Department for Transport

## Road Safety Web Publication No. 18

# The Development of Children's and Young People's Attitudes to Driving: A Critical Review of the Literature

Kevin Durkin[1] and Andy Tolmie[2]
[1]School of Psychological Sciences and Health,
University of Strathclyde
[2]Department of Psychology and Human Development,
Institute of Education, University of London

September 2010

Department for Transport: London

Although this report was commissioned by the Department for Transport (DfT), the findings and recommendations are those of the authors and do not necessarily represent the views of the DfT. While the DfT has made every effort to ensure the information in this document is accurate, DfT does not guarantee the accuracy, completeness or usefulness of that information; and it cannot accept liability for any loss or damages of any kind resulting from reliance on the information or guidance this document contains.

Department for Transport
Great Minster House
76 Marsham Street
London SW1P 4DR
Telephone 0300 330 3000
Website www.dft.gov.uk/pgr/roadsafety/research/rsrr



ISBN 978 1 84864 103 7

# CONTENTS

# EXECUTIVE SUMMARY

The overall purpose of this report is to provide a critical review of the literature on the development of children's and young people's attitudes to driving and being a car passenger. The aim is to synthesise existing evidence to help policymakers better understand how, when and to what extent they can target the development of road use skills in children as they move from being a pedestrian and cyclist to being a driver and passenger.

It is well established that young novice drivers, especially if they are male, are at greater risk of accidents than any other group. Extensive research has addressed a range of factors that might help explain this association, in order to inform attempts to mitigate risk. However, relatively little of this research has been concerned with the pre-driver period, and the influences that might extend from this into becoming a driver. This is despite the fact that: (a) age and gender differences in the risk pattern rule out any simple account in terms of inexperience; and (b) the elevated risk among members of this group emerges too rapidly to be due solely to behaviours acquired at that point. What work there has been on the pre-driver period has tended, moreover, to focus predominantly on attitudinal processes to the exclusion of other types of influence. It has also lacked a developmental orientation aimed specifically at considering continuity and change over the transition to becoming a driver. The existing literature, therefore, presents a restricted basis for understanding the influences that might be operating over this whole period, and thus planning for interventions at the pre-driver stage.

This review is intended to generate a fresh approach, building on what is known from past research, but integrating it within a wider developmental perspective. This approach rests on three fundamental assumptions:

1. The acquisition of the skills required to interact safely with traffic, and of the ability and motivation to deploy these strategically, is a lengthy process starting in childhood.
2. None of these elements are static, but change over time, among drivers as well as children and adolescents.
3. There needs to be consistency between the accounts of pre-driver influences on novice driver behaviour, and those regarding the changes that occur as novice drivers grow into mature drivers: at the very least, related processes must be at work throughout these shifts.

The starting point for the review was provided by the report of Strecher *et al.* (2007a) on the psychosocial predictors of driver behaviour, and the possibilities for pre-driver interventions with regard to these. Seven types of factor were identified in this way:

- attitudes;
- perceived threat and perceived benefits of driving in a particular way;
- norms;
- personality;
- identity;
- task difficulty; habit.

To these were added wider contextual influences, and the effects of education and training. These different types of factor were then used as the source of literature search terms in relation to novice drivers and pre-drivers. In addition, a wide-ranging consultation was undertaken to identify relevant 'grey' literature (reports, etc.) not likely to be turned up by searches of online databases. Next, the findings with regard to the impact of each type of factor on novice drivers were summarised, to provide an overview of what is known about the characteristic sources of problematic behaviour at this stage. Potential developmental issues were then identified, along with their policy implications, informed by both the pre-driver literature and wider developmental research. During this process, it became apparent that adolescence was the probable key period of pre-driver influence.

The key conclusions for each of the areas addressed in this way are as follows:

## Attitudes and affective beliefs

In adults, the relationship between attitudes and behaviours is complex and subject to other influences. In pre-drivers, the relationship is complex, subject to other influences, **and is changeable over time**. Of course, during this period attitudes cannot bear directly on driving behaviour, but they may bear on other aspects of road behaviour, and they may contribute part of the context in which young people progress towards driving. Importantly, at present, the evidence on the stability of attitudes and affective beliefs across the pre-driver and novice driver periods is scant and inconclusive. Some degree of continuity seems likely, but it is also probable that the extent of this continuity is dependent on the effects of personality, identity and contextual influences (peers, parents). Some changes come about as part of broader developmental changes in social reasoning (e.g. the tendency to question authority in late childhood and adolescence). We need more research into how the patterns shift over the course of adolescence. The likelihood that there are changes during this period highlights a major opportunity for intervention.

### *Policy implications*

- Targeting general attitudes towards driving and road safety is unlikely to be of broad effectiveness.

- Education and interventions aimed at pre-drivers should target specific behaviours in specific contexts by specific types of individuals.
- Much remains to be done to determine how best to deliver the relevant messages.
- Pre-drivers' ambivalent attitudes about cars and driving suggest an area for effective intervention, though more work is needed to identify specific points of tension that might prove productive.

## Perceived threats/perceived benefits

Drivers are influenced by perceptions of both risk and benefits, but many drivers, especially novice drivers, fail to perceive risk realistically. There are also individual differences in orientations to risk. Male drivers tend, on average, to take risks more than female drivers. Young drivers take more risks. Risk management in driving entails an array of perceptual, cognitive and emotional skills. Acquiring these skills begins in early childhood, but develops over a long period. Children's judgements of risks as pedestrians are often inadequate into early adolescence, and children show indications of subscribing to risk compensation bias and optimistic bias; there is some evidence that they share these erroneous perceptions with their parents. Recent research into adolescent brain development indicates that the skills required for risk management are likely to be still developing through the teens. Adolescents approaching the age where they could seek a driving licence may also be both more prone to emotional over-reaction in risky environments and less able to suppress appealing actions. Risk-taking is a natural part of adolescent development, but some teenagers are more prone to it than others, and some develop lifestyles of multiple risk-taking. These patterns, established in early to mid-adolescence, are significant precursors of risky driving and crashes in early adulthood.

### *Policy implications*

- Simply providing people with 'cold' information about risky practices is unlikely to lead to substantial changes in behaviour.
- Informing pre-drivers about risks may nevertheless make a contribution to longer-term orientation towards driving.
- Education and intervention should give careful attention to perceived benefits of safe driving because these can outweigh perceived risks.
- Scant research exists to inform our understanding of these processes and to guide modes of intervention.

## Subjective norms

Norms are perceived conventions or standards of behaviour, which fall into two principal categories: descriptive norms (perceptions of what others typically do) and injunctive norms (perceptions of what others want you to do). Descriptive norms create a pressure to conform, to be like one's peers; injunctive norms create a pressure to satisfy someone else's standards, to avoid disappointing others. Evidence indicates that adult drivers are influenced by both types of norm. Different people, and different peer groups, may have different norms. For example, some male peer groups share norms according to which speeding is considered a regular form of behaviour. Children become gradually aware that societal norms exist and that they govern different aspects of our behaviour. In respect of learning the norms associated with road use, children's primary learning experiences are likely to stem from their own activities as pedestrians, cyclists and passengers, though little research has been conducted to examine how they extract norms from their experiences or how they change with cognitive and social development. However, by definition, norms are social phenomena – they are perceptions shared and transmitted among groups – and this signals the role of important others, especially parents and peers, the former over a long period of time. Norms are closely interwoven with forming a sense of identity, itself a complex and sometimes volatile process of adolescence, in which different standards can be salient at different times.

### *Policy implications*

- Parents are an important long-term influence on young drivers' behaviour, and there is a need to encourage parents to reflect on what messages they send to their children about driving and road safety.
- Information and education should include efforts to identify and publicise the positive behaviour of adolescents and young drivers, and to portray peer norms as pro-safety.
- Promoting a greater sense of the role change associated with passing the driving test may help activate 'sleeper effects' from parental norms, and greater resistance to negative peer influences.

## Personality

There is extensive evidence from studies of adults that personality characteristics such as sensation-seeking, external locus of control, impulsivity and aggressiveness are predictive of risky driving; in contrast, the attributes of altruism, anxiety, and conscientiousness tend to be associated with safer driving. These personality characteristics tend to be detectable quite early in life and be associated with behaviour in traffic environments as early as the preschool years. High-quality longitudinal research reveals early emerging risk profiles and stability of difficulties

across childhood into early adulthood. It is very difficult to intervene to change people's personality. However, personality is not absolutely rigid, it does not account for all of the variance in driver behaviour, and there is evidence of development – including increases in conscientiousness and emotional stability – in early adulthood. Some evidence indicates that this period can be an important period of change for males, with responsible driving integrated with other changes in personal responsibilities.

### *Policy implications*

- Any policies concerning pre-driver education should take into account that a 'one size fits all' approach will not map onto the characteristics and needs of all members of target groups.
- Targeting driving risk alone would not meet all of these young people's problems, and cross-Departmental/multi-disciplinary collaboration is therefore essential for developing strategies to tackle early emerging and long enduring indicators of problem behaviour.
- Most teachers could provide a preliminary identification of children in their care with problematic characteristics, but there are educational, ideological, ethical, and possibly legal issues to be taken into account in formally identifying children as 'at risk'.
- People who grow up to commit low to moderate levels of driving violations are better able to regulate their own behaviour and are more amenable to guidance.

## Identity

Forming an identity is a fundamental aspect of development, of particular significance through adolescence and early adulthood. An individual's sense of identity, including desired self-image, can bear importantly on his or her attitudes towards road behaviour. For many adults, driving and car ownership are important components of their identity. Identity development is a broad process extending from childhood to adulthood. Among children, self-identities are associated with attitudes towards risk in pedestrian decision-making. In turn, self-identity factors are correlated strongly with a general measure of risk-taking and with attitudes towards pedestrian behaviours. During adolescence, the prospects of achieving driver status and possessing a particular type of vehicle – and driving it in a particular way – become motivating for many. Gender identity is strongly linked to how young people equip and express themselves as road users. Driver status and vehicle attributes tend to be particularly important to young males and closely interwoven with aspects of male gender role identity, such as autonomy, power, and bravado.

### *Policy implications*

- Information, education and training for pre-drivers should be formulated in ways which are sensitive to adolescents' preoccupations and motivations with regard to identity.
- Attempts to modify identity during mid to late adolescence, in particular, are emotionally arousing and often rejected.
- Interventions aimed at encouraging younger pre-drivers to define themselves in a particular way may be more effective.
- Consideration should be given to the image(s) of drivers and driving that pre-drivers acquire and the ways in which different parties (parents, peers, media) contribute to these.

## Task difficulty and skills

There is a key distinction, implicit in much previous research, between social and cognitive processes relating to driving ability. Social processes are concerned with perceived ability and perceived demands, as coloured by socially-driven self-conceptions, and act primarily as influences on the intention to drive in a particular way. Cognitive processes are concerned with actual competences and skills, and act as influence on moment-to-moment decision-making during driving. These processes interact with each other, but for novice drivers (especially those who are younger and for whom driving marks a major social change) social processes are more dominant, partly because they have yet to attune themselves properly to the task of driving and to attend to relevant feedback. This is particularly the case where belief in personal ability is already high, as adolescent male identity often requires, leading to more challenging and riskier styles of driving that are resistant to moderation via experience. Since greater skill and higher levels of self-monitoring and self-regulation are associated with safer behaviour, one way to counteract this social dominance during the pre-driver period would be to promote better hazard perception (the most transferable aspect of skill, and one of the most central to safe driving) and encourage greater personal responsibility for skill development.

### *Policy implications*

- More research is needed on the relationships between skill and perceived ability at different stages of the driving career, and on what promotes shifts towards self-regulated skill development.
- Training in road crossing and cycling, as well as pre-driver training, should emphasise self-regulated learning and make reading the road a central concern.

- Those responsible for driving instruction and testing should bear in mind the distinction between driving skill and actual driving behaviour, with the latter being influenced by social processes relating to identity.
- The tension between the social and cognitive dimensions of driving ability should be exploited by promoting awareness of the real nature of driver competence, and its equivalence to other desirable skills.

## Habits

Whether or not people carry out a behaviour is often predicted by whether or not they have done so in the past, i.e., whether the behaviour has become habitual. In driving, both positive (putting on seat belts, checking mirrors) and negative (overtaking in the wrong lane, failing to signal) behaviours can become habitual. Many variables affect habit formation, and there is also evidence that habits can be modified. People can scarcely form driving habits before they begin to drive, but they may form habits that become the backdrop to some of their later behaviours on the road. At a very general level, an individual could develop a habit of seeking risk or being cautious; patterns of inattentive behaviour established during childhood may be hard to relinquish when one becomes a driver. Some driving habits may be acquired vicariously through watching one's parents or other significant drivers. Much environmental road policy is designed to influence drivers' and pedestrians' habits, and there is evidence that it can be effective. We need to learn more about driving-related habits formed in childhood and how stable they are.

### *Policy implications*

- Habits are concrete activities and are therefore open to specific interventions ('Clunk click', 'Think before you drink before you drive'), but much remains to be done to determine effective ways of doing this.
- Parents should be reminded about the impact of their own habits in the course of role modelling.

## Contextual influences

From their earliest experiences of road use and vehicles, pre-drivers are exposed extensively to the behaviours and values of others. Parents have a particularly prominent influence as driver role models, as sources of information and values. Peers are important for similar reasons. In both cases, influence could be negative or positive. The contributions of the mass media are open to speculation, but certainly worthy of attention because of their pervasiveness and their potential scope to represent, or misrepresent, driving norms. In respect of all of these potential contextual influences, it is important to bear in mind that social psychological processes are two-way: the messages and values that pre-drivers may extract from

the world around them will themselves be interpreted selectively, according to the individual characteristics, needs, and motivations of the young person.

### *Policy implications*

- Strategies focused on pre-drivers alone will fail to address key influences.
- Adolescents approaching driving age should be provided with guidance in evaluating others' safety levels and in how to raise concerns about others' driving.
- Parents are the most promising contextual influence for intervention, and there is therefore a need to develop strategies to enlist parents in pre-driving and early driving education/supervision.
- The majority of young people aspire to be safe drivers, a point which should be emphasised and built upon in educational and intervention strategies.

## Education and training of pre-drivers

Education about safe road use needs to begin early in life, to be sustained in developmentally appropriate ways, and to involve more than just pre-drivers themselves. It would be inadequate simply to focus on attitudes and/or factual information because these alone do not reliably predict behaviour. It is already established that driver education is often ineffective, and sometimes counterproductive; work with pre-drivers needs to be aware of these challenges and to examine ways to address the preconditions of learning to drive. Reflecting the complexity of the developmental processes, educational and intervention strategies need to be multifaceted, and to involve more than just pre-drivers themselves. Parents, peers, media and formal educational settings may all play important roles, and a range of evidence exists to inform educational strategies.

### *Policy implications*

- There is no 'silver bullet' that will ensure the safe and responsible behaviour of all young drivers. Simply providing factual information about risk and safety will make minimal contributions. Concentrating on vehicle handling skills fails to address higher level factors that influence young people approaching the age of learning to drive.
- A more realistic aspiration is to develop broad ranging, but specific, strategies that take into account the multiple influences on the development of young people's orientations towards driving.
- One overriding task to which pre-driver education should contribute is the fostering of a safety culture with respect to road behaviour, by encouraging

parental role modelling, discouraging the association of images of risky driving with masculine identity, and enlisting positive youth attitudes towards driving responsibly.

- Interactive media, extremely popular among young people, could be exploited in schools to support pre-driver education.
- There is a pressing need for research to inform educational interventions, implementation trials, and careful evaluation of short-, medium- and long-term outcomes.

## Conclusion

The current research literature provides partial answers to the important questions with which we began. There is a lot of good quality research that provides information and offers explanations of aspects of development in these respects; this report has attempted to draw together what we do know. It has also become clear that there is much that we do not know and we conclude that this is an area in pressing need of new research. It is a truism that no adult exists who was not previously a child; what happens in childhood has enormous implications for what happens in adulthood. It is also a truism that no driver exists who was not once a pre-driver: we need to learn much more about the complex processes of development that link these stages.

# 1 INTRODUCTION

The overall purpose of this report is to provide a critical review of the literature on the development of children's and young people's attitudes to driving and being a car passenger. The aim is to synthesise existing evidence to help policymakers better understand how, when and to what extent they can target the development of road use skills in children as they move from being a pedestrian to cyclist and to passenger and driver.

The report was commissioned by the Road User Safety Division in the Department for Transport.

## 1.1 Background

It is well established that young drivers are at greater risk of accidents than any other age group. Recent data from the UK, for example, indicate that approximately 1,200 young drivers were killed or seriously injured annually on UK roads – more than three every day (CEA, 2009). Extensive research, summarised in later sections of this report, has addressed myriad factors believed to help explain this association and to inform attempts to mitigate risk in young drivers. Not surprisingly, the bulk of this work has been concerned with people in their early driving years – typically (with slight variations according to local specifications in licensing age requirements) aged 16 to around 20. However, becoming a driver is not a sudden experience, completely unrelated to the young person's prior experiences, skills, behaviour and attitudes.

Acquiring the range of fundamental psychological **skills** and **knowledge** required in order to interact with traffic, together with the ability to deploy these **strategically** in different traffic situations, is a lengthy developmental process that begins early in life (Tolmie *et al.*, 2006; Thomson *et al.*, 2006). As well as skills and knowledge, children's attitudes and expectations bear on the ways in which they engage with traffic environments. Less is known about the development of these, but research indicates that attitudes to safe driving emerge well before any formal driver training takes place and that these lay the foundations for adult attitudes and behaviours (Organization for Economic Development, Waylen and McKenna, 2002). It needs also to be borne in mind that the relationship between attitudes and behaviour is complex, and this is at least as true in the course of development as it is in adulthood.

Over the period from the pre-school years to their teens, children have extensive direct and indirect opportunities to acquire information about drivers and driving. Some of this information, and the associated attitudes and emotions, may in turn be incorporated into young people's own expectations and practices as novice drivers. Yet, surprisingly, little is known of how children perceive drivers, how the

understanding of drivers' perceptions, competencies and limitations develops, and how variations in development and self-awareness flow through to influence individual differences in early driving performance.

## 1.2 Aims and objectives of this commission

### *1.2.1 Aims*

The primary aims of this project are to review and synthesise research on children's and young people's concepts of driving, and to identify when and how to address effectively their safety through road safety education and training interventions. The review covers child and adolescent pedestrian behaviour and perceptions of/ assumptions about drivers and driving. It considers how other aspects of young people's experiences (including as a pedestrian, cyclist and passenger), reasoning, and everyday practices may bear on their approaches to becoming autonomous drivers.

### *1.2.2 Objectives*

The objectives of the project are:

- to summarise and synthesise the relevant research findings;
- to identify the key issues in the development of understanding of, and attitudes towards, the driver's role, and the behaviour of driving;
- to examine the acquisition and development of attitudes in the course of pre-driving road uses, including being a pedestrian, a cyclist or a passenger;
- to discuss the implications of this work for the transition to early driving; and
- to provide directions for future research.

## 1.3 Defining 'pre-driver'

The term 'pre-driver' could potentially designate any person who has not yet become a driver (i.e. including adults who have not yet learnt to drive). Because researchers have conducted relevant studies with varied age ranges, we do not impose a rigid cut-off point at a particular age. However, for the purposes of the present review, our focus is defined slightly more narrowly on young persons who have not yet learnt to drive, either because they have not reached the minimal legal age to acquire a driving licence or because, while old enough to meet legal requirements, they have not yet begun to drive. In effect, this means we are interested in developments from the pre-school years to around age 20 – a small part of the lifespan, but a very large period in developmental terms.

Within this, our primary (though by no means exclusive) focus will be on early to mid-adolescence. This is partly for the obvious practical reason that this is the

period in which the prospects of becoming a driver are increasingly imminent for many young people, partly because this is a period of important developmental changes in numerous factors that bear on driving, and partly because this is likely to be a critical period for effective pre-driver education.

## 1.4 Why development?

Why take a developmental approach to the study of pre-drivers' attitudes, perceptions, expectations and behaviour? Developmental psychology is the scientific study of the processes of psychological change as human beings age. It is a wide-ranging field, which investigates, among other things, the acquisition of understanding and skills, the progress of behavioural competencies, the development of social relationships, and the construction of identity. It takes account of biological changes within the organism, cognitive developments as the young person interacts with the environment, and social processes as people of varying developmental statuses (e.g. children and parents, adolescents and their peers) interact to influence ways of viewing the world and to co-ordinate behaviours.

All of these processes bear importantly on the development of driving. A fundamental assumption of a developmental approach to this topic is that adolescent attitudes/behaviour arise within a lengthy developmental context and are subject to continuing onward change.

A developmental perspective leads to an attempt to set attitudes/beliefs/understanding/behaviour about aspects of driving in a longer-term perspective. The kinds of questions this prompts include: Where did they come from? How were they formed? What is their status at a given point? How do they interrelate? How might they change (or be changed) in the future?

Thus, a further motivation for a developmental approach is that it informs understanding and planning with respect to education and intervention. It is critical that systematic programmes take into account the developmental histories, status and likely progress of their recipients.

Research into other areas of the development of health-related behaviours shows that radical changes occur in many young people between childhood and adolescence. For example, most primary school children are well aware of the dangers of smoking and tend to regard the practice with considerable negativity (Porcellato *et al.*, 1999), yet many adolescents take up smoking. Most primary school children dislike the taste of alcohol and hold negative connotations of its uses and its psychological consequences (Cameron *et al.*, 2003), yet most adolescents take up drinking, many to excess. Thus, the developments of adolescence need to be understood not only as new activities or practices in response to immediate influences, but also as departures from previously strongly held beliefs.

During adolescence, young people are undergoing dramatic changes in their cognitive capacities, their hormonal and emotional regulation, their relationships with parents and peers, their orientation to society and their sense of personal identity (Durkin, 1995; Keating, 2007; Shope, 2006). For example, Shope points out that adolescents have different sleep patterns and needs from adults, not least a tendency to wake up later in the morning, but the practical arrangements of their lives (e.g. school attendance or work requirements) may lead to early morning start times. Young people are coping with hormonal fluctuations and high energy levels, a desire to become less dependent on parents, strong motivations to engage with peer communities, the temptations of legal and illicit substances, and the need to define who they are (Durkin, 1995; Keating, 2007; Shope, 2006). All of these factors have extensive implications for the development of pre-drivers and early drivers, as will be discussed in fuller detail in later sections of this report.

## 1.5 Structure of the review

A key challenge confronting a review of research into the development of pre-driver perceptions, attitudes and behaviour is that these and related topics have been studied extensively in novice drivers, but far less so in children and early adolescents. Nevertheless, the available research on novice drivers is very relevant to our task because it illuminates the phenomena that are salient at this developmental period. This enables us, in turn, to consider what is known, and what needs to be known, about their antecedents, earlier in development.

Hence, our broad strategy has been to focus initially on psychosocial issues that have been identified as important factors in the behaviour of novice drivers. These form the basis for the main sections of the report. In each section, we summarise first the main findings concerning novice drivers, with a particular emphasis on those that reflect developmental issues. Then, we proceed to consider the developmental implications, drawing where possible on road-user research that has been conducted with participants below driving age and also on related aspects of developmental psychological research. Finally, in each section, we propose a set of policy recommendations.

In identifying the relevant issues we draw substantially, though not exclusively, on a report by Strecher *et al.* (2007a) identified key psychosocial targets for safe driving behaviour in adolescents and reviewed prospects for intervention in terms of this framework. With reference to major theoretical models of health-related behaviour and the empirical literature on novice driver characteristics, the authors specified two inclusion criteria:

1. that the factors should strongly predict safe driving behaviour; and
2. that they should have programmatic utility for intervention strategies (that is, that they have the potential for change and are viable targets for intervention).

The psychosocial factors proposed by Strecher *et al.* (2007a) are: affective beliefs, perceived threat, perceived benefits of unsafe driving, subjective norms, personality, identity, task difficulty, and habit. We share Strecher *et al.*'s view that these should be foremost targets for analysis and intervention, and hence we see our developmental approach as complementary to their account. However, two complementary themes are also very salient when a developmental approach is taken. One of these, namely contextual influences (especially, parents, peers and the mass media) bears on each of the above. The other, education, flows naturally from any consideration of how pre-drivers develop, what influences the course of development, and – typically of great practical interest – what can be done to promote the development of a healthy orientation towards road safety and driving. Contextual influences and education are not psychosocial factors akin to those identified by Strecher *et al.*, and, indeed, since education is considered primarily here in terms of its potential for intervention, it is included as an appendix, rather than as part of the main body of the report (see Appendix 1). However, they are both important potential influences, and are therefore also addressed. Finally, we present a summary of gaps in our knowledge that call for further research.

Our approach was further shaped by a series of research questions that could be identified *a priori* as important both in explaining the development of pre-driver perceptions, attitudes, and behaviour, and in formulating policies and strategies for intervention. The **key research questions** are as follows:

1. When and how do children and young people develop their attitudes and beliefs to driving, riding and being a passenger, and how are these related to their subsequent driving behaviour?
2. What aspects of skills and attitudes acquired from pedestrian and cyclist behaviour are likely to extend to early performance as a driver, and what is the probable strength of the influence of these?
3. What factors, including perceptions of peer behaviour, promote or inhibit the growth of risk-taking during later childhood and adolescence, and how far do patterns of risk-taking and of cautious behaviour generalise across different contexts, including those relating to traffic environments?
4. How far is vicarious experience of the driving behaviour of parents and older siblings, and their statements about that experience, influential in shaping child and adolescent perceptions of drivers and driving, and what evidence is there to suggest that these influences follow through to later personal behaviour?
5. How far are media presentations of the nature of driving influential in shaping conceptions of the social identities associated with driving, and to what extent is novice driver behaviour an enactment of such social identities?
6. How can the attitudes and beliefs of children and young people to driving be influenced, by whom, and how can this be measured?

7. To what extent can children and young people be influenced to have more positive (safe) attitudes to being a driver, rider or passenger of a motor vehicle?

We stress at the outset that, while there is an abundance of good quality empirical research on many aspects of pedestrian behaviour in childhood and on the attitudes and behaviours of novice drivers, there are also many gaps in our knowledge. Part of the purpose of this report is to identify those gaps, to indicate where extant knowledge can provide at least a starting point from which to address them, and to propose directions for future research.

Taking these considerations into account, then, leads to the following sections to this report:

- Attitudes and affective beliefs (Section 2).
- Perceived threat/perceived benefits (Section 3).
- Subjective norms (Section 4).
- Personality (Section 5).
- Identity (Section 6).
- Task difficulty and skills (Section 7).
- Habit (Section 8).
- Contextual influences (Section 9).
- Conclusions – key questions and future research directions (Section 10).

In each of Sections 2 to 9, we begin with an explanation or definition of terms, followed by a summary of what is known in respect of the relevant phenomena in adult drivers. We turn then to the developmental issues, and review what is known of how the processes and experiences of childhood and adolescence contribute to the emergence of the adult phenomena. At many points, we conclude that what is known is insufficient, and we indicate where further research is needed. Each section ends with a summary of policy implications. In addition, we include an appendix on issues relating to the education of pre-drivers (Appendix 1), which follows the same structure. The methodology used to conduct the review is described in Appendix 2.

# 2 ATTITUDES AND AFFECTIVE BELIEFS

Attitude is a widely used concept in everyday speech and in scientific research, but it is a somewhat pliable concept, used in different ways by different sources. For the purposes of this report, we define **attitude** as a positive or negative evaluative stance towards an object, behaviour, practice or rule.

As will swiftly become clear, it is an oversimplification to assume that individuals have singular, unitary attitudes towards particular phenomena or issues. We tend to have an array of beliefs in any given area, each of which can be associated with positive or negative evaluations. For example, a driver might hold the beliefs that (a) it is a good thing that traffic police are essential to ensure safe and efficient uses of the roads, (b) it is a bad thing that traffic police are rarely there when needed (e.g. to control reckless and incompetent drivers), and (c) it is deplorable that traffic police who stop me for speeding are unfair revenue-raisers. Each of (a) to (c) is a belief accompanied by an affective reaction. These are referred to as **affective beliefs** (e.g., Lawton *et al.*, 2007)Importantly, an individual can hold multiple and even contradictory affective beliefs about the same topic. The influence of attitudes is therefore determined to some extent by whichever specific beliefs seem most salient under given conditions (this will not remain uniform), and the combined strength of the evaluations associated with those beliefs.

Attitudes are problematic. To the layperson, it seems obvious that there is a strong connection between attitudes and behaviour: it is natural to assume that, if an individual holds favourable attitudes towards road safety, then he/she will be an exemplary driver. In fact, though, decades of social psychological research have failed to find much support for the belief of a strong, predictable link between attitudes and behaviour. At best, they have been found to be only weakly associated.

In an effort to explain why the influence is weak, contemporary research typically portrays attitudes as an **indirect** influence on behaviour, which operates by helping to shape people's intentions to act in one way or another (Ajzen and Madden, 1986). The impact of attitudes on **actual** behaviour is limited for three reasons.

First, intentions are rarely completely translated into action. This is most commonly because external factors intervene to bring about other reactions. A driver might 'intend' to keep within the speed limit, but, finding that traffic delays have made her late for work, she accelerates when on a clearer stretch of road. Compromises between intention and reality are most likely in the moment-to-moment adjustments demanded by driving.

Second, attitudes are only one of a set of influences on intentions (Ajzen and Madden, 1986, Terry *et al.*, 1999a). Other influences include the following:

- Perceptions of personal ability – for example, an individual's attitude that speeding is reprehensible may have less influence over his driving behaviour than his perception that he can handle a car well at 80 mph.
- The perceived attitudes of others (subjective or injunctive norms) – a person's attitude may be that drivers should leave a safe distance from the car in front, but her driving behaviour may reflect the fact that she perceives drivers behind as expecting her to move closer to the vehicle ahead.
- The behaviours that others exhibit (descriptive norms) – one should stop at amber, but everyday observation leads to the recognition that most other drivers do not.

In the present context, these points give rise to three questions concerning attitudes during the pre-driver period:

1. What evidence is there that attitudes/affective beliefs, as opposed to some other related influence, are actually important determinants of driver behaviour, especially as regards riskier actions?
2. What sources of influence can be identified with regard to the acquisition of affective beliefs in the pre-driver period?
3. How stable are attitudes over time (in particular, is there evidence that attitudes/affective beliefs acquired in the pre-driver period will carry over into novice driving)?

