals you might set are below, but do make your own to fit your circumstances:
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**With whom:** I will travel with Angela because she will be helpful and supportive.

**Step 2:** It may also help you to write down anything that might stop you from achieving your goal and how you will overcome these obstacles.

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If it rains I would be too worried.	I will try again the following week when the weather is better.

Now think about your own goals and prepare your action plan. There is a blank sheet you can use on the next page.

**Goal:**

**When:**

**Where:**

**How:**

**With whom:**

<b>Barriers</b>	<b>Strategy</b>

**Good luck in reaching your driving goal!**