## 2.1 Attitudes and affective beliefs as determinants of driver behaviour

Strecher *et al.* (2007a) argue that attitudes and beliefs are a relatively stable influence on driver behaviour, and that they help to determine the level of risk that individuals are prepared to accept. As already stressed, the relationship between attitudes and behaviour is not invariably straightforward. To take one example, research by Corbett (1995; Corbett and Simon, 1999) identified four different driver profiles in respect of reactions to the installation of speed cameras: 'conformers' (normally complied with speed limits on the survey road and so cameras would make no difference), 'deterred' (reduced their speed on the survey road to avoid detection), 'manipulators' (slowed down on approach to cameras and accelerated once away from them), and 'defiers' (continued as before, driving well above the speed limit). Notwithstanding very different behavioural choices, all types – including the manipulators and defiers – professed attitudes in favour of cameras.

Even if attitudes towards risk are relatively stable, the circumstances in which drivers actually operate can render attitudes more or less accessible. Drivers are unlikely to carry a stable view about risk around with them, which is always present in their mind, to the same extent. Consideration of risk may come to the foreground

of consciousness under some circumstances (e.g. driving on a wet motorway at night under crowded conditions), while on many occasions (e.g. a quiet Sunday morning on a country road) it may not be in drivers' minds at all (Midlands Partnership Group, 2006).

At the very least, then, the influence of attitudes would appear to be an uncertain one. The implication is that the circumstances are in many ways more critical than individual drivers' attitudes, and that, in particular, it is **collective** affective beliefs and consequent intentions and actions that are the proper target of attention. In line with this, Terry *et al.* (1999a) found that, for those who attached great importance to their social group, group norms were as strong an influence on intention as individual attitudes. Viewed from this perspective, the distinct pattern of attitudes towards driver violations exhibited by, for example, drink-drivers relative to the general population (Baum, 2000) takes on a potentially new significance, particularly if they tend to socialise with each other.

The key point here is that, if there is some underlying characteristic that ties affective beliefs about disparate behaviours together, it is a misnomer to call this an attitude, in the sense that this term is technically defined. It may be more appropriate to refer to a general orientation. That is, a driver will have a general orientation towards, for example, road safety that will be reflected in various ways. Any attitudinal statements that she or he endorses are part of this, and each in turn will be associated with affect, but also important are the driver's practical ways of behaving when behind a wheel, the extent to which she or he is responsive to perceived norms, her or his personality and sense of identity. We stress that these variables are not necessarily always perfectly aligned (a general orientation can be multifaceted and ambivalent). This means that attempts to understand driver behaviour in terms of attitudes alone, or to improve behaviour simply by targeting attitudes, are inadequate.

In sum, the answer to our first question above concerning whether attitudes are important determinants of driver behaviour is that attitudes and affective beliefs certainly need to be taken into account as partial determinants, but it is important to recognise that the attitudes–behaviour relationship is complex. For this reason, attitudes need to be examined in relation to a host of other psychosocial and contextual factors, including skills, knowledge, experience, habits, norms, personality and identity. This is true of adult drivers and may be even more so of pre-drivers, whose developing orientations towards road safety are influenced by many variables, as we shall discuss in subsequent sections of this report.

## 2.2 Developmental issues

We have stressed that attitudes alone cannot explain safe and unsafe driving behaviour. In children, as in adults, the relationship between attitudes and behaviour is inconsistent. For example, Berg and Westerling (2001) found that a clear majority

of secondary school pupils in a Swedish sample held attitudes in favour of wearing cycling helmets and believed that they were important for their safety; however, most of the children had abandoned wearing helmets.

Nevertheless, there is evidence of **some** formative influence of attitudes on intention and thence behaviour during the pre-driver period. Examining the relative influence of different variables among 12–15-year-olds on 11 cautious and risky pedestrian behaviours (e.g. waiting for the green man, running through gaps in the traffic), Tolmie *et al.* (2006) found that those who held more positive attitudes towards risk, and more negative attitudes towards caution, were indeed more likely to take risks. However, the strength of the association was never more than moderate. Moreover, further analysis showed that attitudes were typically related to self-identity, and that the latter was the stronger influence on intention. They found also that self-identity was strongly related to peer behaviour, and that it showed a progressive shift towards risk-taking with age, in line with a shift in the perception of peers as being more likely to take risks. Tolmie *et al.* concluded that attitudes were primarily a manifestation of underlying self-identity.

Other studies also point to ambivalent and multifaceted attitudes among pre-drivers. For instance, the Midlands Partnership Group (2006) report much excitement among adolescents about the prospect of car ownership and driving, linked in part to anticipation about its impact on personal popularity, especially, for males, in terms of potential girlfriends (see also Waylen and McKenna, 2002). Yet, among a sample aged up to 14 years, Lupton and Bayley (2001) report distinctly negative perceptions of cars and car drivers:

> When asked what they found to be dangerous on the road invariably a child's immediate response was 'the drivers'. Excessive speed was identified as the main problem. Drivers were often described as crazed, lunatics, maniacs, drunk or drugged and in some cases drivers were 'out to get them'. Most children complained about drivers who were impatient or careless. Young drivers were often singled out to be the main culprits particularly if they drove 'flash' cars or played very loud music and children tended to avoid them. They were also wary of drivers using mobile phones.
>
> (Lupton and Bayley, 2001; p. 10)

Again, it seems that when it comes to formulating a personal orientation towards driving, the basic premise for many adolescents is that it is a very attractive pursuit. At the same time, many perceive the behaviour of (other) drivers as dangerous and unacceptable. In this respect, adolescents appear to be acquiring self-enhancing attitudinal biases that are comparable to those of some adult drivers, namely the belief that 'I am safe and others are dangerous', or 'I am an above-average driver' (Deery and Fildes, 1999; McKenna *et al.*, 1991; Svenson, 1981; Walton, 1999).

Qualitative evidence reported by the Midlands Partnership Group (2006) indicates that, not only do adolescents as a group have conflicting attitudes, but individuals show awareness of ambivalence in their own and others' orientations towards driving:

> 'I don't know why, but every single lad wants one, because of the speed. It's like an adrenalin rush in a way. It's just like going on a roller coaster to some people.' [Boy 14]
>
> versus
>
> 'It's all right sometimes when it's a straight road and if you see what you're doing it's all right, but when it's speeding around these banana bends, I don't like it.' [Boy 14]
>
> and
>
> 'You think "I've passed my test, I'm going to go out", and you go out to impress your mates and stuff, you just have a laugh, it just goes out of your head, all these things that could happen, you just don't think about them.' [Boy 15]
>
> versus
>
> 'My sister had all her lessons and the day she passed her test she took me out, she was like "Oh my God, it's so weird not having someone next to you that can stop the car at any point like an instructor", and then it dawned on me how scary that would be, you were the only one in control of that car.' [Girl 16]
>
> (Midlands Partnership Group, 2006; pp. 140–143)

While it is hard to ascertain from these data how far these different perceptions reside within the same individuals, taken together the evidence is strongly suggestive of ambivalence borne of the contrast between identities and related attitudes that have collective origins (i.e. which reflect socially desirable identity), and those that derive more directly from actual experience and insight, particularly where this has been more negative in character.

These findings raise the possibility of a lack of integration of affective beliefs about driving among adolescents. Adults experience ambivalence, too, but have had more opportunity to work at integration (Higgins, 1987). In concrete terms, adults have had to reconcile their awareness of the positive and risky features of driving, whereas pre-drivers and novice drivers may have heightened perceptions of both, leading to states of psychological dissonance. At present, these are speculations based on qualitative data and they point to the need for additional quantitative

research. However, if confirmed, then this would suggest that personal experiences during this more fluid period of development, and the affective beliefs that derive from them, may serve as a potential lever for influencing future perceptions and behaviour.

These contrasting findings point to early adolescence as an important period for the impact of personal experiences and exposure to norms. Young people are still acquiring information and formulating values, and are sensitive to the attitudes of significant others, including peers and parents. That said, little systematic work has been done on the stability or otherwise of affective beliefs over the pre-driver and novice driving period, and on the factors that precipitate change. We suggest that more extensive evidence on the social cognitive processes of this period would be both informative in its own right and of direct relevance to intervention strategies.

At the same time, it is important to be aware of continuities. There are some indications of enduring patterns, for example, in respect of gender differences in attitudes to risky behaviours (including risky driving) from childhood to early driving. Waylen and McKenna (2002), using primary school, pre-driver and novice driver samples, report consistent tendencies across this age range for males to have more positive attitudes to different kinds of risk, and to exhibit behaviours consistent with these attitudes. If, as mentioned above, affective beliefs are heavily influenced by personality and associated innate characteristics, then this pattern is unsurprising, since factors of this kind would be expected to show a good degree of stability.

### *2.2.1 Development of attitudes to authority*

Learning to follow the rules of road safety (including formal safety information, such as the Green Cross Code, the Highway Code) and to respect the roles of key figures ('lollipop' persons, traffic wardens, police officers) are part of the process of learning how to use the roads that begins in childhood. Relatively little research appears to have been directed to the relationship between learning about these concepts and children's general developmental adjustment to authority. There is a very large literature on children's development of moral understanding (Killen and Smetana, 2006) and a growing literature on children's understanding of society and its components (Barrett and Buchanan-Barrow, 2005), but these do not yet appear to have been drawn upon in relation to road safety.

We note here some key considerations. First, children's understanding of rules and morality is a complex process that begins in the pre-school years and develops gradually through childhood into adolescence (Durkin, 1995; Kohlberg, 1969; Turiel, 1983). While there is dispute over the details, there is broad agreement that young children tend simply to see (and to accept) most adults as authority figures, though by around age five or six they recognise the special status of people who wear uniforms (Durkin and Jeffrey, 2000; Powell *et al.*, 2008). During middle childhood, the understanding of rules and of moral constraints expands, though

often children's understanding is different from adults. For example, they do not always understand hierarchies of authority (Berti and Bombi, 1988). At this stage, they are increasingly likely to question rules – especially, as most parents discover, when children perceive the rules as unilateral (applying to them, but not to their parents). Thus, if parents issue a dictate such as 'Always cross at the crossing, and wait for the little green man', but rarely practise the advocated behaviour themselves, then eight-year-olds will tend to pick up on the discrepancy and may regard it as inequitable.

Second, there are some important shifts in reasoning about authority during adolescence (Kohlberg, 1969; Turiel, 1983). By this stage, understanding is more elaborate, but still not on a par with adults in many respects. However, the ability to question authority is high. Many adolescents – especially boys – tend to resent authority and are hostile to figures such as the police (Ceci e*t al*., 2005). Hence, the relevance of attitudes to road safety is strong (though, as far as we are aware, little investigated): adolescents may be developmentally prone to rejecting the kinds of rules that are imposed in road environments and to scepticism/dislike of the people who enforce them (police, traffic wardens). This is not to say that all adolescents are irremediably and profoundly hostile to traffic authorities, but to suggest that the developmental processes of this phase place them in a different position to younger children in this respect.

Third, attitudes to the rules governing driving may well be linked to children's broader attitudes towards schools and testing. For example, Christmas (2008) found that some pre-drivers regarded the driving test as part of the 'system' and something to be dealt with as quickly as possible.

## 2.3 Attitudes and affective beliefs: summary

In adults, the relationship between attitudes and behaviours is complex and subject to other influences. In pre-drivers, the relationship is complex, subject to other influences, **and changeable over time**. Of course, during this period attitudes cannot bear directly on driving behaviour, but they may bear on other aspects of road behaviour, and they may contribute part of the context in which young people progress towards driving. Importantly, at present, the evidence on the stability of attitudes and affective beliefs across the pre-driver and novice driver periods is scant and inconclusive. Some degree of continuity seems likely, but it is also probable that the extent of this continuity is dependent on the effects of personality, identity and contextual influences (peers, parents). Some changes come about as part of broader developmental changes in social reasoning (e.g. the tendency to question authority in late childhood and adolescence). We need more research into how the patterns shift over the course of adolescence. The likelihood that there are changes during this period highlights a major opportunity for intervention.

## 2.4 Policy implications

- Targeting general attitudes towards driving and road safety is unlikely to be of broad effectiveness. Research shows that most people will profess favourable attitudes towards safety, but their own behaviour may contradict this, radically in some cases.
- Education and interventions aimed at pre-drivers should target specific behaviours in specific contexts by specific types of individuals (identified by personality/social identity/gender/age).
- It should not be assumed that pre-drivers can be 'inoculated' against the later formulation of unsafe attitudes and behaviours, but it is nonetheless desirable to promote positive attitudes throughout this period, though much remains to be done to determine how best to deliver the relevant messages.
- It follows that some interventions may be effective for some individuals, but almost irrelevant to others. For example, there are good grounds for targeting speeding behaviour in young males; the techniques and imagery exploited in reaching this audience may be perceived as less directly relevant by their female counterparts.
- Evidence that pre-drivers are likely to hold ambivalent attitudes about cars and driving suggests an area for effective intervention in young people. Young people see both attractions and threats in becoming autonomous road users. More work is needed, however, to identify specific points of tension between received notions and actual experiences that might prove productive, and ways in which these tensions might be amplified to engender more responsible assessments of the nature of driving.
- This work on ambivalence might have more impact if perceptions and stances at odds with risk-taking had an associated identity that was regarded as 'cool', too. This suggests a need to look at popular adolescent identity and role models to identify potential possibilities (we turn to this in Sections 6 and 10).

# 3 PERCEIVED THREAT/PERCEIVED BENEFITS

As Strecher *et al.* (2007a) summarise, most of the major theories of health-related behaviour give central place to the construct of perceived threat. The broad assumption is that the extent to which an individual perceives a negative outcome as possible will influence his or her relevant behavioural intentions. A driver who anticipates that running a red light would probably result in a collision should be less likely to proceed than one who thinks that there is a safe temporal margin before the intersecting light turns green.

The perceived severity of the outcome is also expected to be taken into account. A cyclist who believes that falling off her bicycle will lead at worse to a grazed knee should be more willing to speed downhill than would be another who anticipates that a fall could lead to broken limbs and serious head damage.

Human behaviour, including health-related behaviour, is also motivated by perceived benefits. There is little doubt that driving itself offers benefits, but still more pertinent for present purposes is evidence that some people may perceive benefits in **risky** driving. As Strecher *et al.* (2007a) point out, the benefits of risky driving may occur frequently and they are likely to be experienced closely after the relevant behaviour, thereby maximising their reinforcement potential. Thus, the psychological computations that road users undertake – the weighting of risk, severity of outcome, possible protective factors, possible rewards – are important foci for road safety researchers.

## 3.1 Perceived threat and adult drivers

The available research with adult drivers establishes, not surprisingly, that there are individual differences in orientations to risk (Beyth-Marom *et al.*, 1993; Corbett and Simon, 1999; Fuller *et al.*, 2006, 2008; Musselwhite, 2006; Vassallo *et al.*, 2007). Overall, male drivers are more likely to take risks than female drivers, though there are variations within gender, too (Baxter *et al.*, 1990; Corbett and Simon, 1999; Vassallo *et al.*, 2007). Older drivers tend to be lower risk takers than younger drivers (Baxter *et al.*, 1990; Corbett and Caramlau, 2006; Musselwhite, 2006), though, again, there are variations within age group.

It is well established that, overall, young drivers take more risks and are disproportionately likely to be involved in accidents (Arnett, 1990; Arnett *et al.*, 2002; Clarke *et al.*, 2005; Fergusson *et al.*, 2003; Jonah, 1990). Fergusson *et al.*, with a sample of 907 21-year-old New Zealand drivers, found that over 90% reported having committed some risky driving behaviours during the past three years, the most common being speeding and driving within four hours of having consumed alcohol. Smaller percentages reported very high-risk behaviours such as street racing (11%) and deliberately running through red lights (8.3%).

There are also subtype differences among young drivers. Clarke *et al.* (2005) report that young drivers of high performance cars are significantly more likely to take speeding risks. Deery and Fildes (1999) identified two relatively high-risk groups of young drivers, one characterised by high levels of driving-related aggression, competitive speed, sensation seeking and hostility, and another with low levels of emotional adjustment and high levels of depression, resentfulness and irritability. These subtypes had lower levels of driving skill than other young drivers.

Understanding that driving is associated with risk is much more than a matter of recognising that 'accidents can happen'. Deery (1999) points out that it entails skills in hazard perception, attentional control, managing time allocation across different components of vehicle management, and calibrating the relationship between one's ongoing performance and changing task demands. In each respect, novice drivers tend to be inferior to experienced drivers (Deery, 1999; Harré, 2000). Furthermore, novice drivers may compound risk by selecting an option which is itself risky for any driver (e.g. speeding), but which they are able to handle less skilfully than a more experienced driver; in turn, they may be more prone to overestimate their own skills in coping with the unnecessarily high demands that their risk taking incurs (De Joy, 1992; Harré, 2000). Young drivers tend to underestimate the risk entailed in various driving conditions (Bragg and Finn, 1982; Harré, 2000; Matthews and Moran, 1986).

Research on the perception of risk has demonstrated that many adults sustain perceptual biases, most notably an optimistic bias whereby they assume that their risk of mishap or injury is lower than it actually is, and a self-enhancement bias, whereby they assume that their skills are superior to average (Deery, 1999; Strecher *et al.*, 2007a). For example, White *et al.* (2004) found that drivers who used their phone while driving felt that they were less likely to have an accident than other drivers committing the same offence.

Young drivers appear to be particularly vulnerable to these biases. There is evidence that optimistic bias is stronger in young people, especially young males (Clarke *et al.*, 2005; Harré, 2000; Matthews and Moran, 1986). Similarly, self-enhancement bias is found in most age groups, but young drivers are particularly prone (Deery, 1999; Harré *et al.*, 2005; McKenna and Horswill, 2006). They tend to overestimate their ability to handle in-vehicle devices such as audio systems, climate control, mobile phones and satellite navigation equipment, and are more likely to be involved in distraction-related accidents (Sarkar and Andreas, 2004; Neyens and Boyle, 2008; Stutts *et al.*, 2001).

## 3.2 Perceived benefits

Several studies have provided evidence that some individuals do perceive benefits in risky driving (Harré, 2000; McKenna and Horswill, 2006; Møller and Gregerson, 2008; Strecher *et al.*, 2007a). Obvious benefits include arriving at one's destination

faster by speeding, the satisfaction of taking revenge on another driver perceived to have transgressed in one's space, or the arousal of handling a vehicle under pressure. Many young drivers, especially young males, are particularly attracted to the thrill of speed (Arnett *et al.*, 1997; Clarke *et al.*, 2005; Fuller *et al.*, 2008).

Perceived benefits may outweigh perceived risks (McKenna and Horswill, 2006; Parsons *et al.*, 1997). McKenna and Horswill (2006), in adult samples, found that concern about accident involvement was the worst predictor of risky driving. The best predictors out of the factors examined were legal constraints and journey time. Mood and thrill seeking were also good predictors of risk taking behaviour.

Møller and Gregerson (2008) surveyed over 4,000 young drivers (18–25 years) about the frequency of their risk taking while driving, their beliefs about the psychosocial functions of driving, and their leisure-time activities. Nine psychosocial functions of driving were assessed: practicality in everyday life; independence; seeing friends easily; status; freedom; becoming an adult; adventure with friends; blowing off steam; and get any place. Each of these was significantly related to a level of self-reported risk-taking behaviour. Among the leisure-time activities, being interested in cars, acting as a chauffeur for friends and driving with friends for fun were associated with higher scores on risk taking.

## 3.3 Developmental issues

### *3.3.1 Learning about risk*

Becoming aware of hazards in the environment is part of a long-term developmental process (Beyth-Marom *et al.*, 1993; Morrongiello and Lasenby-Lessard, 2007). Very young children perceive only the most immediate threats to their physical wellbeing and, as every parent knows, by no means all of them. In the course of childhood, accumulated experience, increasing cognitive abilities and increasing access to information lead gradually to fuller but still often incomplete or inaccurate awareness of risks. In the context of road use, for example, even in late childhood and early adolescence, judgement of crossing gaps or entry points are inadequate (Connelly *et al.*, 1998; Plumert *et al.*, 2004; Tolmie *et al.*, 2006).

Children may learn to respond to wearing safety equipment by increased risk compensation (Morrongiello *et al.*, 2007). This is a familiar phenomenon to analysts of road-user behaviour. Risk homeostasis theory (Wilde, 1998) holds that individuals maintain an acceptable level of risk and that, if the risk is moderated in some way (e.g. by the intervention of a safety restraint) then they adjust some other aspect of their behaviour to restore the acceptable risk level. While this model is controversial and it is uncertain how extensively children's behaviour conforms to the predictions of risk homeostasis theory (cf. Pless *et al.*, 2006), it is very plausible that patterns of balancing risk/preferred behaviour are established in the course of development.

Morrongiello *et al.* (2007) found that children (ages 8 to 11) offered a range of reasons to explain why wearing a helmet when bike riding would be protective, all of which indicated a risk compensation bias. These included suggestions that they were more competent when wearing safety gear ('Because when you are wearing a helmet you have more balance'), or that they were invulnerable ('Because you just wouldn't fall off your bike or get injured'), or that the protection would reduce injury severity in the face of an accident ('Because if I fall, I wouldn't get hurt as much if I wore a helmet').

Interestingly, Morrongiello and Major (2002) found that parents tended towards the same biases. Thus, parents allowed their children to engage in greater risk-taking in activities such as bicycling when wearing safety gear than when not, and the parents' explanations showed that they assumed the gear would fully protect their child – including even parts of the body not covered (e.g. a bike helmet would protect limbs) – and prevent injury regardless of the child's level of risk taking. This optimistic, almost magical, reasoning seems to be shared by children and their parents during periods that may be formative in the development of safety orientation.

Risk taking is normative in adolescence (Arnett *et al.*, 2002; Beyth-Marom *et al.*, 1993; Bingham and Shope, 2004; Durkin, 1995; Galvan *et al.*, 2007). Most teenagers take some risks in some areas of their lives, and a minority take many risks (Jessor, 1987). Risks are taken in experimentation with alcohol and other substance use, sexual behaviour, school performance, petty crime and antisocial behaviour, and in aspects of road use, though it is perhaps less clear how genuinely threatening such experimentation actually is.

Few studies are available of specific patterns of road-related risk taking in adolescents, though research in the context of pedestrian, cycling and car passenger injuries would all seem to support the existence of a growing willingness on the part of adolescents to accept or even seek risk. For instance, epidemiological data indicate broad increases in injury rates with age, though there is some country-to-country variation in the precise patterns. In general, peak pedestrian injury rates in developed nations tend to occur between 11 and 16 years (Roberts *et al.*, 1998; Agran *et al.*, 1998). This holds for the UK, although with some variation according to gender: Sentinella and Keigan (2004), in an analysis of police fatal accident files, found a peak in pedestrian fatalities at age 12 for boys and at age 14 for girls. However, rates remain elevated throughout early to mid-adolescence.

The picture is similar for cyclist injuries (Department for Transport, 2005), albeit with a sharper gender divide in incidence, with boys accounting for 83% of all child cyclist casualties (Durkin *et al.*, 1999; Department for Transport, 2007). Car passenger casualties also show a marked increase in the 11–15 age group, relative to younger children, but only where the driver of the vehicle was in the 16–19 age group; for other age groups of driver, the incidence is either stable across passenger

age groups, or actually declines with age (Department for Transport, 2007). The fact that girls account for just over half of car occupant casualties where they are a much smaller fraction of pedestrian and cycling casualties suggests a particular pattern of involvement on the part of girls being driven by slightly older teenage boyfriends, and being implicitly prepared to accept the risk that this presents.

This apparent pattern of accelerating preparedness to accept and take risks during adolescence is borne out by more detailed psychological research, raising a worrying prospect of declining risk aversion just at the point of first learning to drive. Tolmie *et al.* (2006), for instance, found significant shifts between 12 and 15 years towards more positive attitudes to risky pedestrian behaviours and more negative attitudes to cautious pedestrian behaviours. This appeared to reflect a normalisation of risk taking, since these shifts were associated with perceived increases in peer risk-taking over the same age range. The trend was also stronger among boys, and corresponded to self-reports of a greater incidence of pedestrian injuries.

However, both the casualty data and the psychological evidence need to be interpreted with care. With regard to the former, for example, the increase in pedestrian injuries is accompanied by an increase in exposure, both in terms of time and number of roads crossed. When this is taken into account, the accident risk per unit of exposure actually declines with age in boys – though it does increase for girls (Bly *et al.*, 1999). If boys in particular are taking more risks as they go through adolescence, then the implication might be that they are also getting better at judging when it might be safer, relatively speaking, to do so. The extent to which they really are taking more risks is also questionable, though: the change in attitude patterns reported by Tolmie *et al.* (2006) was modest, and was far outstripped by a perceived increase in risk taking on the part of peers. Since any respondent was likely to have been part of the set of peers referred to by other respondents, it would seem that the shifts in risk taking are more perceived than actual, though this, in itself, may create some pressure in favour of risk. Elliott (2004) points to a similar conclusion.

The pattern of gender differences might also be less significant than it appears to be. Tolmie *et al.* (2006) found that, while adolescent males displayed riskier attitudes, intentions and behaviour than females, the influences leading to elevated risk were identical for boys and girls. Thus, the apparent differences may reflect nothing more than lags in exposure to these influences – and to roads themselves, hence girls' increased accident risk per unit of exposure as they grow older. More research is needed here, but there are grounds for thinking that adolescent girls and boys are simply at different points in the same developmental sequence.

The net conclusion from the pedestrian research – there is a dearth of comparable research relating to influences on risk taking as a cyclist or car passenger – is therefore that the increase in risk propensity during adolescence may be relatively

small overall, and that individual variations may be a more significant concern. Even here, it is unclear how far risk-taking behaviour is actually stable and consistent across contexts, though there are some data to suggest that patterns among novice drivers are in line with the trends noted above for pedestrians. Bina *et al.* (2006) report findings among a sample of 645 Italian adolescents aged 14 to 17 that have some similarities to Fergusson *et al.*'s (2003) data for 21-year-old New Zealand drivers, above. Fergusson *et al.* found that over 90% of young adults reported having committed some risky driving behaviours during the past three years, Bina *et al.* found that some 84% of their teenage sample reported at least one violation of the penal and highway code within the preceding two months. These teenagers were too young to obtain driving licences, but most rode mopeds or motorcycles, and a fifth of these had driven cars without a licence.

By at least adolescence, young people are aware that there are risks associated with driving and they appreciate that traffic injuries are a leading cause of death among the young (Harré *et al.*, 2000; Ramos *et al.*, 2008; Tuohy and Stradling, 1992). Nevertheless, despite some cognitive awareness of risk and its consequences, adolescents remain vulnerable to compensatory errors:

> 'As long as I've got my seat belt on I'll be fine but I don't like love it when we go fast, it just happens doesn't it?' [Girl 14]
>
> (Midlands Partnership Group, 2006; p. 142)

Because these phenomena involve cognitive competencies, and because cognitive ability is still developing through childhood and adolescence, it is of interest to consider how optimistic and self-enhancement biases develop in pre-drivers and whether they might be appropriate targets for intervention in pre-driver education. In fact, however, the evidence is somewhat mixed (Harré, 2000). Some researchers have found no evidence of differences between adolescents and adults in estimations of personal vulnerability in risky situations (Furby and Beyth-Marom, 1992). In one study, adolescents (mean age 15.2 years, range 13 to 18 years) showed unrealistic optimism in respect of being hurt in a car accident, but their parents showed significantly greater unrealistic optimism on this item (Cohn *et al.*, 1995). Christmas (2008) makes the interesting point that pre-drivers are often exposed to commentaries (e.g. their parents') in which the driver implies his or her own superiority over other road users (commenting on their poor skills and bad behaviour), and this everyday process may feed into pre-drivers' inferences about how a safe driver behaves – even if the role model is in fact somewhat less than an ideal driver.

### *3.3.2 Adolescent brain development and perception of risk*

Perceptual and cognitive abilities that are basic to the mechanics and strategies of driving are still developing in adolescence. Recent advances in developmental neuropsychology have shown that the brain continues to undergo considerable

development during the teenage years (Blakemore and Choudhury, 2006; Casey *et al.*, 2008; Giedd *et al.*, 1999; Paus, 2005). Briefly, there is a steady increase in the myelination of axons in the frontal cortex, the region where higher level thinking, planning, behavioural choices and inhibition of inappropriate actions take place, and there is a steady decline, post-puberty, in frontal grey matter density, a change which enhances the efficiency of the functional networks.

These underlying biological changes in capacity are likely to have implications for how adolescents handle driving tasks and for how they perceive and respond to risk. Importantly, these developments are proceeding during the later pre-driver years and are not all complete by age 17.

What practical implications might these neural developments have for adolescent cognitive functions in general and for road-related reasoning and behaviour in particular? Luna *et al.* (2004) investigated the approximate age points at which young people reach mature, adult-like, performance on a set of tasks requiring participants to make eye movements in response to specific cognitive demands. For example, they may be instructed to fixate on a suddenly appearing stimulus in a computer screen display and their speed of their response is measured. Another task may require the participant to inhibit a visual response: the participant is instructed that when a stimulus occurs in peripheral vision, he or she should look in the diagonally opposite area of the screen. Yet another task involves working memory for spatial information: the participant is required to fixate on a central object, but additionally to remember the location of a second object that appears briefly elsewhere on the screen.

Although road behaviour was not the researchers' area of interest, it is obvious that each of these tasks bears some analogy with activities undertaken in driving and other road behaviour. It can be crucial to attend to suddenly appearing vehicles or pedestrians (processing speed). Road users need to be able to ignore potential visual distractions such as roadside advertisements or irrelevant events (response inhibition). Sometimes it is necessary to concentrate on one location, such as a traffic light or road marking, while holding in short-term memory potentially relevant information about something else, such as a toddler standing at the kerb (working memory).

Luna *et al.* (2004) found that the abilities that might be drawn on in such tasks are developing into adolescence. Processing speed and response inhibition began to reach adult levels at around ages 14 to 15 (though the range of responses indicates that some individuals may attain mature competency later). Most notably, mature performance in the working memory task was attained, on average, only at age 19 years.

This, and other developmental research concerned with cognitive control of eye-hand movements (Choudhury *et al.*, 2007a, 2007b), indicates that the kinds of

competencies drawn upon in mechanical driving skills, such as changing gears, operating windscreen wipers, adjusting audio systems, are likely to be still developing through the teens. However, because this research is not well known outside of scientific circles, it is unlikely that driving instructors, parents, or young people themselves will be aware of the implications.

### 3.3.3 Emotions and risk

Importantly, key developments in brain activity during adolescence are not directly cognitive, though they may well have implications for how adolescents deal with cognitive and decision-making tasks. Recent research has emphasised the influence of emotional developments that may be outside conscious awareness (Casey *et al.*, 2008; Steinberg, 2005). Steinberg points out that 'affective influences are relevant in many day-to-day "decisions" that are made at the level of "gut-feelings" regarding what to do in a particular situation (rather than deliberate thoughts about outcome probabilities or risk value)' (Steinberg, 2005; p. 72). Casey *et al.* (2008) argue that developments in neural mechanisms during adolescence result in a heightened responsiveness to incentives and to socioemotional contexts.

An interesting illustration is provided by Galvan *et al.* (2006). These researchers measured activity in the nucleus accumbens, an area of the brain believed to be associated with pleasure and rewards, in children, adolescents, and adults. Participants undertook a simple task in which correct performance led to receive small, medium or large rewards. Brain scans (fMRI images) revealed that when given a medium or large reward, the adolescents (aged 13 to 17 years) reacted more strongly than was the case in children or adults, suggesting an exaggeratedly positive reaction. In contrast, when given the small reward, the teenage accumbens response was lower than those of children and adults, suggesting an exaggeratedly negative response, as if the small reward might have been experienced as equivalent to no reward. Thus, while rewards are motivating to most humans, adolescents in this study seemed to show more extreme responses according to the scale of the reward. At the same time, impulse control is still relatively immature in adolescents. In short, adolescents may be both more prone to over-reaction in risky environments and less able to suppress appealing actions.

Eigsti *et al.* (2006) provide evidence that individual differences in cognitive control emerge early in life. Pre-schoolers were tested initially in a task which exposed them to tempting rewards (cookies) followed by a waiting period. The adult leaves the room (but the child is observed unobtrusively). Some children resist temptation, but others prove unable to do so. Responses in this task were correlated with efficiency in a computerised inhibition task taken by the same individuals some 14 years later.

Certain driving distractions that are developmentally-linked may exacerbate self-enhancement biases. For example, adolescents listen to music more than any other age group and many favour loud music with arousing or even oppositional features

(Arnett, 1991; North *et al.*, 2000). Listening to and managing music in the vehicle may be distracting, but at the same time can boost a sense of excitement, autonomy, invulnerability and identity (North *et al.*, 1999). The equipment is also interwoven with issues relating to peer presentation (e.g. 'My speakers attract quite a lot of attention', young driver quoted in Møller (2004)). Studies of young drivers reveal that many acknowledge these effects and that music is being played loudly at the time accidents occur (Harré, 2000).

### *3.3.4 Multiple risk-taking in adolescence*

Heightened risk-taking is a general phenomenon of adolescence (Harré *et al.*, 2000; Steinberg, 2008; Waylen and McKenna, 2008). Numerous investigators have found that individuals who engage in risky driving are likely to manifest other forms of risk taking and problem behaviour, such as substance use, binge drinking, school difficulties and delinquency (Beirness and Simpson, 1988; Carroll *et al.*, 2009; Jessor and Jessor, 1977; Shope and Bingham, 2002; Vassallo *et al.*, 2007).

While most research on risk taking and driving has focused on novice and young drivers, a small but informative body of work has examined the development of interests in and attitudes to risky driving in earlier adolescence. Harré *et al.* (2000) examined several aspects of risky attitudes towards driving in 14- and 16-year-olds, and found indications of increasing approval of risk taking across this age gap.

Waylen and McKenna (2008) extended the investigation of pre-driver attitudes in a study of 11–16-year-olds. This was a high-quality study with a good sample size and a range of standard measures. Both age and sex differences in attitudes towards specific aspects of risky road use (measured with five items modified from the Violations Questionnaire of the Driver Behaviour Questionnaire (DBQ)) during this period. Affinity for speed increased from age 11 to 12 years in boys, and remained high thereafter; it increased from age 11 to 13 years in girls, but declined from 13 to 16 years (and was lower overall in girls). The acceptance of road violations was higher in boys than girls, though there was no evidence of age-related change. The authors stress that these findings indicate that 'risky driving behaviour is not simply a function of the opportunities provided when behind the wheel of a car; it is also a function of individual characteristics **which are present long before driving is an option**' (emphasis added; p. 909).

A possible response to findings of multiple risk-taking in adolescents could be that 'at least they'll grow out of it', and it is certainly the case that antisocial and delinquent behaviour tends to peak in the mid-teens. But this could be a critical period for pre-drivers and there is evidence pointing to continuity through the pre-driver years into the early driver phase for those most at risk. Two impressive longitudinal studies (Shope *et al.*, 2001; Vassallo *et al.*, 2008) found that higher levels of substance use and antisocial behaviour in early to mid-adolescence were significant precursors of risky driving and crashes in early adulthood.

## 3.4 Perceived threats/perceived benefits: summary

Drivers are influenced by perceptions of both risk and benefits, but many drivers, especially novice drivers, fail to perceive risk realistically. There are also individual differences in orientations to risk. Male drivers tend, on average, to take more risks than do female drivers. Young drivers take more risks. Risk management in driving entails an array of perceptual, cognitive and emotional skills. Acquiring these skills begins in early childhood, but develops over a long period. Children's judgements of risks as pedestrians are often inadequate into early adolescence, and children show indications of subscribing to risk compensation bias and optimistic bias; there is some evidence that they share these erroneous perceptions with their parents. Recent research into adolescent brain development indicates that abilities drawn upon in mechanical driving skills are likely to be still developing through the teens. Adolescents approaching the age where they could seek a driving licence may also be both more prone to emotional over-reaction in risky environments and less able to suppress appealing actions. Risk taking is a natural part of adolescent development, but some teenagers are more prone to it than others, and some develop lifestyles of multiple risk-taking. These patterns, established in early to mid-adolescence, have been demonstrated to be significant precursors of risky driving and crashes in early adulthood.

## 3.5 Policy implications

- Simply providing people with 'cold' information about risky practices is unlikely to lead to substantial changes in behaviour.
- Informing pre-drivers about risks may make a contribution to longer-term orientation towards driving, but any attempts to do so need to be formulated with reference to the fact that many young people are forming positive expectations about driving.
- Education and intervention should give careful attention to perceived benefits of driving because these can outweigh perceived risks. The goal should be to alert pre-drivers to the benefits of safer driving practices.
- Scant research exists to inform our understanding of these processes and to guide modes of intervention.

# 4 SUBJECTIVE NORMS

As noted in Section 2, evidence on the stability of attitudes from the pre-driver period into novice driving is both limited and inconclusive. However, there are other influences where the picture is more clear-cut, and there is good reason to think that the level of continuity is relatively high. This is particularly true where subjective norms and other types of normative influence are concerned.

The term 'norms' is generally less well-understood than 'attitudes'. Norms in the broadest sense are perceived conventions or standards of behaviour, which are derived from observation of majority conduct (i.e. what is **normal**) among a particular set of people. Different sets of people may thus have different norms. At a psychological level, however, information about normative behaviour may be retained and utilised in various ways, giving rise to different types of norm. In particular, a distinction is made between two principal categories:

- Descriptive norms – perceptions of what others typically do under given circumstances, according to observation across a number of occasions and individuals.
- Injunctive (subjective) norms – beliefs about what others want you to do, based on a sense of the principles underlying their behaviour, and a perception of how they see these principles applying to you.

Although both types of norm have the potential to influence behaviour, they do so in different ways. Descriptive norms create a pressure to conform, to avoid 'standing out from the crowd'. They are more likely to be applicable in relatively impersonal situations, where there are a number of others involved (Turner *et al.*, 1987). They tend to be particularly influential where these others are seen as being like ourselves in some important way. For example, we noted above evidence from Bina *et al.* (2006) that high proportions of under-age adolescents in some parts of Italy ride mopeds or motorbikes and regard it as unimportant to have a licence; in such a context, the descriptive norm is potent, 'everybody does it'.

Injunctive norms, in contrast, instigate a perceived need not to disappoint others (usually specific people), and thus operate through an **internalised** sense of approval or disapproval for particular behaviours. For example, young drivers may suppress their desire for speed when an elderly relative is in the car (Parker *et al.*, 1992). Indeed, they may not even require the presence of the source of the norm, provided that they value the person's opinion (e.g. a promise to one's mother that one will not drink and drive could be honoured in her absence).

## 4.1 Norms as determinants of driver behaviour

Direct testing of the concurrent influence of normative behaviour on driving has been limited, but what work there is suggests a genuine effect. Forward (2009) found that, after Theory of Planned Behaviour variables had been taken into account, descriptive norms added 4% in the prediction of adult drivers' intention to speed in an urban area and 10% in the prediction of the intention to overtake under conditions of poor visibility.

Aberg *et al.* (1997) tested a contagion model in which drivers' own speed was hypothesised to be affected directly by comparison with that of other drivers. The evidence favoured such an influence, in that drivers were indeed found to want to drive like others, regardless of attitude to speeding – except that the effect was restricted to those who were already more likely to engage in speeding. Groeger and Chapman (1996), in contrast, found that drivers in general only reduced their speed in response to roadside information about speed limits where other people appeared to comply as well. This suggests that the behaviour of other drivers was the overriding influence for the majority of individuals, irrespective of personal characteristics.

At a basic level, specific research concerning normative influences on driver behaviour has tended to bear out the evidence from work which indicates that the relative influence of subjective norms may often be greater than that of personal attitudes (Parker *et al.*, 1992; but see Forward, 2009, for a contrary view). So, for example, Newnam *et al.* (2004) found that anticipated regret (disappointing important others) acted as a restraint on intention to speed, and had a stronger influence than attitude. Fleiter *et al.* (2006) also found evidence that perceived approval of speeding by family and friends was influential, and associated with greater self-reported speeding. Within this, the influence of peers appeared to be consistently stronger than that of family members, regardless of age, a point to which we will return.

There is considerable evidence relating to parent, peer and partner behaviours as influences on driver behaviour (Shope, 2006; see Sections 6, 8 and 9). What none of this work makes particularly clear, though, are the precise mechanisms by which these sources might exert their influence. Three potential types of influence have been studied in past research. These are:

1. the facilitatory and inhibitory effects on behaviour brought about by the physical **presence** of others;
2. **perceived approval and disapproval** (cf. injunctive norms); and
3. **witnessing of actual behaviour** (cf. descriptive norms).

There is evidence to support the idea that all three of these have an impact on driver behaviour, but also indications that they apply differently, depending on the source of influence.

Thus, any effects of presence seem to entail more than increases in arousal or confidence due to another's company: much depends on who provides the company. The presence within the vehicle of peers who exhibit risk-taking behaviour might serve to amplify the effects of contagion and descriptive norm-following through sheer physical proximity to related or supportive behaviour. This might be especially so when a risk-taking identity is already shared between those involved, and when the number of people involved is sufficient to lead to an element of depersonalisation (Turner *et al.*, 1987). This is, of course, entirely consistent with the association between the extent of peer presence in vehicles and the probability of violations and crashes (Ward *et al.*, 2007).

## 4.2 Gender and normative influences

There are indications that the impact of normative influences varies depending on both context and the nature of the person exposed to these influences. In most domains of life, males tend to be riskier and to be expected to be riskier (Byrnes *et al.*, 1999; Cicone and Ruble, 1978; Lytton and Rommey, 1991; Ozkan. and Lajunen, 2006). This is certainly the case in respect of road use. Young males experience and exert greater pressure to speed (Arnett *et al.*, 1997, Baxter *et al.*, 1990; Conner *et al.*, 2003; Simons-Morton *et al.*, 2005). For males in general, perceived pressure is associated more strongly with intention to speed than is the case for females (Conner *et al.*, 2003). Speeding tends to be more likely when the scenario involves a young male driver and a young male passenger, but less likely if the passenger is female or older (e.g. parents).

Overall, then, there are various indications that young males are more susceptible to the contagion effects associated with normative behaviour of others – at least when this influence is in the direction of greater violation of speed restrictions. Given that many young male drivers are prone to speeding and other risky practices, the implication may be that the current behaviour of others tends to have more influence when it corresponds with ways in which drivers might tend to behave anyway.

## 4.3 Developmental issues

In general, from the pre-school years on, children become gradually aware that societal norms exist and that they govern different aspects of our behaviour. However, their understanding is not always detailed and, for a range of reasons, it may be idiosyncratic, inaccurate and changeable over time (Kohlberg, 1969; Turiel, 1983). Some norms that are important to adults are of no more than peripheral interest to children; they tend to learn most when the area of activity is relevant to their daily lives and needs.

In respect of learning norms associated with road use, children's primary learning experiences are likely to be their own activities as pedestrians, cyclists and passengers. Earlier injunctive norms relating to other aspects of road use, such as road crossing and cycling, may tend to generalise to driving behaviour to some extent as well. For instance, the mechanisms associated with injunctive and descriptive norms can readily be seen as likely to extend over both the pre-driver and novice driver periods. In the first place, many of the individuals (parents, peers) and wider social contexts will remain consistent through this time. Pre-drivers are witnesses of parents' driving behaviour over a longer period of time. Parental beliefs about how it is appropriate to behave as a driver are likely to have become apparent before adolescents actually start learning to drive. As soon as becoming a driver starts to become a salient consideration for teenagers, they are likely to engage in more or less direct conversations with parents about the nature of the exercise, and to receive specific injunctions and advice as part of these (Christmas, 2007; Midlands Partnership Group, 2006).

Similarly, while relationships with peers may have been established before driving becomes salient, once it begins to achieve this status, discussion about being a driver is likely to become a feature of interactions, establishing some sense about the nature of peer-group norms in respect of driver behaviour (Christmas, 2007; Midlands Partnership Group, 2006). In addition, if patterns of wider behaviour that are seen as part of personal identity emerge out of peer relationships (Tolmie *et al.*, 2006), then these may again generalise to driver behaviour itself, at the point of becoming licensed.

The relative importance of parents and peers in relation to the emergence of risk taking in adolescence is the subject of much debate among researchers in related areas, such as substance use. There is no doubt that there is a shift, beginning in early adolescence, from a dependency on parents to an increasing preference for spending time with peers (Smetana *et al.*, 2006). But it would be an oversimplification to assume that this means that parental influence wanes and peer pressure takes over. In respect of alcohol and nicotine uses, for example, research indicates that both parents and peers can be influential throughout adolescence (Chassin *et al.*, 1986; Simons-Morton *et al.*, 2004; Wood *et al.*, 2004).

There are many different contexts of parenting, and some parents are more effective in guiding their children's behaviour than are others (Shope and Bingham, 2008). Peer influences are neither uniform nor unilateral. Some adolescent peers are risk prone, but others are risk averse; some peer pressure encourages risk taking and some opposes it (Durkin, 1995). Thus, much depends on who the parents are, how they parent, who the young person selects as friends, and how these peers behave.

The picture is complicated further by the fact that adolescents often elect to mix with different people at different times, and some contacts may be more influential in particular settings. For example, there are various indications in the context of

driving of a particular influence from slightly older peers who already have cars (Midlands Partnership Group, 2006; Ward *et al.*, 2007). Some of the instability in adolescent identity noted earlier may stem from the exploration of the tensions between the influences of these different sources. Plainly, the nature of the potential variations in family and peer influences stands in need of further research.

With respect to norms, there is good evidence that parental influence operates typically through injunctive norms and approval/disapproval, while peer norms operate more through descriptive norms and forms of behavioural contagion. This picture is borne out by Tolmie *et al.* (2006), in the context of factors affecting adolescent pedestrian behaviour. Analysing influences on self-reported intentions and behaviour from a variety of sources, this research revealed that injunctive norms were shaped primarily by parental behaviour, while descriptive peer norms were a major influence on self-identity. These were also the two main sources of influence on intentions and behaviour, with the parental route tending to be more associated with safer behaviours, and the peer route with riskier ones (though, as noted earlier, there is reason to doubt whether peer behaviour was actually as risky as it was perceived to be).

In this research, the influence of parents and peers was found to be equally poised. This may well have been a function of the sample and the age range (12–15-year-olds) involved. Certainly, the trend was towards stronger peer influence with increasing age across this period, leading to the possibility that, by 16 years, a less balanced picture might have been apparent. Similarly, the association of parents with a pull towards safer behaviour and peers with a pull towards risk need not always obtain: for some adolescents these may point in the same direction, with, presumably, the one tending to reinforce the other.

One of the more often reported patterns of parental influence is in terms of 'sleeper effects', i.e. the resurfacing of parental patterns of behaviour, particularly at moments of role change (Ruble *et al.*, 1988). The mechanism involved in such instances is unclear, but it may be the ingrained memory of patterns of behaviour which are called up in moments of need (i.e. when other guidance on how to behave is absent), and which carry with them implied beliefs and attitudes (cf. the earlier definition of injunctive norms).

There is some reason, then, to think that, in terms of the transmission of norms, there are likely to be fluctuations in the strength of peer and parental influences, both across context and over time. The difference in degree of peer identification found among adolescents by Tolmie *et al.* (2006) and among adults by Terry *et al.* (1999a), as noted in the previous section, is consistent with this, though it leaves unclear when such shifts occur and why.

## 4.4 Subjective norms: summary

Norms are perceived conventions or standards of behaviour. Two principal categories of norms are distinguished here, namely descriptive norms (perceptions of what others typically do) and injunctive norms (perceptions of what others want you to do). Descriptive norms create a pressure to conform, to be like one's peers; injunctive norms create a pressure to satisfy someone else's standards, to avoid disappointing others. Evidence indicates that adult drivers are influenced by both types of norm. Different people, and different peer groups, may have different norms. For example, some male peer-groups share norms according to which speeding is considered a regular form of behaviour. Children become gradually aware that societal norms exist and that they govern different aspects of our behaviour. In respect of learning the norms associated with road use, children's primary learning experiences are likely to be their own activities as pedestrians, cyclists and passengers, though little research has been conducted to examine how they extract norms from their experiences or how they change with cognitive and social development. By definition, norms are social phenomena – they are perceptions shared and transmitted among groups – and this signals the role of important others, especially parents and peers. We stress that norms are closely interwoven with forming a sense of identity, itself a complex and sometimes volatile process of adolescence, in which different standards can be salient at different times.

## 4.5 Policy implications

- Parents are an important long-term influence on young drivers' behaviour. One implication is that pre-driver education needs to take parental positions into account. Ideally, parents should be enlisted in the educational process. There is also a need to encourage parents to reflect on what messages they send to their children about driving and road safety.
- Peers, and perceived peer norms, also influence pre-drivers. Information and education should include efforts to identify and publicise the positive behaviour of adolescents and young drivers, and to portray peer norms as pro-safety and avoidant of risky/antisocial practices.
- The passing of the driving test is a crucial moment of role change from learner to independent driver. Promoting a greater sense of the scale of this role change should help activate 'sleeper effects' from parental norms, and greater resistance to negative peer influences.

# 5 PERSONALITY

Every trip we take brings home that there are individual differences in the ways in which people behave on the road. Some drivers are very risk prone, others very safe, and others intermediate. Some are courteous towards fellow road users, while others carve up weaker members of the species with glee. Considerable research has been addressed to the question of the extent to which these differences in driver performance can be explained as due to differences in personality.

Personality, like other key concepts in this review, is a very familiar term in everyday language, but its casual use can be misleading. Manstead (1995) points out that people are sometimes described as having 'lots of personality' or a 'strong personality'. In scientific usage, the term connotes 'the intrinsic human qualities that lead to differences among individuals in their characteristic patterns of behavior' (Manstead, 1995; p. 437). This is the definition we follow here.

Certain personality characteristics (traits) could reasonably be expected to be predictive of risky driving. In general, research bears out commonsense expectations in this respect (Patil *et al.*, 2006; Strecher *et al.*, 2007a). Studies of both adult and young adult populations show that traits such as sensation-seeking, external locus of control, impulsivity and aggressiveness are associated with risk taking, accident rates and road rage (Arnett, 1992; Arnett *et al.*, 1997; Beirness and Simpson, 1988; Dahlen and White, 2006; Galovski and Blanchard, 2004; Iverson and Rundmo, 2002; Jonah, 1986, 1997; Machin and Sankey, 2008; Ulleberg, 2002; Vavrik, 1997; Zuckerman and Kuhlman, 2000). Correspondingly, safer drivers tend to score lower on these measures, and there is evidence that they score higher on measures of altruism, anxiety, and conscientiousness (Ulleberg and Rundmo, 2003; Arthur and Graziano, 1996).

These personality characteristics tend to be associated with gender: males tend to score higher on sensation-seeking, impulsivity, and aggression, while females tend to score higher on altruism, anxiety, and conscientiousness (Arnett *et al.*, 1997). In turn, risky driving is significantly more common in males, and accident rates are higher (Harré *et al.*, 1996; McKenna *et al.*, 1998; Turner and McClure, 2003). However, these are overlapping distributions: some young males are careful drivers with accident-free records and some young females are risk takers (Fergusson *et al.*, 2003).

There is some debate about the process by which personality factors bear on driving behaviour – for example, whether the focus should be on individual traits or clusters, whether effects are direct or mediated by attitudes (Iverson and Rundmo, 2002; Stacy *et al.*, 1991). Overall, the evidence confirms that personality is a relevant factor, though not necessarily always accounting for a large amount of the variance in driving measures/accident rates.

## 5.1 Developmental issues

Personality characteristics can be identified relatively early in life, and tend to be moderately stable over time (Caspi *et al.*, 2005; Hampson *et al.*, 2006). Several investigators have found that children who score highly on personality traits such as impulsivity and aggressiveness are generally more prone to accidents (Langley *et al.*, 1983; Morrongiello and Lasenby-Lessard, 2007; Potts *et al.*, 1995). We noted in Section 3 that children may respond to wearing safety equipment by increased risk compensation. There is some evidence that children who are high in sensation seeking are particularly likely to make this adjustment (Morrongiello *et al.*, 2007).

Research with quite young children indicates that personality variables such as impulsivity and sensation seeking have implications for behaviour in road contexts. Briem and Bengtsson (2000) found that impulsivity in 3–6-year-olds was associated with poorer performance in both mock and actual traffic situations. Working with 5–6-year-olds, Hoffrage *et al.* (2003) distinguished risk takers from risk avoiders on the basis of their performance in a gambling game. When the same children were tested in a real traffic environment, the risk takers demonstrated impulsive tendencies (making decisions more quickly), proved more likely to cause an accident, made more crossing decisions at a busy one-way street, and tolerated shorter time-intervals between the initiation of the crossing decision and the arrival of the next vehicle.

A reasonable inference is that individuals at risk of becoming poor drivers can be identified early in life. Hoffrage *et al.* (2003) suggest that we can 'identify the dare-devils early'. Cross-sectional studies suggest this, but do not confirm it, because they cannot provide evidence of continuity within individuals over time. The optimal method for testing possible continuities or shifts in behaviour is longitudinal research with the same participants over several years. Such research is time-consuming and expensive, and hence less common. A valuable contribution is provided by Vassallo *et al.* (2007), who used data from the Australian Temperament Project, which has followed over 2,000 children from infancy to young adulthood. In addition to miscellaneous measures of personality characteristics and environmental factors, the Project has obtained information about driving expectancies and behaviour at ages 19 to 20 years. Thus, it was possible to investigate possible correlates and precursors of risk in driving.

On the basis of measures of speeding, driving while very tired, driving when affected by alcohol or illegal drugs, disregard for safety equipment, Vassallo *et al.* (2007) identified three groups of drivers: low, moderate and high risk. It is important to note that the first of these ($n$ = 675) was by far the largest group (64% of the sample). The moderate group ($n$ = 306) accounted for 29% of the sample and the high group ($n$ = 74) constituted only 7%.

The researchers found no evidence that these groups could be distinguished in terms of personal characteristics, parent–child relationship of demographics as measured in infancy, toddlerhood, or early childhood. However, differences began to emerge in the data collected from teachers during the participants' mid-childhood (five to eight years). By this stage, those who in adulthood would be classified in the high-risk group were already identifiable as significantly more aggressive and hyperactive, less task-oriented and less compliant with school routines, than their peers. Differences in task orientation and social skills were significant in late childhood (nine to twelve years).

Differences between the high-risk group and the others became more pronounced by early adolescence (12 to 14 years). The high-risk group showed greater difficulties across numerous domains, notably lower task persistence, higher levels of aggression and antisocial behaviour, lower social competence, more school adjustment problems and poorer interpersonal relationships. The picture is qualified to some extent by results at mid-to-late adolescence, when there were less differences among groups, though the high-risk group still showed evidence of behaviour problems, poorer relationships and less adaptive coping strategies.

Together, these findings point to early emerging risk profiles, and to the stability of difficulties across childhood into early adulthood. In particular, and consistent with other research on the development of antisocial behaviour (Stradling *et al.*, 2005), they indicate the presence of a small, but substantial minority of individuals who behave dangerously and are indifferent to the constraints of authority. Although the findings are also reassuring in indicating that the overwhelming majority of young drivers are low to moderate risk, it should be noted that both of these groups admit to some unsafe driving.

Recent evidence from an independent 40-year longitudinal study in the US indicates that childhood personality characteristics contribute to the prediction of health-related behaviour and outcomes in middle age (Hampson and Goldberg, 2006). In particular, Hampson and Goldberg found that scores on conscientiousness in childhood predict adult health profiles: less conscientious children grow up with poorer health outcomes and more conscientious children fare better. While this research focused on smoking, there are links between conscientiousness and driving style. Together with the evidence from Vassallo *et al.* (2007), it is plausible that individuals who are conscientious from childhood (e.g. task persistent, complying with school behavioural expectations) will tend to be conscientious as they learn to deal with traffic environments (e.g. as pedestrians, cyclists) and, in due course, as they become drivers.

Waylen and McKenna (2008) point out that, if risky driver behaviour is associated with pre-existing personality characteristics, then these characteristics should be detectable and associated with risky driving preferences (e.g. liking for high speed, tolerance of driving violations) **before** driving begins (and hence before any effects

of experience behind the wheel). In one of the few relevant studies of pre-drivers, they tested 567 children aged 11 to 16 years on measures of speed choice, attitudes towards driving violations, sensation seeking, and deviant behaviour.

Compared with females, males had higher enthusiasm for speed. Pupils aged 11 and 16 (particularly females) had lower enthusiasm than other ages. Males regarded driving violations as more acceptable than did females. Males scored higher on sensation seeking than girls. Results revealed a peak at age 14. For both sexes, enthusiasm for speed and sensation seeking were positively correlated, as were tolerance for violations and sensation seeking. Sensation seeking and deviance predicted speeding and violations (though only a small amount of variance was accounted for). The authors conclude that their findings indicate that 'risky driver behaviour is not simply a function of the opportunities provided when behind the wheel of a car; it is also a function of individual characteristics which are present long before driving is an option'. (p. 909)

### *5.1.1 Personality and plasticity*

Nevertheless, while there is good evidence of continuity in personality, it is by no means fixed at birth. Some researchers argue that personality continues to develop at least into the third decade of life. Below age 30, about half of the variance among individuals in personality is stable – but, correspondingly, half is not stable (Costa and McCrea, 1994; p. 145). Within individuals studied from age 18 to age 26, correlations over time between various personality measures fall in the range 0.5 to 0.6 (Roberts *et al.*, 2001), and when they are followed from childhood to middle age, the correlations fall to below 0.3 (Hampson *et al.*, 2006); these relationships indicate continuity, but not rigidity. Some personality measures tend to show increases post age 20 (Roberts *et al.*, 2006). These include conscientiousness and emotional stability.

Furthermore, as noted above, while personality is associated with risky driving, the amount of variance accounted for is moderate at best. In short, other factors also bear on human behaviour, in traffic, as elsewhere. For example, social context can impact on risk taking. Arnett *et al.* (1997) found that adolescents are significantly less likely to drive over the speed limit when their parents are passengers than when their friends are passengers or when they are alone in the vehicle. Arnett *et al.* did not find differences between driving with friends and driving when alone, leading them to conclude that the presence of parents could be an inhibiting factor.

There are also suggestions in the literature that individuals become less risky upon broader changes in their life roles and lifestyles. For example, Jessor *et al.* (1997) found that, as young male drivers (participants were aged 18 to 25 years) became more conventional, they reduced their levels of risky driving; for young women, role changes such as getting married or taking on a new job were associated with

reductions in risky driving. Shelness and Charles (1975) propose that an optimal time to intervene to promote road safety is around the birth of a new baby.

## 5.2 Personality: summary

There is extensive evidence from studies of adults that personality characteristics such as sensation seeking, external locus of control, impulsivity and aggressiveness are predictive of risky driving; in contrast, the attributes of altruism, anxiety and conscientiousness tend to be associated with safer driving. These personality characteristics tend to be detectable quite early in life and be associated with behaviour in traffic environments as early as the pre-school years. High-quality longitudinal research reveals early emerging risk profiles, and stability of difficulties across childhood into early adulthood. It is very difficult to intervene to change people's personality. However, personality is not absolutely rigid, it does not account for all of the variance in driver behaviour, and there is evidence of development – including increases in conscientiousness and emotional stability – in early adulthood. Some evidence indicates that this period can be an important period of change for males, with responsible driving integrated with other changes in personal responsibilities.

## 5.3 Policy implications

- Any policies concerning pre-driver education should take into account that a 'one-size-fits-all' approach to pre-driver education will not map adequately onto the characteristics and needs of the target groups.
- Policy formulation should also recognise that research into personality in novice drivers and pre-drivers establishes that negative stereotypes of the whole of a given demographic group are unjustified and potentially misleading.
- Personality characteristics such as impulsivity, sensation seeking, poor task persistence and poor interpersonal relationships are not unique to driving or road safety: they underlie a general propensity to problem behaviour. To an extent, these characteristics can be identified early in life and some individuals sustain risky profiles throughout their pre-driver years and into adulthood.
- The generality of the problem means that targeting driving risk alone (itself a complex and multi-faceted domain) would not meet all of these young people's problems and might therefore be ineffective.
- Most teachers could provide a preliminary identification of children in their care with these constellations of characteristics, and educational psychologists could provide fuller diagnostic information.
- From a policy perspective, such findings are informative, but present serious challenges. There are educational, ideological, ethical and possibly legal issues to be taken into account in formally identifying children as 'at risk'.

- Cross-departmental/multi-disciplinary collaboration is an essential context in which to develop strategies to tackle early emerging and long enduring indicators of problem behaviour in pre-drivers.
- Attention should be paid to the personality characteristics of people who are growing up to commit low to moderate levels of driving violations. These groups, while less alarming, are far greater in number. Even low levels of unsafe or illegal road behaviour can be dangerous, and the accumulative consequences of millions of minor transgressions contributes to the road toll.
- These individuals are better able to regulate their own behaviour and the developmental evidence suggests that they are more amenable to guidance (e.g. Vassallo *et al.* (2007) found that those who fell into these groups at ages 19 to 20 were better behaved at school during mid-childhood and adolescence).

# 6 IDENTITY

Identity is taken here to refer to a person's sense of who he or she is. Although this sounds straightforward, in fact identity is a complex construct. There are many dimensions to self-image and different senses of self can be invoked in different contexts (e.g. the same individual may have, in the course of a day, an identity as Jean, wife, mother, driver, employee, consumer, citizen, voter, woman, reader, viewer and so on). Identity can be something attained or something aspired to (the 'actual' versus 'ideal' self, e.g. someone who has just passed his driving test, but identifies with Lewis Hamilton). Identity can be personal (the unique 'me', distinguished from every other person) and social ('me as a member of a group or groups' – e.g. 'man', 'Scottish Nationalist', 'biker', 'fitness freak'). Achieving a firm sense of identity takes a long time to unfold. It is widely accepted as one of the basic tasks of adolescence. Even so, most individuals continue to develop their identities through their lifespan. We will not attempt here to provide an exhaustive review of the conceptual nuances and empirical research into identity *per se*, but we do propose that individuals' sense of identity, including desired self-image, can bear importantly on their orientation towards road behaviour.

Strecher *et al.* (2007a; p. 16) point out that, while for many individuals driving is essentially a utilitarian activity – a means of transport – for others it takes on a personal, self-defining significance. Even among adults, the possession of a particular make of vehicle, mastery of road skills, and technical understanding can all be highly ego involving, with implications for an individual's sense of competence and identity. Some people are desperate to own a BMW and others would be embarrassed to be seen in one; some drivers take great pride in reporting how quickly they can proceed from Rotherham to Portsmouth; some will spend Sunday afternoons polishing their vehicle, while others are loathe to rinse off the mud streaks that tell the world that they are getting the best out of their 4 x 4. In all of these ways, individuals are expressing something of their identities via their vehicle.

For younger people – especially, though not only, younger males – identity comes still more to the fore, and we have noted at several points that findings concerning pre-driver and early driver behaviour and attitudes are linked to identity. We noted, for example, that young drivers of high-performance cars are significantly more likely to take speeding risks (Clarke *et al.*, 2005). Those who wish to perceive and project themselves as powerful and courageous will be attracted to particular kinds of vehicle and particular styles of driving. In this section, we examine the nature of identity development in relation to driving attitudes/behaviour.

The importance of identity to younger drivers is illuminated by Møller (2004) and Stradling *et al.* (2000). Møller interviewed a group of 18–24-year-old Danish drivers about the relationship between their lifestyles and driving, and obtained

many indications of the importance of social visibility and status. Participants reported that: 'it [the car] gets washed and nursed – just as much as I do myself'; 'I love it, when the girls are looking admiringly at me, while I am sitting in a car'; 'if there are some cool guys you can impress, right . . . It is kind of cool to be the fastest – especially when you're a girl. Important'; 'The pleasure in having a car that everyone notices when you drive about, it shouldn't be a standard car that's no fun'.

Stradling *et al.* (2000) investigated perceptions of the benefits and disbenefits of driving a car in 791 British drivers aged 17 to 83. Two important dimensions of driver autonomy were identified: personal identity, and independent and autonomous control. Personal identity included the belief that driving a car is a way of projecting a particular image of oneself, provides a feeling of self-pride, affords personal expression, and gives a feeling of power. Young drivers (17 to 20) scored significantly higher on the importance of personal identity than did the rest of the sample. Identity matters for young people and this extends to their perceptions of being a driver.

## 6.1 Developmental issues

The adolescent management of identity is a developmental process. Key developments take place during the mid- to late-teens, and into the 20s. Even so, these need to be understood in relation to still earlier precursors, including earlier forms of road use (as pedestrians and cyclists).

Young people also begin to define themselves in other ways before they reach the period in which they are able to drive or learn to drive, but with implications for how they orient towards risk and safety issues. For example, Tolmie *et al.* (2006) found that dimensions of young adolescents' self-identities were associated with attitudes towards risk in pedestrian decision-making. Two subscales of self-identity were obtained on the basis of factor analyses of participants' selections among adjectives to describe the self. One scale was labelled 'cautiousness/sensitivity' and the other was labelled 'carelessness/insensitivity'.

Importantly, these self-identity factors were correlated strongly with a general measure of risk taking and with attitudes towards pedestrian behaviours. It seems likely that these processes have longer-term implications. Among novice drivers, Palamara and Stevenson (2003) found that scoring highly on a measure of 'confidence–adventurousness' was a good predictor of speeding infringements and likelihood of repeat speeding offences. Although longitudinal studies are needed to assess the extent of within-individual consistency, Tolmie *et al.*'s (2006) findings demonstrate that identity-related characteristics which are associated with risky driving are detectable in pre-drivers.

Evans and Norman (2003) also assessed the predictive utility of variables including self-identity (in this case, an individual's perception of self as a 'safe pedestrian') in

a study of 11–14-year-olds' road crossing intentions. Self-identity contributed a modest amount of additional variance once Theory of Planned Behaviour factors were taken into account.

Self-identity in Evan's and Norman's study was based primarily on past behaviour. Self-identity in relation to driving may also be based partly on future aspirations/ ideal image of self. Gibbons and Gerrard (1995) found that young people's prototypical image of a reckless driver varied as a function of their own behaviour (those who tended to be reckless tended to regard such a driver more favourably), and that having a favourable image in turn increased the likelihood that the behaviour would be performed. That is, image and behaviour influenced each other reciprocally.

Gibbons' and Gerrard's (1995) participants were college-age students and the authors speculate that the impact of images are likely to be more potent with younger adolescents who have not yet directly experienced the behaviour in question. This raises the possibility that undesirable images of the driver/driving to which young people are exposed at an early age may have enduring effects, at least for some, on their own expectations. This points to important issues for future research. Such research also needs to take into account another finding of Gibbons and Gerrard that individuals who score highly on social comparison (i.e. they regularly tend to compare themselves with others) were more prone to image effects than were those who score low on social comparison; social comparison occurs in all age groups, but appears to be particularly intense in adolescence (Durkin, 1995).

### *6.1.1 Autonomy and social identity*

At least two inter-related concerns motivate the development of identity during adolescence. One is a general desire to shed childhood status and to achieve some level of autonomy, beginning or even accelerating the transition to adulthood (Jessor and Jessor, 1977; Smetana *et al.*, 2006). Engaging in activities associated with more mature people is a compelling and visible way to achieve this shift.

The second concern is to develop and maintain a social identity (Emler and Reicher, 1995): the way(s) in which one is known by significant others, especially the peer community. Emler and Reicher (1995) argue that one of the major tasks that all individuals face in social life is to present the self in ways that make sense both to the self and to others. This entails developing a reputation, especially within the peer community. Concern with reputation is particularly acute in adolescence and is reflected in many aspects of young people's behavioural choices, possessions and aspirations.

Both of these factors have implications for how young people perceive driving. In connection with the transition to adulthood, driving is for many one of the key ways

in which control over one's mobility can be assured. As a 16-year-old male interviewee explained, a major attraction is:

> 'Independence, having my own independence, you can go where you want, when you want. Getting places faster and without having to rely on other people, like my Dad.'
>
> (Midlands Partnership Group, 2006; p. 138)

In connection with the development of a social identity, for many adolescents reputation is associated with being able to demonstrate the capacity to look after oneself, to avoid childish or unfashionable appearance, and to align with particular peer values. Images of the driver's role and activities are typically formulated with reference to the peer context and the goal of developing a desired reputation.

An important feature of identity is that it is recognised by others: 'A particular symbol is an effective indicator of a person's identity only to the extent that society recognizes, acknowledges, and legitimizes the symbol or activity. The larger the audience, the more effective the symbol' (Vavrik, 1997; p. 464). Several interviewees from the Midlands Partnership Group attest to this process:

> 'All my mates are proper into cars and that, I've picked up from them what's what and stuff, that's what got me into cars.' [Boy 15]
>
> (Midlands Partnership Group, 2006; p. 139)

> 'Is he going to start revving his car up, is he going to start trying to make an impression? They try to impress you I think in a way, they want to impress you. It gives you a buzz.' [Boy 15]
>
> (Midlands Partnership Group, 2006; p. 144)

Impressing others can be advanced by engaging in risky activities, by getting and sharing a 'buzz', as this interviewee indicates. Vavrik (1997) suggests that young drivers' self-descriptions ('top gun', 'road warrior', 'safe driver'), their behaviours (such as 'driving in the fast lane') and physical objects that they value (such as high-performance cars) are ways in which they construct their identities as road users.

Some young motorcyclists interviewed by Watson *et al.* (2007) described how a different style of motorcycle, or different clothing, can make a rider feel and act differently:

> 'The style of bike you ride affects everything. Your personality, attitude, behaviour, everything.'
>
> (Watson *et al.*, 2007, p. 64)

Adolescent identities fluctuate as they respond to different contexts and try out different images. This, too, is manifest in their orientations to riding/driving:

> ‘Getting on a Harley changes your attitude. Going to the pub as a Harley rider and I become a grumpy bum who won’t take shit from anyone. I go as a Honda rider and I’m friendly and have a drink with anyone.’
>
> (Watson *et al.*, 2007, p. 64)

In the course of determining a social identity, peers are important not only as a source of information, but also a reference group who will provide feedback about your choices and, ultimately, your standing:

> ‘You’re going to look like a right idiot aren’t you, driving in a really old bandit.’ [Boy 14]
>
> (Midlands Partnership Group, 2006; p. 140)

> ‘I like modified cars, and if you’re outside of school or outside the pub somewhere with a nice done-up car then you just look smart don’t you? You’re known for your car.’ [Boy 15]
>
> (Midlands Partnership Group, 2006; p. 140)

As discussed in Section 3, taking risks is a prominent feature of transition and reputation-enhancing strategies during adolescence. One of the most influential accounts of the clustering of risk behaviours has been Jessor and Jessor’s (1977) model of adolescent problem behaviour, later extended (Jessor, 1987) to include risky driving. A core assumption of this theory is that engaging in risky activities is attractive to adolescents because it can mark their transition away from the dependencies of childhood towards the autonomy and control of adulthood. In this context, risky behaviours may, from the perspective of the young person, have important functional value; another interviewee, a boy aged 14, declared:

> ‘I’ll get one as soon as I can. Yeah, just because like, a car is everything isn’t it and you can speed and everything!’ [Boy 14]
>
> (Midlands Partnership Group, 2006; p. 138)

In some contexts, peer reputation can be enhanced by oppositional and even very risky road behaviour. One of Watson *et al.*’s (2007) motorcycling informants explained:

> ‘[Name of a motorcycle club], half of them want to be outlaws. They wear the cut-off gloves, pudding helmets, chains, tattoos, scarfs with skullcaps on them.’
>
> (Watson *et al.*, 2007, p. 64)

Bina *et al.* (2006) suggest that driving without a licence may be highly regarded in some adolescent communities in Italy, as a means of establishing bravado and showing one’s disregard for authority. Similar findings are reported in the Ipsos MORI (2008) study of unlicensed drivers in the UK. Respondents indicated that ‘a

lot' of people in their communities, particularly people in their own age groups, drove without a licence and, hence, that it was an acceptable thing to do; in some cases, it was considered 'cool'. Carroll *et al.* (2009) found that, among delinquent and at-risk youth in Australia, driving stolen cars at extreme speeds, provoking police attention and even racing away from the police are explained as deliberately motivated activities in which the perpetrators seek to establish and enhance their reputations among like-minded peers. While these forms of risky driving may be exceptional, some acceptance and admiration of risk is widespread among adolescents (Hampson *et al.*, 2001; Harré *et al.*, 2000).

### 6.1.2 Identity and multiple risk-taking

Not surprisingly, much of the research and discussion in this field has been focused very specifically on driving behaviour and attitudes in young people, and on possible ways of modifying these. But risky driving is not an isolated phenomenon, independent of everything else in a young person's life (Williams, 1998).

As noted in Section 3, many investigators have stressed that it tends to be associated with various other risk and health-threatening behaviours, such as drinking, smoking, other substance use, sexual risk-taking and delinquency (Beirness and Simpson, 1988; Bina *et al.*, 2006; Jessor *et al.*, 1997; Williams, 1998). There is a growing consensus that risky driving needs to be understood as part of the lifestyle of the young people involved. Recognising that different behaviours and attitudes are interrelated in adolescent identity is important both in terms of explaining the developmental significance of identity in driving behaviour and in terms of the implications for policy.

To give a concrete example, imagine that a sophisticated and effective campaign could be implemented to reduce the appeal of risky driving to adolescents. But imagine that all other aspects of a particular group of young persons' lifestyles were left unaffected (these aspects are the concern of other government departments and therefore not targeted in this campaign). Thus, we would be left with a set of young people with responsible driving attitudes, but who drink excessively, experiment with other drugs, engage regularly in sexual risk-taking, and dabble in petty crime – and need to get about town to undertake these activities. It is improbable that the driving inoculation would be sustained for very long if all other risk taking were preserved.

We stress that this hypothetical group of young persons is not representative of all adolescents. Nevertheless, the crucial point is that identity is a complex interwoven construct with wide-ranging organisational implications for young people. It is not easy to modify just one component.

### 6.1.3 Identity and gender development

An important dimension of identity development is one's gender role orientation. Gender role development begins in early childhood and proceeds into adulthood; the particular processes of adolescence, which many argue include periods of 'gender intensification', need to be understood as part of this longer-term, complex and robust sequence.

As discussed at several places in this report, risky driving is more prevalent among males. Part of the attraction of risk taking for young men is that it is strongly associated with key features of the traditional male role (Arnett *et al.*, 2002; Farrow and Brissing, 1990). Driving is a powerful activity and power is an important component of traditional masculine identity (Addis and Mahalik, 2003; Jeffery and Durkin, 1989). As discussed above, the very freedom to control one's travel autonomously is likely to increase a sense of self-efficacy. Driving also offers the prospects of speed, skill in handling risky situations, and dealing competitively/aggressively with other drivers (Arnett, 2002; Courtenay, 2000; Krahé and Fenske, 2002; Harré, 2000; Midlands Partnership Group, 2006). Certain types of vehicle (e.g. high-performance cars) are still more strongly associated with powerfulness (Arnett, 2002; Clarke *et al.*, 2005).

Again, the importance of having a masculine identity is very much a social process: the identity has to be projected to others and is integral to peer relations. A motorcyclist observed: 'When some people are on a bike they feel more masculine, rougher and tougher, like they are owed more respect' (Watson *et al.*, 2007, p. 64). The Midlands Partnership Group (2006; p. 145) found that adolescent boys never tell their speeding drivers to slow down, even if they are feeling uncomfortable. It is not self-enhancing to the adolescent male to appear timid in the face of assertive displays by peers, and not appropriate to attempt to curtail another's demonstration of his masculine prowess. Both male and female interviewees in the Midlands Partnership Group study report that males like to speed to impress girls, and at least some girls feel obliged to convey that the strategy is successful.

In an interesting experimental study, Schmid Mast *et al.* (2008) found that priming young men by having them listen to masculine words from the car radio while driving a simulator led to significant increases in speed; no such increases were found for participants primed with feminine or neutral words. This suggests that environmental stimuli which activate masculine identity, even outside the conscious awareness of the driver, may put him at greater risk of unsafe driving. Such stimuli could include everyday radio commercials, which are often highly gender stereotyped and have also been shown to affect the processing of gender-related information (Hurtz and Durkin, 2004), and masculine music (such as powerful rock and heavy metal) which tends to be associated with reckless behaviour (Arnett, 1991).

## 6.2 Identity: summary

Forming an identity is a fundamental aspect of development, of particular significance through adolescence and early adulthood. An individual's sense of identity, including desired self-image, can bear importantly on his or her orientation towards road behaviour. For many adults, driving and car ownership are important components of their identity. Identity development is a broad process extending from childhood to adulthood. Among children, self-identities are associated with attitudes towards risk in pedestrian decision-making. In turn, self-identity factors are correlated strongly with a general measure of risk taking and with attitudes towards pedestrian behaviours. During adolescence, the prospects of achieving driver status and possessing a particular type of vehicle become motivating for many. Gender identity is strongly linked to how young people equip and express themselves as road users. Driver status and vehicle attributes tend to be particularly important to young males, and closely interwoven with aspects of male gender role identity, such as autonomy, power and bravado.

## 6.3 Policy implications

- Identity issues are integral to development, especially in the later pre-driver years. Information, education and training for pre-drivers should be formulated in ways which are sensitive to these preoccupations and motivations.
- Because a sense of identity is deeply entrenched and deeply valued in mid to late adolescence, it is difficult to modify during this period. This is especially so in relation to gender identity, threats to which are emotionally arousing and often rejected by adolescents.
- Interventions aimed at younger pre-drivers may be advantageous. If a person can be encouraged to define himself or herself in a particular way (e.g. 'I take care about others' safety on the roads', 'I know the rules') during childhood, and this is sustained into adolescence, then he or she is less likely to engage in behaviours that contradict that dimension of identity.
- Consideration should be given to the image(s) of drivers and driving that pre-drivers acquire and to the ways in which different parties (parents, peers, media) contribute.

# 7 TASK DIFFICULTY AND SKILLS

Strecher *et al.* (2007a) argue that task difficulty is defined by the joint influence of an individual's ability and the demands of the task. In other words, the difficulty of a task is experienced differently depending on individual ability: in general terms, as ability increases, the perceived difficulty of a particular task becomes lower. For example, reversing into a parking space will appear to be hard to a learner driver, but simple to a driver of 20 years' standing. Strecher *et al.* (2007a) also consider the main impact of experienced difficulty to be that it alters the relationship between intention and behaviour (see the brief outline of the Theory of Planned Behaviour in Section 2 of the present report): as perceived difficulty decreases, the likelihood of someone being able to form an intention and carry it through successfully becomes greater.

This perspective on task difficulty provides a useful start point, but it is simplistic in some important ways. Most notably, it disregards the gap between actual ability or task demands, and **perceptions** of these. An individual has an objectively measurable level of ability to carry out the various actions required by the task of driving a car, for instance, but their perception of this ability may be an over- or underestimate. Drivers who perceive their ability to be greater than it really is may attempt to do things, such as cornering at speed, which they are not actually capable of executing. Similarly, the requirements of executing a specific manoeuvre may be objectively measurable, but these are not necessarily the same as the perceived demands. Even if a person has a reasonably accurate sense of their ability, they may still misread the demands of a situation. Out of inexperience and/or failure to direct attention properly, for example, a driver may attempt to overtake another vehicle without being aware of the presence of a further vehicle pulling out of a turning, increasing the task demand substantially.

Since misperceptions of ability and task demand are plainly a major potential source of problems, this raises the questions of how inaccurate perceptions arise, and how they come to be more accurate. In addressing these questions, it is helpful to use a distinction between **social** and **cognitive** aspects of driving captured by Hatakka *et al.* (2002) in their Goals of Driver Education (GDE) framework. In analysing the competences that drivers need to acquire, Hatakka *et al.* propose a four-level hierarchy, with vehicle manoeuvring skills at the lowest level; mastery of traffic situations involving other vehicles at the next level up; then knowledge relating to the social goals and contexts of driving, such as the pressures exerted by passengers; and finally, at the highest level, knowledge about how life goals and personal tendencies affect driving.

At each of these levels, performance is enhanced by the capacity for self-awareness and self-evaluation. However, the nature of the **self-regulation** (to use a more general psychological term) that is required at these different levels is rather

different. At the lower two levels of the GDE framework, for example, self-regulation is principally concerned with attention to moment-to-moment changes in vehicle behaviour within the current traffic context, and management of these changes. It is therefore largely a **cognitively**-based activity, focused on physical behaviour.

At the higher two levels, in contrast, self-regulation is concerned with monitoring the **mental** condition of oneself and others, and how this affects driving. This obviously still involves cognition, but with a focus on **social** processes. As the section on identity outlines, even consideration of one's own personal characteristics is heavily influenced by the perceptions of ourselves that we acquire through interactions with others, and the images of ourselves that we wish to present to other people.

Given these differences, the source of inaccurate perceptions at the lower and higher levels of the GDE framework is rather different, we argue, and is mirrored in the distinction between lapses or errors (genuine mistakes) and violations (deliberate illegal and/or hazardous behaviours) made by Reason *et al.* (1990). Inaccurate perception of the immediate driving task is likely to be associated with lapses and errors. Violations are more likely to arise from faulty – or at least elevated – perceptions of ability, which involve socially-influenced self-concepts: high violators tend to consider themselves to be better drivers than others, and overestimate the number of other drivers who speed, drive too close and commit other violations (Manstead *et al.*, 1992; Stradling *et al.*, 2005). That is, they are not just reckless or inadequate drivers, but they have a view of themselves in relation to others that fuels a risk-prone orientation.

On this basis, we define the cognitive and social dimensions of driving as follows:

- cognitive dimension equals factors relating to actual skills or competence, which operate primarily through an influence on moment-to-moment activity, and which derive primarily from direct individual experience; and
- social dimension equals factors relating to perceived ability, which operate largely through an influence on **intentions** to behave in a particular fashion (often formed in advance of the event), and which are predominantly social in origin.

As is implicit within the GDE framework, the social and cognitive dimensions interact in various ways, and these interactions need to be explored. However, the key motivation for drawing this distinction is that there is reason to suppose the social dimension is a particularly potent influence for novice drivers. Young learner and novice drivers emphasise the attractions of acquiring a licence in terms of the personal autonomy it confers and the advantages for social life (Midlands Partnership Group, 2006), and they make (often flawed) social comparisons between their own skills and those presumed in others (Stradling *et al.*, 2005). In part, this

may be because they also lack the weight of direct experience that would lead to better actual skills, and in the absence of this give greater attention to social perceptions, which they are better practised at dealing with. This point is central to understanding why novice drivers, especially young males, are more likely to commit violations and to have accidents. It also serves to indicate another crucial strand of potential intervention during the pre-driver period.

## 7.1 The social dimension of difficulty

In terms of perceptions of personal ability, the psychological literature draws a distinction between **perceived behavioural control** or PBC (Ajzen and Madden , 1986), and **self-efficacy** (Bandura, 1977). PBC derives from beliefs about the probability of factors arising that may impede performance (e.g. traffic density, weather conditions) and self-perceived ability to manage these constraints. If the anticipated obstacles to acting in a certain way (e.g. driving fast) are many and complex, and the ability to deal with some of these is perceived to be low, then this will make it less likely that a driver will intend to carry out that behaviour, however positive his or her attitude towards it may be. PBC has been demonstrated to be an important moderator of intentions in driving and other traffic-related behaviours. Elliott *et al.* (2003), for instance, found PBC to be a stronger predictor of speeding than either attitudes or subjective norms. Parker *et al.* (1992) found similar effects, and Evans and Norman (1998) report that PBC was the dominant influence on adult road-crossing behaviour: where it was low, pedestrians were less likely to intend to enact a risky road crossing.

A defining characteristic of PBC is that it is at least partially context-dependent. The factors that are seen as intruding on driving fast are likely to vary from circumstance to circumstance. In contrast, self-efficacy is a set of beliefs about the **intrinsic** capability to enact intentions. Because it is focused more exclusively on perceived ability, it tends to be more stable across context, though it varies according to the behaviour involved (a person might have high self-efficacy in relation to driving, for example, without this necessarily extending to, say, his or her occupation or parenting skills). The distinction between PBC and self-efficacy is an important one because it means that they may combine in an unpredictable fashion. For example, if an individual appreciates that dense traffic makes it harder to drive fast, but has a strong sense of self-efficacy, which will weigh more heavily? Self-efficacy is therefore an additional potential influence on intention (Webb and Sheeran, 2006), though it has been less well explored in the context of driver behaviour.

As well as operating in subtly different ways, PBC and self-efficacy tend to have slightly different origins. PBC is built up from past encounters with barriers to and facilitators of performance, and the experienced outcomes of these (Ajzen and Madden, 1986). Self-efficacy rests more on past success and failure rates in general, rather than being concerned with the specific factors at work in any instance (Bandura, 1977). Importantly, though, being **belief**-based, both may also be subject

to social influences. For instance, in the case of PBC, the reports of others about barriers to a behaviour (e.g. the presence of speed traps) and ease of dealing with these (e.g. stories about how to tell whether these are active or not) may affect perceived control. Self-efficacy may be promoted simply by the belief of others in one's ability (Pajares and Urdan, 2006), perhaps especially as captured in narratives that are told about past outcomes. Self-efficacy may also be subject to self-serving biases, in which negative outcomes are perceived in distorted fashion, to allow self-image to be maintained. It is therefore particularly likely to be influenced by social processes, especially those relating to identity.

It is important to note that PBC and self-efficacy are self-conceptions that individuals take into situations, which prepare them to behave in line with intentions **that have already been formed**, i.e. they are not influences that are subject to moment-to-moment adjustment. For this reason, PBC and, more particularly, self-efficacy are likely to be part of individual self-identity. As discussed in earlier sections, self-identity is heavily influenced by the identity of the social groups that we see ourselves as belonging to, and this is particularly likely to be true for younger people, where identification with peer groups is especially marked (Tolmie *et al.*, 2006) – and potentially problematic in the case of males, where the social pressure towards high self-efficacy with respect to driving may be considerable (Midlands Partnership Group, 2006). This underscores Strecher *et al.*'s (2007a) point that, while self-confidence is needed to drive appropriately, too great a level of self-efficacy may be counterproductive, since it may lead those with strong self-belief to act in a negative fashion (at least as far as others are concerned) regardless of more moment-to-moment feedback.

## 7.2 The cognitive dimension of difficulty

Driving demands a diverse range of skills, many of which need to be engaged on a moment-to-moment basis in order to maintain control of a vehicle in traffic. The Driving Standard Agency's list of competencies (DSA, 2003), for instance, comprises 78 separate elements, plus underpinning knowledge, grouped into 24 basic areas. These relate to preliminary checks, use of car equipment and conduct of the vehicle, both in general and under specific circumstances that call for more specialised behaviour (e.g. the use of roundabouts and junctions, parking and reversing).

Models of the acquisition of complex behaviours (e.g. Anderson, 1980; Sternberg, 1977) hold that greater experience leads to increasing automation, and there is no reason to suppose that this differs for driving. Nevertheless, the demands of monitoring driving performance remain considerable. For this reason, there has been extensive interest in the impact of distractions inside and outside vehicles (Lam, 2002; Young *et al.*, 2003), and, in particular, recent concern with regard to mobile phone use (e.g., McEvoy *et al.*, 2005; Neyens and Boyle, 2008).

The near-uniform conclusion of this research is that distractions increase the risk of accidents, and that mobile phones do so in particular, even when used hands-free (Consiglio *et al.*, 2003). Arguments that familiarity with technology use from a young age provide younger drivers with a greater capacity for multi-tasking seem not to be borne out, and indeed, there is no reason to think that attentional resources are very highly elastic, even if they increase substantially during childhood and adolescence (Gathercole *et al.*, 2004). If young drivers make more use of multiple technologies because it is fashionable to do so, it may be that they are simply spreading their attention more thinly.

This underlines the point that the capacity to formulate fresh intentions in the strategic sense – for example, to meet social goals – is likely to be reduced once the vehicle is in motion, and that other modes of behavioural control become of necessity more dominant at this point – for more experienced drivers at least. Among other things, this in turn raises questions about how these other modes of control are acquired, what they consist of, and how the relationship between the social and cognitive dimensions of driving might shift as a result.

With regard to the process of acquisition, there is a general assumption on the part of both the public and the Government that specific instruction in the form of driving lessons plays a central role in this. However, perceptions of what this means and what it provides are less consistent. For the DSA and the Government, for instance, such instruction is intended to produce sufficiently high levels of competence for drivers to become safely independent, and to help ensure that this is the case, the nature of the driving test has shifted over time to reflect more fine-grained analysis of what such independence involves. In contrast, as Christmas (2007) reports, for novice drivers in particular, driving lessons and passing the driving test merely represent the achievement of a certain baseline, at which point real learning can commence.

Viewed as a skill in this latter sense, the central means to acquisition and refinement of driving competencies is action, and the monitoring of the feedback on performance that this provides. This process involves mapping actual onto intended performance, noting any discrepancies, and, provided the learner is motivated to improve, altering subsequent performance via the application of strategies to reduce those discrepancies (cf. the points on calibration in Section 3 (perceived threat and perceived benefits)). This results in behaviour being adjusted accordingly across different skill components, and as far as possible in co-ordinated fashion.

In other words, then, the acquisition of driving skills rests on a form of metacognition, or awareness of cognition, something that is seen as a key strand of **self-regulated learning** (Hatakka *et al.*, 2002; Winne and Hadwin, 1998). In line with the importance attached to driving lessons, the growth of such self-regulation may need to be socially directed at first, to enable the learner's attention to be steered towards key elements of feedback, and to strategies or information that may

prove helpful in adjusting subsequent performance (cf. Hadwin and Oshige, 2007; Tolmie *et al.*, 2005). Ultimately, though, further refinement becomes primarily an internal, cognitive activity, dependent on raw experience.

Engagement in suitable monitoring and self-regulation by young novice drivers seems not to be guaranteed, however, and research by Tolmie *et al.* (2006) on adolescent road-crossing may help explain why. Paralleling Ullebeg's and Rundmo's (2003) work on young drivers, they report evidence of an increasing tendency in early adolescence for individuals to misperceive the demands of road-crossing tasks, consistently estimating these as less difficult than adults, despite measurably lower skill levels. This trend was particularly evident after completing tasks, when feedback from personal monitoring should be available: at this point, adults tended to revise difficulty estimates upwards, while adolescents revised them downwards. The extent of these misperceptions was found to be associated, moreover, with increased espousal of risk-taking as part of self-identity.

It would appear, therefore, that those who perceive themselves to be more able may choose to ignore the feedback that provides a route to actual increases in ability. Given the overestimates of ability reported by Ulleberg and Rundmo (2003), this perhaps explains the deteriorating performance over the first two years of driving reported by Grayson and Elliott (2004). This picture is also borne out to some extent by research described in Clarke *et al.* (2005) and Clarke *et al.* (2006). Comparing the relative contribution of skill deficits and risk-taking to the elevated accident rates found among young drivers, using police reports of actual events, they conclude that a large percentage of these accidents are attributable to voluntary risk-taking alone, i.e. an **intention**-based factor in the sense used above. It is also worth noting that there were signs that the youngest of the drivers for whom data were examined, 17–19-year-olds, exhibited poorer skills, especially with regard to judging the speed and distance of other vehicles, and overbraking/oversteering (Clarke *et al.*, 2005). The potential problems created by this, if self-efficacy is also high, are clear.

Based on this evidence, we argue that the behaviour of young novice drivers is influenced more by intentions that are social in origin, and once basic competence is in place, they fail to use the actual experience of driving to improve their skills. The key questions are, firstly, what produces this effect, and, secondly, what leads it to change as the driving career progresses.

## 7.3 Developmental issues

Answers to both questions are necessarily speculative without further research. It is likely, though, that the effect itself is largely attributable to the importance attached to self-identity as a driver, and the freedoms that this brings – especially where this is interpreted as a freedom to take risks (Christmas, 2007; Midlands Partnership Group, 2006). The fact that older novice drivers exhibit a less extreme version of this same effect (Grayson and Elliott, 2004) indicates that the change of role itself

may contribute partly to this emphasis of social perception over skill. It might also reflect a tendency, on the part of novice drivers, to be unable to focus on much beyond the social dimension because the skill set itself is still too complex and under-learned for them to cognise it appropriately. The greater reinforcement of social identity experienced by young drivers, and the kinds of identity choices that are made, are likely to amplify these effects considerably, though.

As to what leads to change, the Grayson and Elliott (2004) data suggest that the passage of time has an impact, perhaps because the novelty of being an independent driver wears off, and the identity associated with it becomes less focal. It may be that, eventually, time also gives rise to so many close shaves that these create some pressure to re-examine performance (cf. Christmas (2007) on the reports of young drivers with regard to this).

Ultimately, the means of counteracting these problems would seem to lie primarily in promoting genuinely better skills, since these will inevitably tend to be associated with more **controlled** and therefore safer behaviour. This is not to ignore concerns that greater skill levels may fuel greater risk-taking (cf. Strecher *et al.*, 2007a). However, engagement to a greater extent with the **self-regulated** development of skills may assist here because it tends to shift the focus onto the cognitive dimension, diminishing the importance of the social. It might also help if perceptions of what constitutes driving skill could be shifted away from handling fast-performance cars, and – ironically, in a sense – onto the complex combination of social and technical skills that is involved in navigating busy urban environments.

Certainly, promoting skill levels would seem to be the only way to get through the trajectory of competence development implied by the preceding discussion, where, at first, ill-refined behaviours follow social intention; then the source of influence switches to immediate external conditions (hence, the tendency to follow the behaviour of others); and only finally is behaviour brought back under strategic personal control, where moment-to-moment action is performed in service of intentions, but intentions are formed in the knowledge of what is behaviourally possible – and appropriate (cf. Hatakka *et al.*, 2002).

The foregoing discussion identifies the growth of hazard perception and the relative influence of skills and self-perceptions as being the areas of specific concern for the pre-driver period. Since developmental influences on self-identity and associated self-perceptions have been dealt with at length in preceding sections, these will not be considered further here. The focus instead will be primarily on skill development, and ways in which the relative impact of the cognitive dimension on subsequent driver behaviour can be increased. With regard to the latter, there are signs that the early promotion of traffic-related skills does have a positive influence which might act as a safeguard against the distortions caused by social factors.

For instance, in their examination of the relative influence of a range of factors on adolescent self-reports of road-crossing intentions and behaviour, Tolmie *et al.* (2006) found that measured levels of crossing-related skills had an independent effect on behaviour, though not on intention. This was especially true of skills relating to the location of safe crossing points, which comprise an element of hazard perception in the sense of recognising the differences between safe and less safe crossing points. That the impact of these was on behaviour rather than intention indicates that higher levels of skill act directly on moment-to-moment behavioural decisions, helping to counteract social pressures towards risk-taking – as was actually the case in terms of pedestrian behaviour.

The early promotion of traffic-related skills might not require efforts specifically devoted to driver behaviour, either, since there is much relevant experience that children and adolescents acquire in any case, to some extent through programmes of pedestrian training, but also as part of the acquisition of wider social skill. In particular, if reading the road (i.e. anticipating future vehicle movements) is a key element of driver skill (cf. Kinnear *et al.*, 2007), this can be seen primarily as a special case of reading the intentions and beliefs of others (what is termed having a *theory* **of mind** within developmental psychology; see, e.g., Wimmer and Perner, 1983; Flavell, 1999), something which is critical to everyday social interaction.

The principal difference is that the kinds of visual (e.g. eye gaze, facial expression) and auditory information (e.g. verbal statements, tone of voice) that are used in face-to-face interaction are typically absent when drivers are sitting within separate vehicles. Nevertheless, alternative cues are available, for instance from vehicle position and speed, and car signalling equipment, and the process of interpreting these in terms of intentions and beliefs seems likely to be essentially the same (see, e.g., Foot *et al.*, 2006). Thus, adapting existing understanding should not prove difficult, given some specific training on the cues to attend to, and successful simulation-based materials of this kind have already been developed for training children to read the road as pedestrians (Tolmie *et al.*, 2002).

There may well be other experiences from road-crossing and cycling that are relevant to driver skills too, with the primary issue being one of connecting those experiences and associated understanding with the context of driving, and encouraging suitable degrees of generalisation. This does present difficulties, since connection and generalisation of this kind is characteristically a problematic aspect of human learning (Gick and Holyoak, 1983). Nevertheless, such linkage is known to be substantially more likely when externally assisted (Dunbar, 2001). Investigation of the types of linkage that are most useful and most effective in the pre-driver period would seem likely to repay investment, therefore. It might also be helpful to reconsider the way in which driver training is presented: the tendency for an emphasis on vehicle handling may well serve to make driving seem like independent skill, impeding rather than facilitating connections back to relevant pre-existing skills.

A further barrier here may be opaque or faulty conceptualisation of some of the key elements of driver skill. As noted earlier, there is a general consensus within the driver behaviour literature that reading the road and hazard perception are emergent higher-order skills, which can only be acquired once the more basic driving-related skills are in place. In fact, from a developmental perspective there is relatively little to support this conclusion. Certainly, children are able to engage in equally complex forms of social perception and interpretation from the age of four years. Similarly, training in reading the road as a pedestrian has been found to be effective with children as young as six years (Tolmie *et al.*, 2002; Foot *et al.*, 2006).

Provided suitable means and opportunity can be found, therefore, there would seem to be no reason not to work on hazard perception in the pre-driver period. This does not mean that the deployment of such skills will be unaffected by the attentional demands of getting to grips with the basics of vehicle control (which is perhaps one reason why they seem to be higher-order in character). Nevertheless, having them ready to be deployed once greater automation of vehicle control has been achieved seems preferable to attempting to address them only at that point. Moreover, they may help to reduce the influence of the social dimension during this period, as already noted. The emphasis on training such skills among pre-drivers would, of course, also fit well with the wider consensus that skill development is the most successful aspect of pre-driver education (see Deighton and Luther, 2007), while underscoring the importance of selecting appropriate skills and grounding these suitably in existing experiences. In this respect, avoiding and resisting distraction may be another suitable area for consideration (see Young *et al.*, 2003).

One further important strand to consider here is the potential use of pre-driver training to promote engagement with self-regulated learning. As noted earlier, there is a tendency for the public at large to perceive formal driver instruction as a preliminary phase of learning to drive. In addition to the reasons discussed at that point, it might also be argued that such instruction often over-emphasises the external regulation of learning. In the context of initial experiences of controlling a vehicle, such external regulation is entirely reasonable, of course. However, having set this tone, it may then prove hard to shift emphasis toward self-regulation. Efforts to extend the pedagogic skills of driving instructors may prove helpful here.

If pre-driver education took advantage of the less immediately critical nature of the skills being promoted to encourage self-regulation at this stage, however, this might push learners towards a focus on the performance-feedback-adjustment cycle when it comes to acquiring skills relating to vehicle control, once more helping to counteract influences from the social dimension. Again, achieving this would demand careful analysis of the skills being developed in the pre-driver phase, and consideration of suitable task designs to encourage the three elements that make up self-regulated learning, i.e. awareness of the learning process itself, knowledge of strategies for adjusting performance, and the maintenance of motivation to master

the task (Winne and Hadwin, 1998). This would not seem to present any substantial barrier, though.

## 7.4 Task difficulty and skills: summary

We argue that there is a key distinction, implicit in much previous research, between social and cognitive processes relating to driving ability. Social processes are concerned with perceived ability and perceived demands, as coloured by socially-driven self-conceptions, and act primarily as influences on the intention to drive in a particular way. Cognitive processes are concerned with actual competences and skills, and act as an influence on moment-to-moment decision-making during driving. These processes interact with each other, but for novice drivers (especially those who are younger and for whom driving marks a major social change) social processes are more dominant, partly because they have yet to attune themselves properly to the task of driving and to attend to relevant feedback. This is particularly the case where belief in personal ability is already high, as adolescent male identity often requires, leading to more challenging and riskier styles of driving that are resistant to moderation via experience. Since greater skill and higher levels of self-monitoring and self-regulation are associated with safer behaviour, one way to counteract this social dominance during the pre-driver period would be to promote better hazard perception (the most transferable aspect of skill, and one of the most central to safe driving) and encourage greater personal responsibility for skill development.

## 7.5 Policy implications

- There should be more research on the relationships between skill and perceived ability at different stages of the driving career, and on what promotes or impedes shifts towards genuine self-regulated skill development. Such research is an essential requirement for the longer-term development of effective interventions.
- Training in road-crossing and cycling, as well as pre-driver training, should emphasise self-regulated learning, and make reading the road a central concern, connecting this back to children's and adolescents' underlying social skills in reading others' intentions.
- Those responsible for driving instruction and testing should bear in mind that there is an important distinction between driving skill and actual driving behaviour, with the latter being influenced by social processes, especially those relating to identity.
- The tension between the social and cognitive dimensions of driving ability – based on the contrast between driving 'flashily' and driving with the full range of complex skills in place – should be exploited by promoting awareness of the real nature of driver competence, and its equivalence to other desirable skills of similar complexity, such as playing football and other sports.

# 8 HABIT

## 8.1 Habit, social practices and modelling

The association between past and future behaviour is strong. In many instances, the single biggest predictor of whether or not people carry out a behaviour is simply whether or not they have done so in the past.

This influence from past behaviour is generally felt to be attributable to **habit**, i.e. repeated patterns of behaviour that become sufficiently established that they are performed as a matter of course whenever the circumstances associated with them occur, without pause for thought. The existence of such automated behaviours is a feature of many theories of adult learning, and driving involves many repetitive actions that make it a strong candidate for a high level of automation (Groeger, 2000).

There would therefore seem likely to be much scope for the acquisition of habits, both good and bad. Direct evidence on the issue is not extensive, but there is certainly some which appears supportive. In the context of seat-belt use, for example, Calisir and Lehto (2002) found that more conscious processes, such as risk perception, had little influence on the anticipated use of belts under a range of conditions, the main predictors being instead demographic factors such as age and level of education. They conclude that the pattern of influences suggests habit is the principal mechanism at work.

Habit is not completely separable from other influences on driver behaviour that we have discussed in previous sections. The apparent dominance of habit in some aspects of driving may often be more to do with conformity to social practices than to personal idiosyncrasies. Speeding may be routine for some drivers, but it is also influenced by the actual or perceived behaviour of other drivers (e.g. 'keeping up with the flow'; Aberg *et al.*, 1997). Similarly, 'habits' of using the road at particular times, or of driving less frequently than average, can often be explained in relation to overriding considerations, such as employment demands and health status (Gallo *et al.*, 1999; Hamblin, 1987; Owsley *et al.*, 1999). Nevertheless, while many variables may affect the likelihood of a behaviour occurring, the extent to which it is repeated (or habitually omitted) is clearly an important component of driving.

Habits can be modified. In relation to seat-belt usage, for example, Pasto and Baker (2001) found that increases could be achieved by posting information on usage by others. This is, in effect, a manipulation of perceived norms (see Section 4) and apparently it created pressure to conform. Similar processes appear to have been entailed in a successful intervention to promote turn signalling at an intersection, increased from a baseline of 68% to 89% by use of posters exhorting drivers to 'Please Signal and Drive Safely' (Clayton and Myers, 2007).

## 8.2 Developmental issues

From a developmental point of view, the status of habit in the context of pre-driver influences on novice driver behaviour is unclear for several reasons, not least the fact that people can scarcely form driving habits before they begin to drive. Even so, there are some important points regarding the emergence and setting conditions of habit that relate to processes discussed in earlier sections.

In terms of **personal** habit, as opposed to social practices, this could only be an influence if a very broad definition of what constitutes a repeated pattern of behaviour is accepted. Habitual forms of behaviour could be implicated, for example, in an individual's propensity for rule following, or for using the roads as a context for risk taking. If this is true, though, it is hard to see how an account in terms of habit takes us beyond the factors discussed in relation to personality (characteristic patterns of behaviour) and identity (a sense of who one is, what one does).

Forms of habitual behaviour, such as how a young person deals with multitasking or distractions, emerging in other contexts during childhood and adolescence may have potential for generalisation to driving. For example, expertise in the use of computers and video games can promote some aspects of children's spatial cognition (Subrahmanyam *et al.*, 2001), but not all young people have equivalent access or motivation in this domain. Thus, some will develop skills in handling digital information and spatial tasks under time pressure, and others may be less advantaged, or prefer shortcuts. Similarly, young people who habitually exhibit difficulties in regulating attention (e.g. those with Attention-Deficit Hyperactivity Disorder (ADHD)) and who tend through childhood to be at greater risk of accidents (DiScala *et al.*, 1998), tend to be at significantly greater risk of driving errors (Barkley *et al.*, 1996; Nada-Raja *et al.*, 1997).

Social practice accounts of habit, involving some form of vicarious learning from observation of the behaviour of others during the pre-driver period, may be an influence on later behaviour. This again leads back to influences discussed previously, with the 'sleeper effects' derived from parental 'habits' likely to be of particular relevance, for good or ill, since these are the most likely to be witnessed in detail (Ivett, 2001). If one's father habitually swears upon observing others' transgressions, or one's mother slips her seat belt on only when she approaches a main road, then these could become part of the 'script' of what a young person anticipates driving to involve. Evidence of the influence of parental modelling has been found in the context of adolescent pedestrian behaviour (see Section 4), suggesting that there is a possibility for this to extend to driving.

Broader social practices, such as environmentally determined opportunities, also bear on the emergence of habitual patterns of behaviour. For example, children's play will take them into the street if they live in heavily built-up urban environments

where this is the only, or the most readily accessible, leisure environment, whereas children in leafier suburbs or villages may have more immediate recourse to parks and fields. The everyday habit of playing in a particular location has implications for the children's safety: accident rates are highest in the urban environments (Downswell *et al.*, 1996). Correspondingly, modifications to the physical structure of the road can lead to changes in where and how children play, and to changes in drivers' behaviour, resulting in substantial improvements in children's safety (Downswell *et al.*, 1996). These are not necessarily conscious adjustments on the part of child or driver, but they can establish safer practices.

Anyone looking at child accident rates or casualties among novice drivers is likely to empathise with calls, often made by road safety educators and policymakers, for the instillation of positive habits from an early age. However, at present, very little is known of the durability of habits acquired at different stages of childhood – as pedestrians, cyclists or passengers. Intuitively, it is plausible that, if a child 'gets into the habit' of looking in both directions, or donning a safety helmet whenever getting onto a bicycle, or wearing a seat belt as soon as entering a car, then she or he will be more likely to sustain positive practice into her or his novice driver period and beyond. However, there is little evidence to test this assumption. Furthermore, there are developmental phenomena which may act in the opposite direction. For example, no matter how regularly a 10-year-old puts on a cycling helmet, he may find it very difficult to keep doing so some four years later when his peers impress upon him that this is just not cool. More research is needed into the durability, robustness and threats to driving-related habits formed in childhood.

Research to date has assessed broad correlations between parental driving and novices' driving, but more attention could be paid to the role of habitual dimensions. In particular, we need to know more about the possible transfer of habits during what may be a critical period, namely the weeks and months during which parental supervision of driving practice occurs.

## 8.3 Habit: summary

Whether or not people carry out a behaviour is often predicted by whether or not they have done so in the past, i.e. whether the behaviour has become habitual. In driving, both positive (putting on seat belts, checking mirrors) and negative (overtaking in the wrong lane, failing to signal) behaviours can become habitual. Many variables affect habit formation, and there is also evidence that habits can be modified. People can scarcely form driving habits before they begin to drive, but they may form habits that become the backdrop to some of their later behaviours on the road. At a very general level, an individual could develop a habit of seeking risk or being cautious; patterns of inattentive behaviour established during childhood may be hard to relinquish when one becomes a driver. Some driving habits may be acquired vicariously through watching one's parents or other significant drivers. Much environmental road policy is designed to influence drivers' and pedestrians'

habits, and there is evidence that it can be effective. We need to learn more about driving-related habits formed in childhood and how stable they are.

## 8.4 Policy implications

- Habitual practices are important in driving (and accidents).
- In principle, laying down the basis for safety habits and for minimising risk would be valuable achievements of pre-driver education.
- Habits are concrete activities and therefore open to specific interventions. Road safety campaigns often exploit this ('Clunk click', 'Think before you drink before you drive'). Much remains to be done to determine effective ways of doing so and to evaluate short-, medium- and long-term consequences of intervention.
- The likely significance of exposure to parental driving habits leads to a need to target key parties beyond pre-drivers themselves. Parents should be reminded about the impact of their own habits in the course of role modelling. Parenting organisations and driving associations do provide guidance for parents of teenage learners, including the instigation of safety habits (e.g. http://kidshealth.org/parent/positive/family/driving_lessons.html). This could be extended and evaluated.

# 9 CONTEXTUAL INFLUENCES

Pre-drivers do not construct their perceptions, affective beliefs and images of driving in a social vacuum. As noted in previous sections, from their earliest experiences of road use and vehicles they are exposed extensively to the behaviours and values of others. Children watch how their parents drive. As they grow up, they listen to experienced road users' commentaries on the shortcomings of other drivers, how to deal with speed cameras or traffic police. At times, they receive instruction, such as how to cross roads, how to behave as a passenger and, eventually, how to drive. They learn about regulations: how to cycle safely, at what age it is permissible to sit in the front passenger seat, at what age one can apply for a provisional licence. They are exposed to shared images (informal beliefs communicated within family or peer settings, media representations of driving and drivers).

Thus, the several psychosocial factors we have discussed so far also need to be considered in relation to a wide range of contextual influences that are potentially influential in the ways children and adolescents develop their views of driving. In this section, we review evidence concerning some of the most prominent sources of information and potential influence. These are: parents, peers and the mass media.

## 9.1 Influence of parents

Parents have a particularly prominent role in the socialisation of pre- and novice drivers (Ivett, 2001; Shope, 2006). For the majority of children and adolescents, the persons they are most frequently able to observe in charge of vehicles will be their principal caregivers. Thus, parents serve as driver role models, as sources of information about vehicles and safety, as interpreters of legal constraints, and as commentators on the behaviours of other road-users and those who police the roads. In many households, parents serve in due course as facilitators of and/or direct contributors to the young person's own driving lessons. Parents may also contribute indirectly to young people's driving styles because of shared genetic material (e.g. temperament, sensation seeking) and/or because of the acculturation of more general behavioural and attitudinal standards (e.g. a global disregard for the law, a strong commitment to courtesy towards others which extends to courtesy on the road).

There is good evidence to confirm that intergenerational transfer does occur, with long-term consequences. Several studies of the relationship between parental driving records or driving style and those of their adolescent/young adult children have demonstrated associations (Bianchi and Summala, 2004; Carlson and Klein, 1970; Fergusson *et al.*, 2001; Shope *et al.*, 2001; Taubman-Ben-Ari *et al.*, 2005). Fergusson *et al.* (2001) found that drivers aged 18 to 21, whose parents had three or more crashes on their driving records, were 22% more likely to have crashes than were young drivers whose parents had clean records. Young drivers whose parents

had a history of driving violations were 38% more likely to have obtained a record for a violation themselves.

It is important to note that these figures suggest that influence could be negative or positive. While they show an association between poor parental driving and unsafe early driving in the offspring, they reveal also that many parents who have no records of violations produce children who, in turn, appear to be non-offending drivers.

Most of the available research on parental involvement has been focused on the contexts of novice drivers. There is particular interest in this topic in the US, where many states enforce Graduate Driver Licensing (GDL) schemes and supporting programmes (Senserrick, 2006; Simons-Morton and Ouimet, 2006), some aspects of which tacitly or indirectly involve parents (e.g. in supervisory roles in driving practice).

Hartos *et al.* (2000) found evidence of strong links between parenting practices and the prevalence of risky driving behaviours, traffic violations and crashes in a sample of 16–18-year-old American novice drivers. Higher levels of parental monitoring (i.e. requiring information where the young person is, what he or she is doing) were related to fewer risky driving behaviours. The researchers note that this could reflect preventive processes (parental interest reduces the likelihood of embarking on risky driving practices) and detection (parents who monitor will identify problems earlier). Higher levels of parental control (i.e. directly guiding the young driver to avoid risks and to maintain safe practices) were related to fewer traffic violations. The imposition of parental restrictions – such as whether peers were allowed as passengers – also affected violation and crash incidences.

A large body of research conducted by Simons-Morton, Hartos and their colleagues (2003, 2006) into parental restrictions and teen driving shows that parents tend to emphasise trip conditions (where and when the driver is going), but tend to intervene less in respect of risk conditions (such as night driving, driving with peer passengers, using high-speed roads; Simons-Morton and Ouimet, 2006; Simons-Morton *et al.*, 2008). Furthermore, limits on the latter conditions tend to decline rapidly. This research indicates that parents do have potentially important roles to play in guiding the practices of novice drivers; however, very little attention has been paid to the guidance parents provide to pre-drivers and its possible effects.

## 9.2 Influence of peers

A feature of adolescent development is the increasing salience of the peer group (Durkin, 1995; Smetana *et al.*, 2006). Young people begin to spend less time with their families and more with their 'age mates'. Most activities that adolescents undertake voluntarily are shared with friends, if possible. Risky activities are

particularly likely to be undertaken in peer company (Carroll *et al.*, 2009; Emler and Reicher, 1995).

It has been argued that the social dynamics of friendship cliques may provide part of the explanation for the high accident rates in 16- and 17-year-old drivers (Arnett, 2002; Keating, 2007). This claim is consistent with the findings of several studies showing that crash rates are higher for teens when the driver is accompanied by two or more passengers (Doherty *et al.*, 1998; Preusser *et al.*, 1998; Rice *et al.*, 2003). These studies also show that crashes involving young drivers are more likely to occur at night-time (i.e. a key period for socialising). Arnett speculates that adolescents in company tend to treat the car as a recreational and social space, and that they are dealing with heightened emotions due to the arousal of peer company and with desires to impress one another (e.g. by speeding or other risky driving).

It may also be that being seen to behave safely, to follow adult-recommended guidelines, is perceived as 'uncool' among some adolescents (Keating, 2007; Keating and Halpern-Felsher, 2008). In analyses of fatal crashes, Williams and Shabanova (2002) found that, among teen drivers but not adults, seat-belt use decreased with increasing number of passengers.

## 9.3 Influence of the mass media

The mass media have been identified as possible sources of unrealistic and dangerous images of risky driving. Critics point to the glamorisation of high-speed driving and car chases in action movies, and the association that these potentially forge between masculinity and sensational driving exploits (Arnett, 2002; Beullens and Van den Bulck, 2008; Harré, 2000; Keating and Halpern-Felsher, 2008).

Møller and Gregerson (2008) found that young adults who listed interest in computer games among their leisure activities showed higher levels of risk-taking in driving. Any causal inferences need to be made with care, however. It is possible that sensational games encourage risky attitudes and behaviour, but it is also possible that risky individuals seek sensation on the roads and in their game preferences.

Jacobsen *et al.* (2001) compared the rates of seat-belt use in top grossing US movies and in reality over a 20-year period (1978 to 1998). Seat-belt laws were passed in several states in the mid-1980s. The rate of use in movies was below 10% until 1987, i.e. shortly after the introduction of the new laws. Over the next 10 years, seat-belt use in the movies fluctuated between 10% and 30%. National Highway Traffic and Safety Administration (1997) statistics showed low rates of seat-belt use in the US before 1984, but substantial increases following the changes in the law and related public education campaigns. Actual use rates were in the range of 50–70% from around 1990 to 1998, whereas movie rates were between 20% and 30% during the same period.

Jacobsen *et al.* (2001) point out that the influence of movies on viewers' attitudes and behaviours is difficult to determine. Their data do not support a simple, direct effect of media on behaviour interpretation. Analyses showed that changing public acceptance of seat-belt use preceded (smaller) increases in movie rates. The authors suggest that any effects of the movies' images may be indirect, via distortions of viewers' perceptions of social norms.

Ramsay *et al.* (2005) performed a similar analysis of G and PG rated movies (i.e. content still more likely to be viewed by young pre-drivers), with similar findings. The researchers studied movies for the period 1998 to 2002. About 35% of scenes set in motor vehicles depicted characters wearing seat belts. About 15% of people showing bicycling wore helmets. In both contexts, movie use of safety equipment was lower than actual use in the community.

The involvement of young drivers in road accidents and fatalities is a theme of interest to the mass media: tragedies sell. In a study of newspapers in four Midwest states, Connor and Wesolowski (2004) found that the press over-represented the involvement of teenage drivers in fatal crashes. Official statistics revealed that only 14% of all fatal crashes in the relevant communities involved a teen driver, but a content analysis showed that 22% of crashes covered in the four papers involved teen drivers. Furthermore, a crash involving a teenager was likely to be covered by more newspapers.

Connor and Wesolowski (2004) found that accidents involving young drivers were treated in ambivalent ways by the media. Following particularly high-profile crashes, newspapers tended to run editorials which included serious commentary on the risk factors associated with teenage drivers. On the other hand, the actual news reports relating to the same accidents concentrated more on the personal tragedies (promising young lives cut short) and emotional consequences (family grief)

In sum, there is evidence that parents and peers can be influential in the behaviour of novice drivers. This influence can be, variously, negative (intergenerational transmission of poor driving practices and attitudes) and positive (parental regulation of teenage drivers' uses of the car). Any involvement of the mass media is open to speculation. It is possible that glamorised representations of reckless driving may influence some directly (e.g. via role modelling) and/or indirectly (e.g. by conveying false images of normative behaviour). But it is also possible that the media respond sometimes to changing community standards (e.g. increased use of seat belts leading to more frequent use in the movies). Any impact of 'shock horror' representations of young driver casualties appears to be untested.

## 9.4 Developmental issues

### *9.4.1 Parental influence and pre-drivers*

For better or worse, as Fergusson *et al.* (2001) stress: 'much of the influence parents have on the driving records of their children probably already has occurred prior to the start of the licensing process' (p. 233). Not only do opportunities to observe parents driving occur over many years (Sections 4 and 8), but any effects due to parental behaviour may vary in complex ways over time.

For example, parents have the scope to introduce safety habits – such as always wearing a seat belt and behaving appropriately within a vehicle – from very early in the child's life. Research shows that this can make a difference: for example, seat-belt use is significantly higher among children whose parents themselves use seat belts and encourage the child to do so (Page, 1986). Some of these habits may become ingrained but, as discussed in Section 8, some may change with development. Toddlers have to be strapped into safety seats; slightly older children may be required to sit in the back and may become involved in fixing their own seat belts; still older children may be allowed into the passenger seat and different parents may or may not enforce seat-belt requirements. In all of these cases, the parents are conveying implicit or explicit messages, and children may interpret them in different ways according to their stage of development.

Importantly, this is not a one-way process. Kakefuda *et al.* (2008) report that one variable influencing whether mothers used child seat restraints consistently was the child's level of resistance to the restriction. Koppel *et al.* (2008) found that 8% of parents who moved their children prematurely to seat-belt use rather than the appropriate safety seats did so because the child protested that he or she was too mature for the toddler restraints.

Children may come to evaluate their parents' driving skills with varying degrees of accuracy. In some cases, poor or reckless drivers might be admired with a view to eventual emulation, but in others, young passengers might aspire never to be as dangerous or as incompetent as they believe their parent(s) to be. Some parents who drive safely might be respected, but others (or the same parents at a different point in the child's development) may be perceived as boring. Parental influence might take the form of powerful direct pedagogy (e.g. parents convey strong messages about driving and safety) or it may take the form of 'sleeper effects' (e.g. the young person absorbs almost without awareness some driving practices – positive or otherwise – which later become manifest in his or her own driving; see Section 4).

Contrary to popular assumptions that adolescents are beyond parental influence, Yeh *et al.* (2008) found that parental attitudes had a significant influence on the likelihood of young adolescents engaging in unlicensed riding of motorcycles.

Shope *et al.* (2001) found that poor levels of parental monitoring and family connectedness in the mid-teens were predictive of risky driving in the early 20s.

While a range of possible parental influences can be suggested, direct research into the everyday processes of driving socialisation is scant. This contrasts with many other important areas of child development (such as social skills, literacy, educational attainment), where the roles of parents are well studied.

Green and Dorn (2008) conducted focus groups with British 17–19-year-olds about their pre-driving experiences. About half of the sample had not yet attempted to learn to drive and the remainder were undertaking some level of instruction. Two main themes emerged: one concerned modelling others' behaviour, and the second was 'distancing from others' driving behaviour'.

Parental – especially paternal – driving was carefully attended to by many of the participants; about 20% said that they intended to imitate their fathers' driving styles. However, many of the observations of parental driving that the children reported suggested less than ideal practices were being monitored. For example, fathers tended to be admired because they were confident, even cocky, in the car, brought a fun aspect to driving, and liked to speed:

> 'I think my dad, well I feel more confident with my dad's driving, although he does tend to go quite fast and he sometimes drives with his knees.'
>
> (Green and Dorn, 2008; p. 8)

> 'My dad like at the lights he gets aggressive, not road rage but he just gets aggressive with other drivers if they are going too slow. . . he calls them a ******. And when my mum sits in the passenger seat she sometimes, if my dad if he is going too fast, can't stick his finger up, my mum does it for him.'
>
> (Green and Dorn, 2008; p. 8)

Some parents were regular drink drivers, and some children anticipated that they would, in turn, be likely to combine alcohol and driving:

> 'She [mother] hasn't had any major crashes that were her fault, so I wouldn't mind having a bit, but I wouldn't get drunk.'
>
> (Green and Dorn, 2008; p. 9)

The young people tended to perceive their mothers as less competent and less assured drivers:

> 'My mum you have to be alert because otherwise it's very embarrassing. She might go "Oh my god I need to go to . . ." and she just stops in the middle of the road.'
>
> (Green and Dorn, 2008, p. 9)

> ‘My mum does her make up and stuff and she is always on the phone. I don’t have to concentrate when my dad’s driving but when my mum is driving, the lights will change or something and she won’t notice because she’s sat there looking in the mirror or something.’
>
> (Green and Dorn, 2008, p. 9)

As stressed in Section 2, young people, especially adolescents, are capable of developing ambivalent attitudes towards aspects of driving. Green and Dorn’s qualitative data suggest that pre-drivers do reflect critically on the skills and behaviours of more experienced drivers, especially those with whom they are most familiar.

### 9.4.2 Peer influence and pre-drivers

Relatively little research has addressed directly how peer context may affect pre-drivers’ perceptions and attitudes. However, there is evidence to suggest that peer norms are perceived as relatively tolerant of risk. Evans *et al.* (1995) surveyed over 5,000 Californian 12–17-year-olds on their perceptions of peers’ health norms. Participants were asked ‘Do you think people your age care about . . . ?’ a range of practices, including avoiding drugs, marijuana, cigarettes, heavy drinking, fitness, weight control, healthy eating habits, and two driving-related behaviours: drink-driving and seat-belt use.

About 85% of these teenagers perceived that their peers cared a lot about weight control, in contrast, only about 40% felt that their peers were concerned about not drinking and driving. Seat-belt use was perceived to be a priority peer concern by only about 15%. As noted above, lower levels of seat-belt use in peer company have been reported in analyses of fatal crashes involving young drivers (Williams and Shabanova, 2002). Evans *et al.*’s (1995) findings suggest that disregard for this safety feature is prevalent before people become drivers.

It is not clear how accurate are young people’s perceptions of what their peers care about, nor to what extent the values attributed to peers in general are actually those held by the respondents themselves. Evans *et al.* (1995) did not test directly whether participants endorsed what they took to be peer priorities. Participants in Green and Dorn’s (2008) focus groups believed that some undesirable driving styles that they had seen in young drivers (e.g. careless, reckless, aggressive behaviour) were practices to be avoided. Adolescent respondents in Tolmie *et al.* (2006) also reported themselves as being substantially less likely to take risks than their peers. Hence, additional research is required to investigate more closely the relations among: (1) adolescents’ perceptions of peer norms regarding driver safety issues; (2) their own attitudes; and (3) the ways in which they resolve any tensions between these.

In this connection, an interesting laboratory study by Gardner and Steinberg (2005) suggests that peer norms are salient and do affect choices – but also that these processes are subject to developmental change. Adolescents (13–16 years), youths (mean age 18–22 years) and adults (24 and older) played a simulated driving video game ('Chicken') which involved taking risks in response to traffic lights. Participants were tested in either a group condition or in a sole participant condition. Compared with older participants, the adolescents took more risks in the game. They also indicated more risky decisions on a questionnaire test of risk preference. Importantly, peer presence increased risk taking and risky decision-making. The benefits of risky activities were given more weight than the costs by participants in the group condition. However, peer effects were strongest among the younger participants. This suggests some vulnerability in the pre-driver period, but also that the vulnerability is reduced by the time of licensure. Of course, we cannot extrapolate directly from behaviour in a laboratory game to behaviour on the roads, but, together with the Evans *et al.* (1995) study mentioned above, the study suggests that the perception of peer norms is influential around the time people are becoming interested in learning to drive.

It should be noted that peer influences in adolescence are not invariably to promote risky or negative behaviours (Durkin, 1995; Keating, 2007). In relation to other areas of health-related behaviour, such as smoking, peers sometimes convey forceful messages against harmful practices. There is evidence to suggest that peers can sustain safety practices. Two observational studies of helmet use by child (and adult) bicyclists in American cities found very high levels of concordance among companions (Dannenberg, *et al.* 1993; Jacques, 1994). A questionnaire-based study of 12–19-year-olds in Finland found that the number of friends using a helmet accounted for 35% of variance in helmet use (Lajunen and Räsänen, 2001).

While the positive contributions of peers do not appear to have attracted much attention in research into adolescents and driving, it is possible that promoting positive peer pressure could contribute towards increasing safe driving practices in novice drivers. The respective roles of males versus females may be important here. Girls tend to be more safety conscious and more conscientious (Jessor, 1987); they are more likely to be passengers, and there is some evidence that they may be more willing to confront unsafe drivers (Ulleberg, 2004). Much may depend on the dynamics of particular relationships.

### *9.4.3 Media influence and pre-drivers*

> Father of 13-year-old girl: 'She knows everything about the car, if you ask her about the gas, clutches. She has never sat down on the driver's seat, but she knows everything. She knows the signs when we are going on the motorway.'

> Question: 'And how has she learnt all that?'
>
> 'Well, by watching television I think. She picked it up somehow but she knows a lot more about the signs and everything.'
>
> (Christmas, 2008; p. 25)

As Arnett (2002; p. 19) notes, we have little in the way of concrete research evidence concerning how young audiences interpret the kinds of portrayals of driving that are common in the media. It could be added that we have even less in the way of research evidence concerning ways to tackle media representations.

One useful recent study does provide some relevant information. Beullens and Van den Bulck (2008) addressed the possibility that specific television genres are related in different ways to adolescents' intentions to take risks in traffic. An important feature of their study was that they reasoned that 'a risk-taking propensity may be present before a person starts driving' (p. 351).

First, they proposed that exposure to television news should be positively related to the assessment of the dangers of speeding and drink driving. The assumption here is that, as discussed above, news coverage tends to over-represent (relative to its statistical frequency in real life) dramatic, dangerous, antisocial or threatening events. The authors argued that exposure to this kind of material should promote misperceptions (exaggerations) of the frequency of traffic accidents, which, in turn, should lead to great anxiety about the risks to self.

In contrast, the world of music videos tends to portray risk-taking behaviours in a glamorous way, with little attention paid to harmful consequences. The authors argued that exposure to this genre should be negatively correlated with assessment of the dangers of speeding and drink driving. Similar predictions were made with respect to watching action movies.

In a large sample of predominantly 16–17-year-olds, Beullens and Van den Bulck (2008) found some support for their predictions. Viewing TV news was positively correlated with the risk perception of speeding and the risk perception of drink driving, while viewing music videos was negatively correlated with the same. The relationships were not strong. There was no relationship between viewing action movies and either of the risk perception variables.

As the authors acknowledge, this is a correlational study at a single point in time, and it does not provide a strong basis for causal inferences. It is possible that exposure to the TV genres impact on driving-related risk perceptions. But it is also possible that adolescents' media selections reflect other aspects of their personalities, values or lifestyles. For example, sensation-seeking youth may prefer music videos (or particular types of music videos) and may also seek risks in other domains (see Sections 3 and 6). The researchers did not report on any analyses that

tested for variability across genre consumption. For example, some individuals may watch a lot of news broadcasts and a lot of music videos. Should these sources cancel each other out?

The authors stress that an important implication of their study is that a risk-taking propensity may be present before adolescents start driving. They suggest that prevention campaigns should be addressed to these pre-drivers. (Note, the participants were Belgian. In Belgium, the minimum legal age to obtain a driving licence is 18.) While this seems plausible, it should be noted that the levels of responses on the measures of intention to speed and intention to drink drive were, on average, low. Furthermore, the study invited the participants to indicate a level of intention to engage in these behaviours, and did not include any comparison behaviours.

## 9.5 Contextual influences: summary

From their earliest experiences of road use and vehicles, pre-drivers are exposed extensively to the behaviours and values of others. Parents have a particularly prominent influence as driver role models, as sources of information and values. Peers are important for similar reasons. In both cases, influence could be negative or positive. The contributions of the mass media are open to speculation, but certainly worthy of attention because of their pervasiveness and their potential scope to represent, or misrepresent, driving norms. In respect of all of these potential contextual influences, it is important to bear in mind that social psychological processes are two-way: the messages and values that pre-drivers may extract from the world around them will themselves be interpreted selectively, according to the individual characteristics, needs and motivations of the young person.

## 9.6 Policy implications

- While the challenges should not be underestimated, identifying contextual influences upon pre-drivers serves to guide educational and intervention efforts. The fundamental point is that strategies focused on pre-drivers alone will fail to address key influences.
- Adolescents approaching driving age should be provided with guidance in specific skills in evaluating others' safety levels and in how to raise concerns about others' driving.
- Parents should be regarded as the most promising contextual influence for intervention. Although parents do have entrenched driving styles, they also have, in most cases, a strong commitment to the wellbeing of their children. Parents are concerned about the safety of their children as they learn to drive. There is a need to develop strategies to enlist parents in pre-driving and early driving education/supervision.

- Although youth peer cultures are difficult to address, there is evidence that the majority of young people aspire to be safe drivers. This motivation should be emphasised and built upon in educational and intervention strategies.

# 10 CONCLUSIONS – KEY QUESTIONS AND FUTURE RESEARCH DIRECTIONS

Several key questions were specified at the outset of this review and we summarise here provisional answers, based on research considered in the previous sections. The answers are provisional because in many respects necessary work has yet to be conducted/reported. Hence, we indicate also possible directions for future research that would enhance our understanding of the lengthy and multifaceted transition from pre-driver to driver.

## 10.1 Key research questions 1 and 2

1. When and how do children and young people develop their attitudes and beliefs to driving, riding and being a passenger, and how are these related to their subsequent driving behaviour?
2. What aspects of skills and attitudes acquired from pedestrian and cyclist behaviour are likely to extend to early performance as a driver, and what is the probable strength of the influence of these?

### *10.1.1 Response and future directions*

Attitudes and affective beliefs concerning driving are likely to begin to develop at least as soon as children become aware of the roles of motor vehicles in their lives (e.g. as passengers in the family car, as pedestrians being instructed about safety). They will continue to develop through childhood as individuals gain more experience and are exposed to others' attitudes and norms of behaviour. The developments of adolescence need to be understood not only as responses to immediate influences, but also as departures from previously strongly held beliefs. However, while we can offer this broad description with confidence, it is much more difficult to fill in the details, and to specify what those attitudes and beliefs are, how varied they are across a large population of young people, or how they change with development. The reason is that the relevant research is scarce.

### *10.1.2 The development of attitudes from childhood*

One of the most useful available studies to help answer questions about pre-drivers' attitudes is that of Waylen and McKenna (2008) (see Section 2). These investigators report age-related increases in the favourability of attitudes towards specific aspects of risky road use during the period 11 to 16 years, though also qualified by gender differences.

While this is valuable evidence on a critical period, we need to know more about development prior to this age range and how it relates to adolescents' and, in due course, novice drivers' attitudes. Waylen and McKenna were particularly interested in attitudes towards risk, and did not survey other attitudes or beliefs. It would be valuable to collect more information on the place of responsible attitudes in young people's reasoning, and to learn more about those individuals who emerge as safe drivers in early adulthood.

There is evidence that adolescents undergo changes in their attitudes and behaviour, though the two are not perfectly aligned (for example, adolescents will sometimes still profess to favour safety considerations even while their actual behaviour is in a contrary direction). There are very few studies comparing attitudes across different age groups and none following them longitudinally (although valuable longitudinal research does point to some continuities in risky behaviour from childhood to early driving).

Two other important themes for future research arise in relation to the transformation and contradictions that appear to be prevalent in adolescents' attitudes towards different aspects of road use and driving behaviour. One is that models and methods are needed that go beyond assumptions of a simple attitudinal continuum from 'positive' to 'negative' or from 'favourable' to 'unfavourable'. Instead, adolescents may well entertain ambivalent attitudes. We need more evidence and better measures of how they formulate and organise what may be complex sets of attitudes/affective beliefs, and how the relative strength of different components change over development. The second theme that calls for attention is the possibility that the changes and fluctuations of attitudes and social reasoning during this period provide fertile ground for intervention. Personal experiences during this more fluid period of development, and the affective beliefs that derive from them, may serve as a potential lever for influencing future perceptions and behaviour.

### *10.1.3 The development of understanding of regulatory authorities*

There is a surprising dearth of research on the development of children's and adolescents' understanding of the roles of those who enforce traffic rules (police, traffic wardens, other safety personnel) and of their attitudes towards these personnel. Research into the development of attitudes to authority more generally leads to the expectation that there will be shifts, for some, during adolescence, but this remains to be tested.

More generally, attitudes towards the rules and personnel governing road behaviour need to be investigated in relation to the broad processes of social and moral reasoning that proceed from childhood to early adulthood. Deighton and Luther (2007) make a similar point and note the relevance of the Kohlbergian model of moral development. We agree that there is a need to take account of moral

reasoning, but note that one of the limitations of this particular model is that it has similar problems to those discussed in relation to attitudes: specifically, Kohlbergian stages tend not to predict actual moral behaviour (Durkin, 1995). A related model may have more promise in respect of children's reasoning in this domain, namely Turiel's (1983) model of social conventional development.

Briefly, this model distinguishes between core moral values (e.g. the belief that one should not kill) and social conventions (beliefs about the desirability of particular ways of behaving). Even quite young children will understand that driving dangerously and causing harm is 'bad'. Many other aspects of driving behaviour, however, are governed by more subtle and complex sets of rules, many of which are subject to social conventions concerning how they should be met in reality. For example, the law is clear about how the driver should respond to speed limits or traffic lights, but there are widely shared practices that do not match the regulations. Research into the development of understanding and values in this respect could make a substantial contribution to the ways in which emergent reasoning influences pre-driver assumptions and expectations.

### *10.1.4 Continuity in skills development*

The direct evidence for continuity in skills from earlier experience as a pedestrian or a cyclist to driving is as limited as that for continuity in attitudes: quite simply, although there have sometimes been assumptions of carry-over effects, there has been very little work actually testing that possibility. There is a wider literature relating to the transfer of learning and skills, however, and, as noted in Section 7, the general message of this is that such extension is typically very limited, for a variety of reasons, though two are predominant: firstly, a tendency on the part of human cognition towards compartmentalisation of thinking, so that even close parallels between experiences in different contexts go unrecognised; and, secondly, the fact that skills tend towards highly context-specific calibration as they become more automated. The net result is that strategies for, say, adjusting movement to that of other vehicles that have been acquired as a cyclist will not be applied as a driver because the connections are unlikely to occur to people, and in any case the relative physical speeds will be different, as will the means of enacting adjustments, so the applicability would in any case be low.

This said, there are some aspects of driver skill which are less clearly dependent on calibration of this kind, and where connections and transfer might be encouraged, the most obvious of these being hazard perception and reading the road, where the available cues and their interpretation would be reasonably consistent across experience as a pedestrian, as a cyclist and as a driver. The feasibility of doing this has yet to be demonstrated, but it might be noted that some elements of the Driving Standards Agency (DSA) materials for training hazard perception assume that such transfer occurs.

Above all, we have stressed that attitudes are only one factor predicting behaviour. This is true of adult drivers, and is likely to be all the more so if we are able to obtain evidence on the relationships between attitudes formulated in childhood and actual behaviour during the novice driver stage. At present, we do not have such evidence.

## 10.2 Key research questions 3 and 4

3. What factors, including perceptions of peer behaviour, promote or inhibit the growth of risk-taking during later childhood and adolescence, and how far do patterns of risk-taking and of cautious behaviour generalise across different contexts, including those relating to traffic environments?
4. How far is vicarious experience of the driving behaviour of parents and older siblings, and their statements about that experience, influential in shaping child and adolescent perceptions of drivers and driving, and what evidence is there to suggest that these influences follow through to later personal behaviour?

### *10.2.1 Response and future directions*

We have stressed that attitudes and behaviours do not develop in a vacuum. There is evidence that these are influenced by parental and peer attitudes and behaviours, and by perceptions of community norms. There is extensive evidence on the development of risk taking during adolescence to show that a minority of young people engage in multiple risk-taking, of which dangerous road behaviour is one component.

The development of cautious and responsible behaviour tends to be studied less directly. There are many individuals who do not develop profiles of serious and compound risk-taking, but evidence on them is typically available via inference, in that they are less exposed or less vulnerable to the risk factors associated with the (more studied) risk-prone youth. More research is needed on the ways in which (the majority of) young people formulate safe(r) attitudes to driving.

As other recent reviewers have concluded, there is a shortage of research addressing the detailed nature of parent–child interactions in and around vehicles (Cattan *et al.*, 2008). An identical gap is apparent in respect of the nature of peer interactions. There is considerable evidence, reviewed in previous sections, to show that peers share attitudes, values and practices in respect of road safety issues, and there is evidence that the presence of peer passengers affects novice driver behaviour. However, the processes of transmission and consolidation are little studied. In particular, while it is clear that perceived peer norms are influential, especially in adolescence, it is not clear how these perceptions (which are not invariably accurate) are constructed.

We considered the possibility that one way in which parents and other drivers influence pre-drivers is through the modelling of habitual forms of behaviour in driving and other aspects of road use. At present, very little is known of the durability of habits related to roads and driving that are acquired at different stages of childhood – as pedestrians, cyclists or passengers. There are reasons to suppose that early established safe habits can be conducive to later safety, but there is also compelling evidence that even well-entrenched habits can be subordinated to the priorities of adolescent peer culture. More research is needed into the durability, robustness and threats to driving-related habits formed in childhood, and into the role of parents and others in modelling, transmitting and enforcing habits (such as safety belt use, courtesy towards other road users, etc.).

We have stressed the importance of identity as a crucial context within which young people, especially adolescents, formulate attitudes and expectations about the role driving will play in their lives and what will be their priority as drivers. Our understanding of these processes would be enriched by research that elicits the contents and structures of pre-drivers' images of drivers, especially the kinds of drivers they aspire to become or not to become. Clinical-developmental interview techniques could be an important component of such a research programme.

One basic aspect of identity development that appears not to have been addressed directly in research is the shifting sense of what is appropriate as one changes age group. We have noted that there are radical shifts in orientations of safety-related behaviours during adolescence. Intuitively, it seems likely that part of this change could be associated with a rejection during the autonomy-seeking phase of things perceived to be childish, such as wearing safety helmets and accepting seat restraints. Closer analysis is needed, not only of successive identities but of the dynamics of identity change. Again, such research would be important in its own right, but also in terms of how it might guide interventions.

Shope and Bingham (2008) have advocated that research is needed to understand young drivers' viewpoints, for example in relation to what kinds of behaviour appear 'cool'. Shope and Bingham speculate that the more we understand of drivers' ways of looking at the world, the better we are placed to develop relevant interventions. Their points can be extended readily to the interpretations and outlooks of pre-drivers. Hence, research into the influences of experiences, role models, interventions, etc., would profit from a component which examines closely the phenomenology of the participants themselves: how they interpret the 'raw data' and what they see as the implications for their own development. Both qualitative and quantitative research could make valuable contributions here.

## 10.3 Key research question 5

5. How far are media presentations of the nature of driving influential in shaping conceptions of the social identities associated with driving, and to what extent is novice driver behaviour an enactment of such social identities?

### *10.3.1 Response and future directions*

This topic has been addressed more by speculation than by hard evidence. There is no doubt that examples of dangerous driving and reckless attitudes can be found in the media. Often, these are associated with glamour, prestige and exaggerated images of masculinity. Given that young males are the most high-risk category of road users, it is tempting to assume that the media contribute to the problem. We found little research to test this possibility. A careful study of the links between seat-belt use in popular movies and actual seat-belt usage in the community suggests the opposite direction of effect: changing public acceptance of seat-belt use preceded (smaller) increases in movie rates (Jacobson *et al.*, 2001). However, it remains open to future research to investigate whether this general pattern holds for young vehicle users in particular. For example, (some) adolescents could be more susceptible to copying reckless images.

Other areas of the media find great interest in stories of youth casualties. It is implausible that press articles on road tragedies inspire reckless driving in the majority of their readers. It is conceivable that they might impact on a very small number of youth at risk of suicide. They may contribute in other ways – for example, by alerting some pre-drivers and their parents to the risks faced by young drivers. At present, all of these possibilities are in need of careful research.

Studies are called for of: (a) pre-drivers' awareness, interpretation and evaluation of driving imagery in popular media; (b) pre-drivers' emotional responses to media representations; and (c) the relationship between media images and developing identities from pre-drivers to early drivers.

## 10.4 Key research questions 6 and 7

6. How can the attitudes and beliefs of children and young people to driving be influenced, by whom, and how can this be measured?
7. To what extent can children and young people be influenced to have more positive (safe) attitudes to being a driver, rider or passenger of a motor vehicle?

### *10.4.1 Response and future directions*

Attitudes and beliefs are influenced by many factors. We have stressed here the formative role of parents and the potential impact of peer attitudes and behaviour. We suggest it is an open question at present as to whether or how the media contribute. We have speculated in the course of the report that other people may be important, including siblings.

As indicated above, while measures of attitudes towards driving violations have been employed in some research with pre-drivers, measures of attitudes towards other related issues appear to have been more neglected. Such issues include safety, skills development, the role of experience in improving driving skills, courtesy to other drivers, understanding and respecting traffic rules, attitudes towards those who enforce the rules, traffic-controlling devices, attitudes towards passengers, pedestrians, cyclists, and so on.

Research is required to investigate more closely the relations among: (a) adolescents' perceptions of peer norms regarding driver safety issues; (b) their own attitudes; and (c) the ways in which they resolve any tensions between these.

Oddly, there appear to be few studies of the influence of people whom we might expect to be well placed to have a singular influence on the crystallisation of driving attitudes, namely driving instructors (informal or professional). Christmas (2008) did find that pre-drivers and learners agreed almost unanimously that the teaching of driving should be in the hands of the professionals (rather than parents). However, driving instructors are not uniform; the characteristics of effective instructors, and the ways in which instructors prioritise and communicate attitudes, beliefs and expectations about driving seem to have been neglected in the research literature to date. Evidence of pre-drivers' needs and expectations in this respect would be of obvious relevance to the work of the DSA in relation to the training of instructors.

## 10.5 Conclusion

The extant research literature provides partial answers to the important questions with which we began. There is a lot of good-quality research that provides information and offers explanations of aspects of development in these respects; this report has attempted to draw together what we do know. It has also become clear that there is much that we do not know and we conclude that this is an area in pressing need of new research.

It is a truism, but also an inescapable fact of life, that no adult exists who was not previously a child; what happens in childhood has enormous implications for what happens in adulthood. It is also a truism that no driver exists who was not once a pre-driver: we need to learn much more about the complex processes of development that link these stages.

# 11 REFERENCES


Åberg, L., Larsen, L., Glad, A. and Beilinson, L. (1997) Observed vehicle speed and drivers' perceived speed of others. *Applied Psychology: An International Review*, 46, 287–302.

Addis, M. E. and Mahalik, J. R. (2003) Men, masculinity, and the contexts of help seeking. *American Psychologist,* 58, 5–14.

Agran, P. F., Winn, D. G. and Anderson, C. L. (1998) *Epidemiology of Pediatric Pedestrian Injuries*. Panel to Prevent Pedestrian Injuries Conference, Atlanta.

Ajzen, I. (1991) The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes,* 50, 179–211.

Ajzen, I. and Madden, T. J. (1986) Prediction of goal directed behaviour: attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology*, 22, 453–474.

Anderson, J. R. (1980) *Cognitive Psychology and its Implications*. San Francisco: W.H. Freeman and Company.

Arnett, J. J. (1990) Drunk driving, sensation seeking, and egocentrism among adolescents. *Personality and Individual Differences*, 11, 541–546.

Arnett, J. J. (1991) Heavy metal music and reckless behaviour among adolescents. *Journal of Youth and Adolescence,* 20, 573–592.

Arnett, J. J. (1992) Reckless behavior in adolescence: a developmental perspective. *Developmental Review*, 12, 339–373.

Arnett, J. J. (2002) Developmental sources of crash risk in young drivers. *Injury Prevention*, 8, ii17–ii23.

Arnett, J. J., Irwin, C. E. and Halpern-Felsher, B. L. (2002) Developmental sources of crash risk in young drivers. *Injury Prevention,* 8, ii17–ii23.

Arnett, J. J., Offer, D. and Fine, M. A. (1997) Reckless driving in adolescence: "State" and "trait" factors. *Accident Analysis and Prevention*, 29, 57–63.

Arthur, W. and Graziano, W. G. (1996) The five-factor model, conscientiousness, and driving accident involvement. *Journal of Personality,* 64, 593–618.

Augustyn, M. and Simons-Morton, B. G. (1995) Adolescent drinking and driving: etiology and interpretation. *Journal of Drug Education*, 25, 41–59.

Backlund, P., Engström, H. and Johannesson, M. (2006) Computer Gaming and Driving Education. *Proceedings of the Workshop Pedagogical Design of Educational Games affiliated to the 14th International Conference on Computers in Education (ICCE)*, Beijing, China.

Bandura, A. (1977) *Self-efficacy: The Exercise of Control*. New York: Freeman and Company.

Barkley, R. A., Murphy, K. R. and Kwasnik, D. (1996) Motor vehicle driving competencies and risks in teens and young adults with attention deficit hyperactivity disorder. *Pediatrics*, 98, 1089–1095.

Barrett, M. and Buchanan-Barrow, E. (eds) (2005) *Children's Understanding of Society.* New York, NY: Psychology Press.

Baum, S. (2000) Drink driving as a social problem: comparing the attitudes and knowledge of drink driving offenders and the general community. *Accident Analysis and Prevention*, 32, 89–94.

Baxter, J. S., Manstead, A. S. R., Stradling, S. G., Campbell, K. A., Reason, J. T. and Parker, D. (1990) Social facilitation and driver behaviour. *British Journal of Psychology*, 81, 351–360.

Begg, D. J. and Langley, J. D. (2004) Identifying predictors of persistent non-alcohol or drug-related risky driving behaviours among a cohort of young adults. *Accident Analysis and Prevention*, 36*,* 1067–1071.

Beirness, D. J. and Simpson, H. M. (1988) Lifestyle correlates of risky driving and accident involvement among youth. *Alcohol, Drugs and Driving*, 4, 193–204.

Berg, P. and Westerling, R. (2001) Bicycle helmet use among school children – the influence of parental involvement and children's attitudes. *Injury Prevention,* 7, 218–222.

Berti, A. E. and Bombi, A. S. (1988) *The Child's Construction of Economics*. Cambridge: Cambridge University Press.

Beullens, K. and Van den Bulck, J. (2008) News, music videos and action movie exposure and adolescents' intentions to take risks in traffic. *Accident Analysis and Prevention*, 40, 349–356.

Beyth-Marom, R., Austin, L., Fischhoff, B., Palmgren, C. and Jacobs-Quadrel, M. (1993) Perceived consequences of risky behaviors: adults and adolescents. *Developmental Psychology*, 29, 549–563.

Bianchi, A. and Summala, H. (2004) The 'genetics' of driving behaviour: parents' driving style predicts their children's driving style. *Accident Analysis and Prevention*, 36, 655–659.

Bina, M., Graziano, F. and Bonino, S. (2006) Risky driving and lifestyles in adolescence. *Accident Analysis and Prevention,* 38*,* 472–481.

Bingham, C. R. and Shope, J. T. (2004) Adolescent developmental antecedents of risky driving among young adults. *Journal of Studies on Alcohol*, 65, 84–94.

Blakemore, S-J. and Choudhury, S. (2006) Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry,* 47, 296–312.

Bly, P., Dix, M. and Stephenson, C. (1999) *Comparative Study of European Child Pedestrian Exposure and Accidents*. London: MVA Ltd and HMSO.

Bragg, B. W. and Finn, P. (1982) *Young Driver Risk-taking Research: Technical Report of Experimental Study.* Report No. DOT HS-806-375. Washington, DC: US Department of Transportation.

Briem, V. and Bengtsson, H. (2000) Cognition and character traits as determinants of young children's behaviour in traffic situations. *International Journal of Behavioural Development*, 24, 492–505.

Brown, A. (2002) Pre-driver education. *Proceedings of the 67th Road Safety Congress*, 4–6 March 2002.

Byrnes, J. P., Miller, D. C. and Schafer, W. D. (1999) Gender differences in risk taking: a meta-analysis. *Psychological Bulletin*, 125, 367–383.

Calisir, F. and Lehto, M. R. (2002) Young drivers' decision making and safety belt use. *Accident Analysis and Prevention*, 34, 793–805.

Cameron, C., Stritzke, W. and Durkin, K. (2003) Alcohol expectancies in late childhood: an ambivalence perspective on transitions toward alcohol use. *Journal of Child Psychology and Psychiatry,* 44, 687–698.

Carlson, W. L. and Klein, D. (1970) Familial vs institutional socialization of the young traffic offender. *Journal of Safety Research,* 2, 13–25.

Carroll, A. M., Houghton, S. J., Durkin, K. and Hattie, J. (2009) *Adolescent Reputations and Risk: Developmental Trajectories to Delinquency.* New York: Springer.

Casey, B. J., Jones, R. M. and Hare, T. A. (2008) The adolescent brain. *Annals of the New York Academy of Sciences,* 1124, 111–126.

Caspi, A., Roberts, B. W. and Shiner, R. (2005) Personality development. *Annual Review of Psychology,* 56*,* 453–484.

Cattan, M., Green, J., Newell, C., Ayrton, R., & Walker, J. (2008) *Child-Parent interaction in relation to road safety education: Part 1 – A critical literature review.* Road Safety Research Report No. 101. London: Department for Transport.

CEA (2009) *CEA Road Safety Compendium 2009*. Brussels: CEA. www.cea.eu/uploads/DocumentsLibrary/documents/1237474647_road-safety-compendium.pdf (accessed on 22 February 2009.

Ceci, S. J., Markle, F. and Chae, Y. (2005) Children's understanding of the law and legal processes. In M. Barrett and E. Buchanan-Barrow (eds), *Children's Understanding of Society.* New York, NY: Psychology Press. pp. 105–134.

Chassin, L., Presson, C. C., Montello, D., Sherman, S. J. and McGrew, J. (1986) Changes in peer and parent influence during adolescence: longitudinal versus cross-sectional perspectives on smoking initiation. *Developmental Psychology,* 22, 327–334.

Choudhury, S., Charman, T., Bird, V. and Blakemore, S. J. (2007a) Development of action representation during adolescence, *Neuropsychologia,* 45, 255–262.

Choudhury, S., Charman, T., Bird, V. and Blakemore, S. J. (2007b) Adolescent development of motor imagery in a visually guided pointing task. *Consciousness and Cognition*, 16, 886–896.

Christie, R. (2001) *The Effectiveness of Driver Training as a Road Safety Measure: A Review of the Literature.* Noble Park, Victoria, Australia: Royal Automobile Club of Victoria (RACV).

Christmas, S. (2007) *The Good, the Bad and the Talented: Young Drivers' Perspectives on Good Driving and Learning to Drive*. Road Safety Research Report No. 74. London: Department for Transport.

Christmas, S. (2008) *Feeling Safe, Itching to Drive: Pre-driver and Learner Perspectives on Driving and Learning*. Road Safety Research Report No. 86. London: Department for Transport.

Cicone, M. V. and Ruble, D. N. (1978) Beliefs about males. *Journal of Social Issues*, 34, 5–16.

Clarke, D. D., Ward, P. and Truman, W. (2005) Voluntary risk taking and skill deficits in young driver accidents in the UK. *Accident Analysis and Prevention,* 37, 523–529.

Clarke, D. D., Ward, P., Bartle, C. and Truman, W. (2006) Young driver accidents in the UK: the influence of age, experience, and time of day. *Accident Analysis and Prevention,* 38, 871–878.

Clayton, M. and Myers, E. (2007) Increasing turn signal use by drivers exiting a university parking garage: a comparison of passive and mediated prompting. *Journal of Organizational Behavior Management,* 27, 53–61.

Cohn, L. D., Macfarlane, S., Yanez, C. and Imai, W. K. (1995) Risk-perception: differences between adolescents and adults. *Health Psychology*, 14, 217–222.

Connelly, M. L., Conaglen, H. M., Parsonson, B. S. and Isler, R. B. (1998) Child pedestrians' crossing gap thresholds. *Accident Analysis and Prevention,* 30, 443–453.

Conner, M., Smith, N. and McMillan, B. (2003) Examining normative pressure in the theory of planned behaviour: impact of gender and passengers on intentions to break the speed limit. *Current Psychology,* 22, 252–263.

Connor, S. M. and Wesolowski, K. (2004) Newspaper framing of fatal motor vehicle crashes in four Midwestern cities in the United States 1999–2000. *Injury Prevention*, 10, 149–153.

Consiglio, W., Driscoll, P., Witte, M. and Berg, W. P. (2003) Effect of cellular telephone conversations and other potential interference on reaction time in a braking response. *Accident Analysis and Prevention*, 35, 495–500.

Corbett, C. (1995) Road traffic offending and the introduction of speed cameras in England: the first self-report survey. *Accident Analysis and Prevention,* 27, 345–354.

Corbett, C. and Caramlau, I. (2006) Gender differences in responses to speed cameras. *Criminology and Criminal Justice,* 6, 411–433.

Corbett, C. and Simon, F. (1999) *The Effects of Speed Cameras: How Drivers Respond*. Road Safety Research Report No. 11. London: Department for the Environment, Transport and the Regions.

Costa, P. T. and McCrae, R. R. (1994) *Set like plaster? Evidence for the stability of adult personality.* In T. F. Heatherton and J. L. Weinberger (eds), *Can Personality Change?* Washington, DC: American Psychological Association. pp. 21–40.

Courtenay, W. H. (2000) Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Social Sciences and Medicine,* 50, 1385–1401.

Dahlen, E. R. and White, R. P. (2006) The big five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personality and Individual Differences*, 41(5), 903–915.

Dannenberg, A. L., Coté, T. R., Kresnow, M. J., Sacks, J. J., Lipsitz, C. M. and Schmidt, E. R. (1993) Bicycle helmet use by adults: the impact of companionship. *Public Health Reports,* 108, 212– 217.

Deery, H. A. (1999) Hazard and risk perception among young novice drivers. *Journal of Safety Research*, 30, 225–236.

Deery, H. A. and Fildes, B. N. (1999) Young novice driver subtypes: relationship to high-risk behaviour, traffic accident record, and simulator driving performance. *Human Factors: The Journal of the Human Factors and Ergonomics Society,* 41, 628–643.

Deighton, C. and Luther, R. (2007) *Pre-driver Education: A Critical Review of the Literature on Attitude Change and Development, Good Practice in Pre-driver Education and Programme Effectiveness*. Road Safety Research Report. London: Department for Transport.

DeJoy, D. M. (1992) An examination of gender differences in traffic accident risk perception. *Accident Analysis and Prevention*, 24, 237–246.

Department for Transport (2005) *Road Casualties Great Britain 2004*. London: Department for Transport.

Department for Transport (2007) *Department for Transport Child Road Safety Strategy 2007*. London: Department for Transport.

DiScala, C., Lescohier, I., Barthel, M. and Li, G. (1998) Injuries to children with attention deficit hyperactivity disorder. *Pediatrics*, 102, 1415–1420.

Doherty, S. T., Andrey, J. C. and MacGregor, C. (1998) The situational risks of young drivers: the influence of passengers, time of day, and day of week on accident rates. *Accident Analysis and Prevention,* 30, 45–52.

Downswell, T., Towner, E.M.L., Simpson, G., & Jarvis, S.N. (1996) Preventing childhood unintentional injuries – what works? A literature review. *Injury Prevention,* 2, 140–149.

Driving Standards Agency (DSA) (2003) *DSA Competencies: Instructors*. www.dsa.gov.uk/forms (accessed on 8 August 2008).

D'Silva, M. U. and Palmgreen, P. (2007) Individual differences and context: factors mediating recall of anti-drug public service announcements. *Health Communication,* 21, 65–71.

Dunbar, G. L. (2001) Towards a cognitive analysis of polysemy, ambiguity, and vagueness. *Cognitive Linguistics,* 12*,* 1–14.

Durkin, K. (1995) *Developmental Social Psychology: From Infancy to Old Age.* Oxford: Blackwell.

Durkin, K. and Jeffery, L. (2000) The salience of the uniform in young children's perception of police status. *Legal and Criminal Psychology,* 5*,* 47–55.

Durkin M. S., Laraque, D., Lubman, I. and Barlow, B. (1999) Epidemiology and prevention of traffic injuries to urban children and adolescents. *Pediatrics,* 103(6), e74.

Eigsti, I-M., Zayas, V., Mischel, W., Shoda, Y., Ayduk, O., Dadlani, M. B., Davidson, M. C., Aber, J. L. and Casey, B. J. (2006) Predicting cognitive control from preschool to late adolescence and young adulthood. *Psychological Science,* 17(6), 478–484.

Elliott, M. A. (2004) *The Attitudes and Behaviour of Adolescent Road Users: An Application of the Theory of Planned Behaviour.* TRL Report No. 601. Crowthorne: TRL Limited.

Elliott, M. A., Armitage, C. J. and Baughan, C. J. (2003) Drivers' compliance with speed limits: an application of the Theory of Planned Behavior. *Journal of Applied Psychology,* 88, 964–972.

Emler, N. and Reicher, S. (1995) *Adolescence and Delinquency.* Oxford: Blackwell.

Evans, D. and Norman, P. (1998) Understanding pedestrians' road crossing decisions: an application of the Theory of Planned Behaviour. *Health Education Research*, 13, 481–489.

Evans, D. and Norman, P. (2003) Predicting adolescent pedestrians' road-crossing intentions: an application and extension of the Theory of Planned Behaviour. *Health Education Research*, 18, 267–277.

Evans, N., Gilpin, E., Farkas, A. J., Shenassa, E. and Pierce, J. P. (1995) Adolescents' perceptions of their peers' health norms. *American Journal of Public Health,* 85(8), 1064–1069.

Farrow, J. A. and Brissing, P. (1990) Risk for DWI: a new look at gender differences in drinking and driving influences, experiences, and attitudes among new adolescent drivers. *Health Education and Behavior*, 17, 213–221.

Fergusson, D., Swain-Campbell, N. and Horwood, J. (2003) Risky driving behaviour in young people: prevalence, personal characteristics and traffic accidents. *Australian and New Zealand Journal of Public Health,* 27, 337–342.

Fergusson, S. A., Williams, A. F., Chapline, J. F., Reinfurt, D. W. and De Leonardis, D. M. (2001) Relationship of parent driving records to the driving records of their children. *Accident Analysis and Prevention,* 33, 229–234.

Flavell, J. H. (1999) Cognitive development: children's knowledge about the mind. *Annual Review of Psychology*, 50, 21–45.

Fleiter, J., Watson, B., Lennon, A. and Lewis, I. (2006) Significant others, who are they? Examining normative influences on speeding. *Proceedings of Australasian Road Safety Research Policing Education Conference*, Gold Coast.

Foot, H. C., Thomson, J. A., Tolmie, A., Whelan, K., Morrison, S. and Sarvary, P. (2006) Children's understanding of drivers' intentions. *British Journal of Developmental Psychology*, 24, 681–700.

Forward, S. E. (2009) The theory of planned behaviour: the role of descriptive norms and past behaviour in the prediction of drivers' intentions to violate. *Transportation Research Part F*, 12, 198–207

Fuller, R. (2005) Towards a general theory of driver behaviour. *Accident Analysis and Prevention,* 37, 461–472.

Fuller, R., Bates, H., Gormley, M., Hannigan, B., Stradling, S., Broughton, P., Kinnear, N. and O'Dolan, C. (2006) Inappropriate high speed: who does it and why? *Behavioural Research in Road Safety, Sixteenth Seminar*. London: Department for Transport.

Fuller, R., McHugh, C. and Pender, S. (2008) Task difficulty and risk in the determination of driver behaviour. *European Review of Applied Psychology,* 58, 13–21.

Furby, L. and Beyth-Marom, R. (1992) Risk taking in adolescence: a decision-making perspective. *Developmental Review,* 12, 1–44.

GADGET (1999) *Guarding Automobile Drivers through Guidance Education and Technology* Duration 1998–*1999*. www.kfv.at/fileadmin/Publikationen_englisch/Gadget/GADGET_ (accessed on 12 January 2008).

Gallo, J. J., Rebok, G. W. and Lesikar, S. (1999) The driving habits of adults aged 60 years and older. *Journal of the American Geriatric Society*, 47, 335–341.

Galovski, T. E. and Blanchard, E. B. (2004) Road rage: a domain for psychological intervention? *Aggression and Violent Behavior,* 9, 105–127.

Galvan, A., Hare, T. A., Parra, C. E., Penn, J., Voss, H., Glover, G. and Casey, B. J. (2006) Earlier development of the accumbens relative to orbitofrontal cortex might underlie risk-taking behaviour in adolescents. *The Journal of Neuroscience,* 26, 6885–6892.

Galvan, A., Hare, T., Voss, H., Glover, G. and Casey, B. J. (2007) Risk-taking and the adolescent brain: Who is at risk? *Development Science*, 10, F8–F14.

Gardner, M. and Steinberg, L. (2005) Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: an experimental study. *Developmental Psychology*, 41, 625–635.

Gathercole, S. E., Pickering, S. J., Ambridge, B. and Wearing, H. (2004) The structure of working memory from 4 to 15 years of age. *Developmental Psychology*, 40, 177–190.

Gibbons, F. X. and Gerrard, M. (1995) Predicting young adults' health risk behaviour. *Journal of Personality and Social Psychology,* 69, 505–517.

Gick, M. L. and Holyoak, K. J. (1983) Schema induction and analogical transfer. *Cognitive Psychology,* 15, 1–38.

Giedd, J. N., Blumenthal, J., Jeffries, N. O., Castellanos, F. X., Liu, H., Zijdenbos, A., Paus, T., Evans, A. C. and Rapopost, J. L. (1999) Brain development during childhood and adolescence: a longitudinal MRI study. *Nature Neuroscience*, 2, 861–863.

Grayson, G. B. and Elliot, M. A. (2004) The attitudes of reported behaviours of novice drivers: Results from the Cohort II study. *Behavioural Research in Road Safety 2004: Fourteenth Seminar*. London: Department for Transport.

Green, A. and Dorn, L. (2008) How do 'significant others' influence young people's beliefs about driving? In L. Dorn (ed.), *Driver Behaviour and Training, Vol. 3.* Farnham: Ashgate Publishing. pp. 3–16.

Groeger, J. A. (2000) *Understanding Driving: Applying Cognitive Psychology to a Complex Everyday Task*. Philadelphia, PA: Psychology Press.

Groeger, J. A. and Chapman, P. R. (1996) Judgement of traffic scenes: the role of danger and difficulty. *Applied Cognitive Psychology*, 10, 349–364.

Hadwin, A. F. and Oshige, M. (2007) Self-regulation, co-regulation, and socially shared regulation: examining the many faces of social models in SRL. *Proceedings of the 12th Biennial Conference of the European Association for Research on Learning and Instruction (EARLI)*, Budapest, Hungary.

Haggerty, K. P., Fleming, C. B., Catalano, R. F., Harachi, T. W. and Abbott, R. D. (2006) Raising healthy children: examining the impact of promoting healthy driving behavior within a social development intervention, *Prevention Science,* 7, 257–267.

Hamblin, P. (1987) Lorry driver's time habits in work and their involvement in traffic accidents. *Ergonomics,* 30*,* 1323–1333.

Hampson, S. E. and Goldberg, L. R. (2006) A first large-cohort study of personality-trait stability over 40 years between elementary school and mid-life. *Journal of Personality and Social Psychology*, 91, 763–779.

Hampson, S. E., Goldberg, L. R., Vogt, T. M. and Dubanoski, J. P. (2006) Forty years on: teachers' assessments of children's personality traits predict self-reported health behaviors and outcomes at midlife. *Health Psychology,* 25(1), 57–64.

Hampson, S. E., Severson, H. H., Burns, W. J., Slovic, P. and Fisher, K. J. (2001) Risk perception, personality factors and alcohol use among adolescents. *Personality and Individual Differences,* 30, 167–181.

Harré, N. (2000) Risk evaluation, driving, and adolescents: a typology. *Developmental Review*, 20, 206–226.

Harré, N., Brandt, T. and Dawe, M. (2000) The development of risky driving in adolescence. *Journal of Safety Research,* 31(4), 185–194.

Harré, N., Field, J. and Kirkwood, B. (1996) Gender differences and areas of common concern in the driving behaviors and attitudes of adolescents. *Journal of Safety Research*, 27, 163–173.

Harré, N., Foster, S. and O'Neill, M. (2005) Self-enhancement, crash-risk optimism and the impact of safety advertisements on young drivers. *British Journal of Psychology*, 96, 215–230.

Hartos, J. L., Eitel, P., Haynie, D. L. and Simons-Morton, B. G. (2000) Can I take the car? Relations among parenting practices and adolescent problem-driving practices. *Journal of Adolescent Research*, 15, 352–367.

Hatakka, M., Keskinen, E., Gregersen, N. P., Glad, A. and Hernetkoski, K. (2002) From control of the vehicle to personal self-control; broadening the perspectives to driver education. *Transportation Research Part F*, 5, 201–215.

Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R. and Hill, K. G. (1999) Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Archives of Pediatrics and Adolescent Medicine,* 153, 226–234.

Henriksen, L. and Jackson, C. (1998) Anti-smoking socialization: relationship to parent and child smoking status. *Health Communication*, 10, 87–101.

Higgins, E. T. (1987) Self-discrepancy: a theory relating self and affect. *Psychological Review*, 94, 319–340.

Hoffrage, U., Hertwig, R., Weber, A. and Chase, V. M. (2003) How to keep children safe in traffic: find the daredevils early. *Journal of Experimental Psychology: Applied*, 9, 249–260.

Hurtz, W. and Durkin, K. (2004) The effects of gender-stereotyped radio commercials. *Journal of Applied Social Psychology,* 34, 1974–1992.

Iverson, H. and Rundmo, T. (2002) Personality, risky driving and accident involvement among Norwegian drivers, *Personality and Individual Differences,* 33, 1251–1263.

Ivett, L. (2001) The role of parents/carers in the road safety education of children and youth. *Proceedings of the Road Safety: Gearing Up for the Future,* Perth, WA, 31 August.

Jacobsen, H. A., Kreuter, M. W., Luke, D. and Caburnay, C. A. (2001) Seat belt use in top-grossing movies vs actual US rates, 1978–1998. *American Journal of Public Health,* 91, 1395–1396.

Jacques, L. B. (1994) Rates of bicycle helmet use in an affluent Michigan County. *Public Health Reports*, 109, 296–301.

Jessor, R. (1987) Risky driving and adolescent problem behavior: an extension of problem-behavior theory. *Alcohol Drugs and Driving*, 3, 1–11.

Jessor, R. and Jessor, S. L. (1977) *Problem behavior and psychosocial development: a longitudinal study of youth*. New York: Academic Press.

Jessor, R., Turbin, M. S. and Costa, F. M. (1997) Predicting developmental change in risky driving: the transition to young adulthood. *Applied Developmental Science*, 1, 4–16.

Jeffrey, L. and Durkin, K. (1989) Children's reactions to televised counter-stereotypes male sex role behaviour as a function of age, sex, and perceived power. *Social Behaviour*, 4, 285–310.

Jonah, B. A. (1986) Accident risk and risk-taking behaviour among young drivers. *Accident Analysis and Prevention*, 18, 255–271.

Jonah, B. A. (1990) Age differences in risky driving. *Health Education Research,* 5, 139–149.

Jonah, B. A. (1997) Sensation seeking and risky driving: a review and synthesis of the literature. *Accident Analysis and Prevention*, 29, 651–665.

Kakefuda, I., Yamanaka, T., Stallones, L., Motomura, Y. and Nishida, Y. (2008) Child restraint seat use behaviour and attitude among Japanese mothers. *Accident Analysis and Prevention*, 40, 1234–1243.

Keating, D. P. (2007) Understanding development: implications for driving safety. *Journal of Safety Research,* 38, 147–157.

Keating, D. P. and Halpern-Felsher, B. L. (2008) Adolescent drivers: a developmental perspective on risk, proficiency, and safety. *American Journal of Preventive Medicine,* 35 (3S), S272–S277.

Kellett, S. and Gross, H. (2005) Addicted to joyriding? An exploration of young offenders' accounts of their crime. *Psychology, Crime and Law*, 12, 39–59.

Kinnear, N., Kelly, S. W., Thomson J. A. and Stradling, S. (2007) Do we really drive as we feel? *Behavioural Research in Road Safety 2007: Seventeenth Seminar.* London: Department for Transport.

Killen, M. and Smetana, J. G. (2006) *Handbook of Moral Development.* Mahwah, NJ: Erlbaum.

Kohlberg, L. (1969) Stage and sequence: the cognitive-developmental approach. In D. A. Goslin (ed.), *Handbook of Socialization Theory and Research*. Chicago: Rand McNally. pp. 347–480.

Koppel, S., Charlton, J. L., Fitzharris, M., Congiu, M. and Fildes, B. (2008) Factors associated with the premature graduation of children into seatbelts. *Accident Analysis and Prevention,* 40(2), 657–666.

Krahe, B. and Fenske, I. (2002) Predicting aggressive driving behavior: the role of macho personality, age, and power of car. *Aggressive Behavior,* 28(1), 21–29.

Lajunen, T. and Räsänen, M. (2001) Why teenagers owning a bicycle helmet do not use their helmets, *Journal of Safety Research,* 32, 323–332.

Lam, L. T. (2002) Distractions and the risk of car crash injury: the effects of drivers' age. *Journal of Safety Research*, 33, 411–419.

Langley, J., McGee, R., Silva, P. and Williams, S. (1983) Child behaviour and accidents. *Journal of Paediatric Psychology,* 8(2), 181–189.

Lawton, R., Conner, M. and Parker, D. (2007) Beyond cognition: predicting health risk behaviors from instrumental and affective beliefs. *Health Psychology*, 26, 259–267.

Luna, B., Garver, K. E., Urban, T. A., Lazar, N. A. and Sweeney, J. A. (2004) Maturation of cognitive processes from late childhood to adulthood. *Child Development*, 75(5), 1357–1372.

Lupton, K. and Bayley, M. (2001) *Children's Perceptions of the Road Environment: The Implications for Highway Design; Analysis of Interviews and Video Recordings*. Intermediate Report 01/14N. Transport Management Research Centre, Middlesex University.

Lytton, H. and Rommey, D. M. (1991) Parent's differential socialization of boys and girls: a meta-analysis. *Psychological Bulletin*, 109, 267–296.

Machin, M. A. and Sankey, K. S. (2008) Relationships between young drivers' personality characteristics, risk perceptions, and driving behaviour. *Accident Analysis and Prevention,* 40, 541–547.

Manstead, A. S. (1995) Personality. In Manstead, A.S.R. and Hewstone, M. (eds). *Blackwell Dictionary of Social Psychology.* Oxford: Blackwell.

Manstead, A. S. R., Parker, D., Stradling, S. G., Reason, J. T. and Baxter, J. S. (1992) Perceived consensus in estimates of the prevalence of driving errors and violations. *Journal of Applied Social Psychology*, 22, 509–530.

Matthews, M. L. and Moran, A. R. (1986) Age differences in male drivers' perception of accident risk: the role of perceived driving ability. *Accident Analysis and Prevention*, 18, 299–313.

Mayhew, D. R. and Simpson, H. M. (1996) *Effectiveness and Role of Driver Education and Training in a Graduated Licensing System*. Ottawa, Ontario: Traffic Injury Research Foundation.

Mayhew, D. R. and Simpson, H. M. (2002) The safety value of driver education and training. *Injury Prevention*, 8(Suppl. II), ii3–ii8.

McEvoy, S. P., Stevenson, M. R., McCartt, A. T., Woodward, M., Haworth, C., Palamara, P. and Cercarelli, R. (2005) Role of mobile phones in motor vehicle crashes resulting in hospital attendance: a case-crossover study. *British Medical Journal*, 331, 428–434.

McKenna, F. P. and Horswill, M. S. (2006) Risk taking from the participant's perspective: the case of driving and accident risk. *Health Psychology*, 25, 163–170.

McKenna, F. P., Stanier, R. A. and Lewis, C. (1991) Factors underlying self-assessment of driving skills in males and females. *Accident Analysis and Prevention*, 23, 45–52.

McKenna, F. P., Waylen, A. E. and Burkes, M. E. (1998) *Male and Female Drivers: How Different Are They?* Berkshire: University of Reading, AA Foundation for Road Safety Research.

Midlands Partnership Group (2006) *Drivers' Attitude Study – Final Report*. Birmingham: Step Beyond.

Møller, M. (2004) An explorative study of the relationship between lifestyle and driving behaviour among young drivers. *Accident Analysis and Prevention*, 36, 1081–1088.

Møller, M. and Gregersen, N. P. (2008) Psychosocial function of driving as predictor of risk-taking behaviour. *Accident Analysis and Prevention*, 40, 209–215.

Morrongiello, B. A. and Major, K. (2002) Influence of safety gear on parental perceptions of injury risk and tolerance fro children's risk taking. *Injury Prevention*, 8, 27–31.

Morrongiello, B. A. and Lasenby-Lessard, J. (2007) Psychological determinants of risk taking by children: and integrative model and implications for interventions. *Injury Prevention*, 13, 20–25.

Morrongiello, B. A., Lasenby, J. and Walpole, B. (2007) Risk compensation in children: why do children show it in reaction to wearing safety gear? *Journal of Applied Developmental Psychology,* 28(1), 56–63.

Musselwhite, C. (2006) Attitudes towards vehicle driving behaviour: categorising and contextualising risk. *Accident Analysis and Prevention,* 38, 324–334.

Nada-Raja, S., Langley, J. D., McGee, R., Williams, S. M., Begg, D. J. and Reeder, A. I. (1997) Inattentive and hyperactive behaviors and driving offences in adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 36, 515–522.

National Highway Traffic and Safety Administration. (1997). *Buckle Up America: The Presidential Initiative for Increasing Seat Belt Use Nationwide. Recommendations From the Secretary of Transportation*. Available at: http://purl.access.gpo.gov/GPO/LPS1500 (accessed on 10 September 2010).

Newnam, S., Watson, B. and Murray, W. (2004) Factors predicting intentions to speed in a work and personal vehicle. *Transportation Research,* 7, 287–300.

Neyens, D. M. and Boyle, L. N. (2008) The influence of driver distraction on the severity of injuries sustained by teenage drivers and their passengers. *Accident Analysis and Prevention,* 40, 254–259.

North, A. C. and Hargreaves, D. J. (1999) Music and adolescent identity. *Music Education Research,*1(1), 75–92.

North, A. C., Hargreaves, D. J. and O'Neill, S. A. (2000) The importance of music to adolescents. *British Journal of Educational Psychology*, 70, 255–272.

Organization for Economic Development (OECD) (2004) *Keeping Children Safe in Traffic*. Paris: OECD.

Ozkan, T. and Lajunen, T. (2006) What causes the differences in driving between young men and women? The effects of gender roles and sex on young drivers' driving behaviour and self-assessment of skills. *Transportation research Part F: Traffic Psychology and Behaviour*, 9, 269–277

Owsley, C., Stalvey, B., Wells, J. and Sloane, M. E. (1999) Older drivers and cataract: driving habits and crash risk. *Journal of Gerontology: Medical Sciences,* 54A, M203–M211.

Page, R. M. (1986) Role of parental example in preadolescents' use of seat belts. *Psychological Reports,* 59, 985–986.

Pajares, F. and Urdan, T. (eds) (2006) *Adolescence and Education, Volume 5: Self-Efficacy Beliefs of Adolescents*. Greenwich, CT: Information Age Publishing.

Palamara, P. G. and Stevenson, M. R. (2003) *A Longitudinal Investigation of Psychosocial Risk Factors for Speeding Offences Among Young Motor Car Drivers*. Research Report No. RR128. Crawley: Injury Research Centre. www.criminologyresearchcouncil.gov.au/reports/200102-13.pdf/ (accessed on 9 May 2008).

Palmgree, P., Donohew, L., Lorch, E. P., Hoyle, R. H. and Stephenson, M. T. (2001) Television campaigns and adolescent marijuana use: tests of sensation seeking targeting. *American Journal of Public Health,* 91, 292–296.

Parker, D., Manstead, A. S. R., Stradling, S. G. and Reason, J. T. and Baxter, J. S. (1992) Intentions to commit driving violations: an application of the theory of planned behaviour. *Journal of Applied Pyschology*, 77, 94–101.

Parsons, J. T., Siegel, A. W. and Cousins, J. H. (1997) Late adolescent risk-taking: effects of perceived benefits and perceived risks on behavioural intentions and behavioural change. *Journal of Adolescence,* 20, 381–392.

Pasto, L. and Baker, A. G. (2001) Evaluation of a brief intervention for increasing seat belt use on a college campus. *Behavior Modification*, 25, 471–486.

Patil, S. M., Shope, J. T., Raghunathan, T. E. and Bingham, C. R. (2006) The role of personality characteristics in young adult driving. *Traffic Injury Prevention*, 7, 328–334.

Paus, T. (2005) Mapping brain maturation and cognitive development during adolescence. *Trends in Cognitive Sciences*, 9(2), 60–68.

Petty, R. E. and Cacioppo, J. T. (1986) *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. New York: Springer.

Pless, I. B., Magdalinos, H. and Hagel, B. (2006) Risk-compensation behaviour in children: Myth or reality? *Archives of Pediatrics and adolescent Medicine,* 160(6), 610-614.

Plumert, J. M., Kearney, J. K. and Cremer, J. F. (2004) Children's perception of gap affordances: bicycling across traffic-filled intersections in an immersive virtual environment. *Child Development*, 75(4), 1243–1253.

Porcellato, L., Dugdill, L., Springett, J. and Sanderson, F. (1999) Primary schoolchildren's perceptions of smoking: Implications for health education. *Health Education Research,* 14, 71–83.

Potts, R., Martinez, I. and Dedmon, A. (1995) Childhood risk taking and injury: self report and informant measures. *Journal of Pediatric Psychology*, 20, 5–12.

Powell, M., Wilson, J., Gibbons, C. and Croft, C. (2008) Children's conception of police authority when responding to requests for assistance. *Police Practice and Research: An International Journal*, 9, 5–16.

Preusser, D. F., Ferguson, S. A. and Williams, A. F. (1998) The effect of teenage passengers on the fatal crash risk of teenage drivers. *Accident Analysis and Prevention,* 30(2), 217–222.

Preusser, D. F., Williams, A. F. and Lund, A. K. (1985) Parental role in teenage driving. *Journal of Youth and Adolescence,* 14(2), 73–84.

Quadrel, M. J., Fischhoff, B. and Davis, W. (1993) Adolescent (in)vulnerability. *American Psychologist*, 48, 102–116.

Quine, L., Rutter, D. R. and Arnold, L. (1998) Predicting and understanding safety helmet use among schoolboy cyclists: A comparison of the theory of planned behaviour and the health belief model. *Psychology and Health,* 13, 251–269.

Quine, L., Rutter, D. and Arnold, L. (2001) Persuading school-age cyclists to use safety helmets: effectiveness of an intervention based on the Theory of Planned Behaviour. *British Journal of Health Psychology*, 6, 327–345.

Ramos, P., Diez, E., Perez, K., Rodriguez-Martos, A., Brugal, M. T. and Villalbi, J. R. (2008) Young people's perceptions of traffic injury risks, prevention and enforcement measures: a qualitative study. *Accident Analysis and Prevention,* 40, 1313–1319.

Ramsey, L. T., Ballesteros, M. F., Pelletier, A. R. and Wolf, J. (2005) Injury prevention practices as depicted in G and PG rated movies: the sequel. *Injury Prevention,* 11, 353–356.

Reason, J. T., Manstead, A. S. R., Stradling, S. G., Baxter, J. S. and Campbell, K. A. (1990) Errors and violations on the road: a real distinction? *Ergonomics,* 33(10/11), 1315–1332.

Rice, T. M., Peek-Asa, C. and Kraus, J. F. (2003) Nighttime driving, passenger transport, and injury crash rates of young drivers. *Injury Prevention*, 9, 245–250.

Roberts, B. W., Caspi, A. and Moffitt, T. E. (2001) The kids are alright: growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology,* 81(4), 670–683.

Roberts, B. W., Walton, K. E. and Viechtbauer, W. (2006) Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin*, 132(1), 1–25.

Roberts I. and Kwan I. (2001) School-based driver education for the prevention of traffic crashes (review). *Cochrane Database of Systematic Reviews*, (3).

Roberts, I., DiGuiseppi, C. and Ward, H. (1998) Childhood injuries: extent of the problem, epidemiological trends and costs. *Injury Prevention*, 4 (Supplement), S10–S16.

Ruble, D. N., Fleming, A. S., Hackel, L. S. and Stangor, C. (1988) Changes in the marital relationship during the transition to first time motherhood: effects of violated expectations concerning division of household labor. *Journal of Personality and Social Psychology*, 55, 78–87.

Sarkar, S. and Andreas, M. (2004) Acceptance of and engagement in risky driving behaviors by teenagers. *Adolescence,* 39(156), 687–700.

Schmid Mast, M., Sieverding, M., Esslen, M., Graber, K. and Jäncke, L. (2008) Masculinity causes speeding in young men. *Accident Analysis and Prevention*, 40, 840–842.

Senserrick, T. M. (2006) Reducing young driver road trauma: guidance and optimism for the future. *Injury Prevention,* 12, i56–i60.

Sentinella, J. and Keigan, M. (2004) *Child and Young Adolescents' Road Deaths: An Analysis of Police Fatal Accident Files.* TRL Report No. 605. Wokingham: TRL Limited.

Shelness, A. and Charles, S. (1975) Children as passengers in automobiles: the neglected minority on the nation's highways. *Pediatrics,* 56(2), 271–284.

Shope, J. T. (2006) Influences on youthful driving behavior and their potential for guiding interventions to reduce crashes. *Injury Prevention,* 12, i9–i14.

Shope, J. T. and Bingham, C. R. (2002) Drinking-driving as a component of problem driving and problem behavior in young adults. *Journal of Studies on Alcohol,* 63, 24–33.

Shope, J. T. and Bingham, C. R. (2008) Teen driving: motor-vehicle crashes and factors that contribute, *American Journal of Preventive Medicine*, 35(3S), S261–S271.

Shope, J. T., Waller, P. F., Raghunathan, T. E. and Patil, S. M. (2001) Adolescent antecedents of high-risk driving behaviour into young adulthood: substance use and parental influences. *Accident Analysis and Prevention,* 33, 649–658.

Simons-Morton, B. G. and Hartos, J. L. (2003) Improving the effectiveness of counter measures to motor vehicle crashes among young drivers. *Journal of Health Education,* 34, S57–S61.

Simons-Morton, B. G. and Ouimet, M. C. (2006) Parent involvement in novice teen driving: a review of the literature. *Injury Prevention,* 12, i30–i37.

Simons-Morton, B. G., Chen, R., Abroms, R. and Haynie, D. L. (2004) Latent growth curve analyses of peer and parent influences on smoking stage progression among early adolescents. *Health Psychology*, 23, 612–621.

Simons-Morton, B. G., Hartos, J. L., Leaf, W. A. and Preusser, D. F. (2006) The effect on teen driving outcomes of the Checkpoints Program in a state-wide trial. *Accident Analysis and Prevention,* 38, 907–912.

Simons-Morton, B., Lerner, N. and Singer, J. (2005) The observed effects of teenage passengers on the risky driving behaviour of teenage drivers. *Accident Analysis and Prevention*, 37, 973–982.

Simons-Morton, B. G., Ouimet, M. C. and Catalano, R. F. (2008) Parenting and the young driver problem. *American Journal of Preventive Medicine,* 35 (3S), S294–S303.

Smetana, J. G., Campione-Barr, N. and Metzger, A. (2006) Adolescent development in interpersonal and societal contexts. *Annual Review of Psychology,* 57, 255–284.

Stacy, A., Newcomb, M. D. and Bentler, P. M. (1991) Personality, problem drinking, and drunk driving. *Journal of Personality and Social Psychology,* 60, 795–811.

Steinberg, L. (2005) Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*, 9(2), 69–74.

Steinberg, L. (2008) A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, 28, 78–106.

Stephenson, M. T. (2003) Examining adolescents' responses to antimarijuana PSAs. *Human Communication Research,* 29(3), 343–369.

Sternberg, R. J. (1977). *Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities*. Hillsdale, NJ: Lawrence Erlbaum.

Stradling, S., Broughton, P., Kinnear, N., O'Dolan, C., Fuller, R., Bates, H., Gormley, M. and Hannigan, B. (2008) *Understanding Inappropriate High Speed: A Quantitative Analysis*. Road Safety Research Report No. 93. London: Department for Transport.

Stradling, S., Gormley, M., Fuller, R., Broughton, P., Kinnear, N. and O'Dolan, C. (2007) A typology of speeding drivers: extent of and motives for exceeding the speed limit. In *Behavioural Research in Road Safety, Seventeenth Seminar*. London: Department for Transport.

Stradling, S., Kinnear N. and Mann, H. (2005) *Evaluation of Brake Bridge House Trust Young Driver Education Scheme Pilot Project Literature Review.* Edinburgh: Napier University.

Stradling, S. G., Meadows, M. and Beatty, S. (2000) Characteristics of Speeding, Violating and Thrill-Seeking Drivers. *Proceedings of the International Conference on Traffic and Transport Psychology*, Bern.

Strecher, V. J., Bauermeister, J. A., Shope, J., Chang, C., Newport-Berra, M., Giroux, A. and Guay, E. (2007a) *Intervention Modalities to Address Relevant Psychosocial Predictors of Driving Behaviour Among Adolescents: Primary Report.* Road Safety Research Report No. 70. London: Department for Transport.

Strecher, V. J., Shope, J., Bauermeister, J. A., Chang, C., Newport-Berra, M., Boonin, A., Giroux, A., Guay, E., Candee, E., Ewing, L. and Flewellen, R. (2007b) *Review of Judgement and Decision-making Literature Pertinent to the Development of Traffic Offender Training/Improvement Programmes*. Road Safety Research Report No. 70. London: Department for Transport

Stutts, J. C., Reinfurt, D. W., Staplin, L. and Rodgman, E. A. (2001) *The Role of Driver Distraction in Traffic Crashes*. Report Prepared for AAA Foundation for Traffic Safety.

Subrahmanyam, K., Greenfield, P., Kraut, R. and Gross, E. (2001) The impact of computer use on children's and adolescents' development. *Journal of Applied Developmental Psychology,* 22, 7–30.

Svenson, O. (1981) Are we all less risky and more skillful than our fellow drivers? *Acta Psychologica*, 47*,* 143–148.

Taubman-Ben-Ari, O., Mikulincer, M. and Gillath, O. (2005) From parents to children – similarity in parents and offspring driving styles. *Transportation Research Part F*, 8, 19–29.

Terry, D. J., Hogg, M. A. and White, K. M. (1999a) The theory of planned behaviour: self-identity, social identity and group norms. *British Journal of Social Psychology*, 38, 225–244.

Terry, D. J., Hogg, M. A. and Duck, J. M. (1999b) Group membership, social identity, and attitudes. In D. Abrams and M. A. Hogg (eds), *Social Identity and Social Cognition*. Oxford: Blackwell.

Thomson, J. A., Tolmie, A., Foot, H. C. and McLaren, B. (1996) *Child Development and the Aims of Road Safety Education: A Review and Analysis.* Road Safety Research Report No. 1. London: HMSO.

Tilleczek, K. (2004) The illogic of youth driving culture. *Journal of Youth Studies,* 7, 473–498.

Tolmie, A. K., Thomson, J. A., Foot, H. C., Whelan, K. M., Sarvary, P. and Morrison, S. (2002) *Development and Evaluation of a Computer-based Pedestrian Training Resource for Children Aged 5 to 11 Years*. Road Safety Research Report No. 27. London: Department of Transport, Local Government and the Regions.

Tolmie, A., Thomson, J. A., Foot, H. C., Whelan, K., Morrison, S. and McLaren, B. (2005) The effects of adult guidance and peer discussion on the development of children's representations: evidence from the training of pedestrian skills. *British Journal of Psychology*, 96, 181–204.

Tolmie, A., Thomson, J. A., O'Connor, R., Foot, H. C. Karagiannidou, E., Banks, M., O'Donnell, C. and Sarvary, P. (2006) *The Role of Skills, Attitudes and Perceived Behavioural Control in the Pedestrian Decision-making of Adolescents Aged 11–15 Years.* Road Safety Research Report No. 68. London: Department for Transport.

Tuohy, A. P. and Stradling, S. G. (1992) Pre-drivers' behaviour in driving task: an analysis of interactive video data. In G. B. Grayson (ed.), *Behavioural Research in Road Safety, Vol. II*. Crowthorne: Transport Research Laboratory.

Turiel, E. (1983) *The Development of Social Knowledge*. Cambridge: Cambridge University Press.

Turner, C. and McClure, R. (2003) Age and gender differences in risk-taking behaviour as an explanation for high incidence of motor vehicle crashes as a driver in young males. *International Journal of Injury Control and Safety Promotion,* 10(3), 123–130.

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D. and Wetherell, M. S. (1987) *Rediscovering the Social Group: A Self-Categorization Theory.* Oxford: Blackwell.

Ulleberg, P. (2002) Personality subtypes of young drivers. Relationship to risk-taking preferences, accident involvement, and response to a traffic safety campaign. *Transportation Research Part F*, 4, 279–297.

Ulleberg, P. (2004) Social influence from the back-seat: factors related to adolescent passengers' willingness to address unsafe drivers. *Transportation Research Part F*, 7, 17–30.

Ulleberg, P. and Rundmo, T. (2002) Risk taking attitudes among young drivers: the psychometric qualities and dimensionality of an instrument to measure young drivers' risk taking attitudes. *Scandinavian Journal of Psychology*, 43, 227–237.

Ulleberg, P. and Rundmo, T. (2003) Personality, attitudes and risk perception as predictors for risky driving behaviour among young drivers. *Safety Science*, 41, 427–443.

Vassallo, S., Smart, D., Sanson, A., Cockfield, S., Harris, A., McIntyre, A. and Harrison, W. (2008) Risky driving among young Australian drivers II: co-occurrence with other problem behaviours. *Accident Analysis and Prevention*, 40, 376–386.

Vassallo, S., Smart, D., Sanson, A., Harrison, W., Harris, A., Cockfield, S. and McIntyre, A. (2007) Risky driving among young Australian drivers: trends, precursors and correlates. *Accident Analysis and Prevention,* 39, 444–458.

Vavrik, J. (1997) Personality and risk-taking: a brief report on adolescent male drivers. *Journal of Adolescence*, 20, 461–465.

Vernick, J. S., Li, G., Ogaitis, S., MacKenzie, E. J., Baker, S. P. and Gielen, A. C. (1999) Effects of high school driver education on motor vehicle crashes, violations, and licensure. *American Journal of-Preventive Medicine*, 16, 40–46.

Walton, D. (1999) Examining the self-enhancement bias: professional truck drivers' perception of speed, safety, skill and consideration. *Transportation Research Part F,* 2, 91–114.

Ward, H., Christie, N., Lyons, R., Broughton, J., Clarke, D. and Ward, P. (2007) *Trends in Fatal Car Occupant Accidents*. Road Safety Research Report No. 76. London: Department for Transport.

Watson, B., Tunnicliff, D., White, K., Schonfeld, C. and Wishart, D. (2007) *Psychological and Social Factors Influencing Motorcycle Rider Intentions and Behaviour.* ATSB Research and Analysis Report. Road Safety Research Grant Report 2007-04.

Waylen, A. and McKenna, F. (2002) *Cradle Attitudes – Grave Consequences. The Development of Gender Differences in Risky Attitudes and Behaviour in Road Use*. Basingstoke: University of Reading and AA Foundation for Road Safety Research Report.

Waylen, A. E. and McKenna, F. P. (2008) Risky attitudes towards road use in pre-drivers. *Accident Analysis and Prevention,* 40, 905–911.

Webb, T. L. and Sheeran, P. (2006) Does changing behavioral intentions engender behaviour change? A meta-analysis of the experimental evidence. *Psychological Bulletin,* 132, 249–268.

Wells, P., Tong, S., Sexton, B., Grayson, G. and Jones, E. (2008) *Cohort II: A study of Learner and New Drivers. Volume 1 – Main Report*. Road Safety Research Report No. 81. London: Department for Transport.

White, M. P., Eiser, J. R. and Harris, P. R. (2004) Risk perceptions of mobile phone use while driving. *Risk Analysis,* 24(2), 323–334.

Wilde, G. J. S. (1998) Risk homeostasis theory: an overview. *Injury Prevention,* 4, 89–91.

Williams, A. F. (1998) Risky driving behavior among adolescents. In R. Jessor (ed.), *New Perspectives on Adolescent Risk Behavior.* Cambridge: Cambridge University Press. pp. 221–237.

Williams, A. F. and Shabanova, V. I. (2002) Situational factors in seat belt use by teenage drivers and passengers. *Traffic Injury prevention,* 3(3), 201–204.

Wimmer, H. and Perner, J. (1983) Beliefs about beliefs: representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13, 103–128.

Winne, P. H. and Hadwin, A. F. (1998) Studying as self-regulated learning. In D. H. Hacker, J. Dunlosky and A. C. Graesser (eds), *Metacognition in Educational Theory and Practice.* Mahwah, NJ: Lawrence Erlbaum.

Wood, M. D., Read, J. P., Mitchell, R. E. and Brand, N. H. (2004) Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychology of Addictive Behaviors*, 18, 19–30.

Yanchor, N. L., Kennedy, R. and Russell, C. (2006) ATVs: motorized toys or vehicles for children? *Injury Prevention*, 12, 30–34.

Yeh, T-H., Chang, H-L. and Chang, H-W. (2008) Initial age of unlicensed motorcycling experience for a cohort of high school students. *Accident and Analysis and Prevention*, 40, 511–517.

Young, K., Regan, M. and Hammer, M. (2003) *Driver Distraction: A Review of the Literature*. Monash University Accident Research Centre, Report No. 206.

Zuckerman, M. and Kuhlman, D. M. (2000) Personality and risk-taking: common biosocial factors. *Journal of Personality,* 68(6), 999–1029.

# APPENDIX 1: Education and training of pre-drivers

> It may be too late to try and educate individuals about safe road use when they are actually learning to drive.
>
> (Waylen and McKenna, 2008; p. 909)

> . . . isolating single characteristics to identify the proverbial 'silver bullet' is a research and policy strategy that is doomed before it begins. What is needed is a strategy that maximizes the potentially beneficial interactions among multiple dimensions that contribute to increased safety and harm reduction.
>
> (Keating, 2007; p. 149)

> 'There's never been anything in school either there's not even anything about driving licences or how to get them there's nothing to make you aware or educate you on how dangerous it can be. Yeah, you just kind of learn from word of mouth, "Do you know what's happened to so and so?"' [Girl 16]
>
> (Midlands Partnership Group, 2006; p. 147)

This review has been concerned with aspects of the development and behaviour of young people as they progress towards becoming drivers. Following on from the work of many researchers, it identifies numerous respects in which pre-driver and novice driver preparation and skills for road use are inadequate. It is natural – and, indeed, it is the natural responsibility of adult society – to consider educational strategies that can mitigate risks and problems where they occur, as well as nurture and advance positive features where they can be found.

In this appendix, we turn to the issues and challenges facing educational interventions with pre-drivers. Two of the initial questions with which we began this review are addressed here:

- To what extent can children and young people be influenced to have more positive (safe) attitudes to being a driver, rider or passenger of a motor vehicle?
- How can the attitudes and beliefs of children and young people to driving be influenced, by whom, and how can this be measured?

We set the scope quite broadly, to reflect the fact that the education of pre-drivers is not only (in many cases, not at all) the preserve of formal educational contexts and there is a consensus among reviewers of issues in driver education at any age level that effective approaches must be multifaceted (Hatakka *et al.*, 2002; Stradling *et al.*, 2005). As indicated in previous sections, many influences bear on pre-drivers'

learning about driving, including parents, peers and media; these factors are also considered here.

## A1.1 From driver education to pre-driver education

Researchers have identified many aspects of safe and risky driving. Accident statistics from around the world demonstrate that young drivers are particularly at risk. It seems obvious that the relevant skills and information should be passed on – through education, training and safety warnings – to young people who are about to become drivers. It seems almost as obvious that once they are alerted to their special risk status and to the numerous dangers that confront them, young drivers will adjust their behaviour to ensure their own safety and the avoidance of harm to others. Unfortunately, these intuitively appealing assumptions are not borne out by the facts (Stradling *et al.*, 2005).

As we have stressed in previous sections, attitudes do not reliably predict behaviour. Similarly, the provision of factual information does not necessarily give rise to what seem, on the face of it, to be the appropriate responses. For example, there is much evidence to show that driver education is not very effective in reducing accident figures and in some respects may even be counterproductive (Hatakka *et al.*, 2002; Mayhew and Simpson, 1996, 2002; Roberts and Kwan, 2001; Stradling *et al.*, 2005; Vernick *et al.*, 1999). Over 30 studies, conducted around the world, failed to demonstrate lower crash rates among novice drivers who had received formal driver or motorcycle education/training, including even those who had received advanced training (Mayhew and Simpson, 1996). A small number of studies showed the opposite outcome.

The implications for driver education are disturbing. Policymakers might reasonably ask whether any additional expenditure on driver education is warranted. However, the human and economic costs of high injury and fatality rates involving young drivers compels further analysis to determine why current approaches are of limited effectiveness and how they might be improved (Hatakka *et al.*, 2002). In a valuable discussion, Mayhew and Simpson (2002) outline several possible reasons why formal instruction may fail to reduce crash rates and they consider how the limitations of current approaches could be addressed. Their account focuses primarily on the immediate pre-driver (i.e. those receiving driving lessons) and the novice driver phases. However, we suggest that several of the issues Mayhew and Simpson (2002) raise lead also to consideration within a broader developmental framework, and that some of the interventions that might be entertained need to be targeted (additionally) at younger persons.

As shown in this review, young people learn about driving over many years. By and large, this is informal induction with little planning or regulation, relatively poorly studied by researchers because it is difficult to access, yet it is the fundamental everyday arena within which the culture of road use is passed from generation to

generation. The consequences are that the endorsement of risky attitudes towards aspects of driving is widespread in 11–16-year-olds (Waylen and McKenna, 2008; see Sections 2, 3 and 4) and 'drivers tend to enter the driving population with fairly fixed ideas about themselves, both in absolute terms and in relation to others' (Wells *et al.*, 2008, p. 127). Hence, we consider here ways in which lessons learnt about driver education need to be drawn upon in planning strategies for pre-driver education.

## A1.2 Why is training often ineffective?

One possible explanation for ineffective training is that the instruction fails to teach the knowledge and skills required for safe driving. For example, driving instruction often concentrates on the mechanics of handling a vehicle, and Mayhew and Simpson (2002) suggest that it may be that more emphasis needs to be provided on skills associated with avoiding accidents, such as hazard detection and risk assessment. As discussed in earlier sections of this report, perceptual skills associated with hazard detection are still developing through adolescence. It is controversial whether adolescents are inferior to adults in risk assessment in 'cold' paper and pencil tasks, but they may be less proficient in handling distractions and emotional responses in actual driving situations (Section 7). This suggests that relevant training could be targeted at pre-drivers which aims both to alert young people to their areas of difficulty and to enable them to practise safety techniques in simulated conditions. We concur with Strecher *et al.* (2007b) that interactive media provide the most promising widely available facilities in which to undertake such training.

A second explanation could be that, while driver education does teach safety skills, students are not motivated to learn them (Mayhew and Simpson, 2002; p. ii.5). As stressed in earlier sections, there are likely to be individual differences in this respect. For example, Stradling *et al.* (2007, 2008) found that a minority of risky (speeding) drivers indicated that they enjoyed the risk, and the authors concluded that merely providing these drivers with an improved understanding of the negative consequences would be unlikely to remediate their behaviour. Keating (2007) has also stressed the potential mismatch between adult/trainer goals and those of would-be young drivers: the former wish to promote safety, while the latter wish to achieve independent mobility. Christie (2001) and Mayhew and Simpson (2002) suggest that interventions aiming to modify motivations need to be targeted at earlier stages than the period of driver instruction, and quite likely need to be delivered over several years. An essential goal here, then, would be to foster a long-standing correlation between driving skills and safety, essentially so that this notion is ingrained before the excitement of engaging with driving instruction and practice on the roads.

A third possibility is that driver education is counterproductive because it instils overconfidence. Hatakka *et al.* (2002) point to evidence that novice drivers who acquire driving skills relatively quickly (i.e. 'good' pupils in driving schools) tend to

have higher accident and violation rates. Students who receive early driver education tend to seek driver status earlier and are thus at risk sooner and during the most vulnerable period of mid-adolescence (GADGET, 1999; Hatakka *et al.*, 2002; Stradling *et al.*, 2005). Mayhew and Simpson (2002) discuss possible educational strategies in this respect for advanced driver courses. They suggest that drivers need to be alerted to their own limitations rather than led to believe that they can handle all challenges. While clearly there are considerations here that relate most directly to practising drivers, it is also possible that pre-drivers can be helped to reflect on the interrelations of skills, confidence and risk estimation in simulated contexts. Simply put, coming to terms with the notion that 'I am not always right' is difficult for adolescents – but creative educational techniques may help.

A fourth possibility is that driver education fails to address lifestyle issues. As this review makes clear, these are fundamental concerns in relation to risky driving in young people. We agree with Mayhew and Simpson (2002; p. ii.5) that intervening in adolescent lifestyle is enormously challenging. This is especially the case if the intervention is targeted at late adolescents who are already old enough to learn to drive. However, as noted in Section 5, there is evidence that young people who, in their early teens, elect positive, health-protecting lifestyles, and who score highly on conscientiousness, are less likely when they become drivers to engage in risky driving, with the result that they have lower accident rates. Hence, while by no means underestimating the challenges of lifestyle intervention, we propose that it should be targeted at early teens and, ideally, maintained thereafter at regular intervals via developmentally-appropriate strategies.

## A1.3 Educational strategies with pre-drivers

It has been stressed throughout this review that a wide range of perceptual, cognitive, psychosocial and contextual factors bear on driving attitudes and behaviour. Correspondingly, educational and intervention strategies need to be multifaceted.

Five important principles should be stressed at the outset. The first is that successful education invariably begins where the student is at. Educational strategies need to be both developmentally appropriate and addressed to issues and concerns that are meaningful to learners. Approaches and materials which are pitched significantly below or above a student's level are unlikely to be effective. Those which engage with issues that the student is ready to confront are more promising. A favourable factor is that most adolescents are interested in driving/transportation (Simons-Morton and Hartos, 2003), and pre-driver education has the potential to tap into their motivations and enthusiasms.

The second principle is that no one size fits all. As Keating (2007) emphasises above, there is no silver bullet that can be applied quickly and universally to bring about dramatic improvements in pre-driver education and/or novice driver

performance. Some interventions, skilfully delivered, may be advantageous for some individuals, some of the time (see also Vassallo *et al.*, 2008). The challenge ahead is to determine what these are, and when and how they should be delivered.

The third principle is that no educational programme can expect to succeed unless it is founded on clear and explicitly-stated objectives (Tolmie *et al.*, 1996). Simply exhorting young people, or any road users, to behave better will be unlikely to be effective.

The fourth principle is that education takes longer than training, and could be commenced earlier. Stradling *et al.* (2005) stress the distinction between driver training and driver education. The former concerns the acquisition of practical vehicle skills and tends to be the primary preoccupation of learner drivers, who hope to attain proficiency relatively quickly; the latter is a far broader, more reflective process encompassing the teaching of safe driving behaviour and the promotion of responsible attitudes. Pre-driver education in schools may afford valuable opportunities to establish ways of thinking about road use that may later form the backdrop to actual participation as drivers (GADGET, 1999). Hatakka *et al.* (2002; p. 205) suggest that 'driver training should be broadened into transport education'. For example, they point out that schoolchildren could be guided to take into account the transport options available for different purposes, to develop skills in computing journey times, route planning, management of traffic conditions/time of day, and awareness of the goals, limitations and risk factors of other road users.

The fifth principle is the need to capitalise on the positives. Inevitably, discussions of young drivers have to attend to distressing facts about accident rates and risky driving behaviours; it is easy to adopt a negative assumption that we are dealing with a pervasively dangerous and irresponsible demographic. This is not invariably the case. Many young people have awareness of safety issues in driving and aspire to be safe drivers (Green and Dorn, 2008; Tilleczek, 2004; Vassallo *et al.*, 2007). This is important not only in terms of how the educational needs of those individuals might be addressed, but also in terms of how positive aspects of peer culture might be drawn upon in promoting shifts of subjective norms.

## A1.4 Individual difference issues

Several commentators have suggested strategies for driver training that take into account known vulnerabilities of young drivers. By extension, some of these strategies could be adapted for educational work with pre-drivers. For example, in light of findings establishing links between personality characteristics and risky driving, Machin and Sankey (2008) and Strecher *et al.* (2007b) propose that self-awareness exercises could be included in driver education programmes. Machin and Sankey (p. 546) suggest that 'it may be far more effective to assist young drivers to reflect on their personality and how it influences their decisions rather than just to emphasise the importance of following the road rules'. Such a strategy could be

included in pre-driver education. While challenging to implement – risk takers and sensation seekers may be less reflective – it does have the virtue of accommodating to individual differences. No one size fits all.

## A1.5 Parents

We have seen that there is considerable evidence to confirm the importance of parents in the development of driving attitudes and behaviours. There is intergenerational transfer of risk, but there is also evidence that parental monitoring can promote safer driving practices (Sections 3, 4, 9). Teenage drivers perceive their parents as having an important role in their early driving and most learn to drive at least partially under parental instruction (Preusser *et al.*, 1985; Stradling *et al.*, 2005). Parents themselves regard road safety as one of their top concerns about their children's wellbeing (Stradling *et al.*, 2005), yet their own understanding of specific risks and of their own children's driving behaviour are often ill-informed and inaccurate (Simons-Morton and Hartos, 2003; Stradling *et al.*, 2005). Specialists in traffic safety research have called for 'an enhanced.and supported role for parents in young people's driving, especially in graduated licensing programs' (Shope *et al.*, 2001; p. 657). We agree, but suggest additionally that the parental role could be enhanced and supported at earlier stages to positive effect.

It is not entirely paradoxical that parents can be both a source of risky practices and undesirable driver attitudes as well as authoritative guides to sensible early driving. Parents are road users and are likely, as a group, to display the normal distribution of driving standards that are observed in a given community. At the same time, parents are generally strongly motivated to ensure their children's wellbeing. This motivation should make many parents receptive to the prospect of playing a role in their children's developing familiarity with road safety. Careful research is needed to test different modes of implementing this.

### *A1.5.1 A promising educational intervention with parents and pre- to novice drivers*

Haggerty *et al.* (2006) report an evaluation of an intervention designed to promote healthy driving behaviour in young people from disadvantaged communities in the US around the time of licensure. Two intensive sessions were administered to families. The theme of the intervention was 'Safe drivers wanted'. The first session was conducted in the families' homes, prior to the young person gaining a licence. It included the provision of information about risk taking, healthy behaviour and current driving laws, it facilitated mutual understanding between parents and teenager on views of risk taking, and it encouraged parental coaching skills in respect of healthy choices. The process was consolidated in written family driving contracts. The second session, administered at the time of licensure, aimed to assist the families in formulating specific expectations in relation to the driving contract. For example, it dealt with issues such as when and how the car could be used, the

consequences of drug and alcohol use, finance, responsibility for looking after the vehicle after use, and safety (e.g. the use of mobile phones while driving).

The evaluation indicated several positive outcomes. Compared with control participants who had not received the intervention, those taking part in the sessions were more likely to report having a written driving contract with their parents, had participated in generating driving rules within the family, and showed lower levels of risky driving behaviours/driving with someone who had been drinking. The effects were strong for having a contract and for participation in rule making, and weaker for risky driving/drink driving. There were no differences with respect to receiving tickets for traffic violations or accident rates.

There are some limitations to the intervention. One of the strengths of the overall project is its scale – the families were followed over several years as part of a broader effort to promote healthy development. This is commendable in a targeted intervention for disadvantaged people, but scarcely an economically or logistically viable model for the provision of driving education for a whole population. Also, the outcome measures were self-reports, and they could be explained in part by demand characteristics (the participants knew that they had received instruction about driving and driving contracts, and might have attempted to give the researchers the answers they could be presumed to wish to hear). Furthermore, driving outcomes were not perfect, with 35% of the intervention group versus 33% of the control group (a non-significant difference) reporting having been in an accident. Nevertheless, 17.4% of the adolescents in the intervention group said that they had written driving contracts, compared with only 3.7% of the controls, and the intervention parents were also much more likely to report implementing contracts.

The implication is that families can be assisted in this difficult transition, and that many will seek to implement specific strategies when provided with guidance as to how this might be undertaken. This feature could be adapted for wider use. (Simons-Morton *et al.* (2006) report an intervention program conducted on a state-wide basis in Connecticut, with evidence of positive outcomes; we do not review this study in detail here because it concerned adolescents who had acquired their licences, rather than pre-drivers, but the results do support the inference that large-scale interventions with parents can be effective.)

## A1.6 Schools

Schools play an important role in pre-driver education, whether intentionally or otherwise. There is a very general relationship. Some children are disaffected with school and do not succeed within it. Some of these children are at particular risk of entering into deviant peer groups, risky lifestyles, opposition to authority, and delinquent activities (Emler and Reicher, 1995). Some of their activities will include transport-related crime, such as vandalism, thefts, and reckless driving (Begg and Langley, 2004; Carroll *et al.*, 2009; Kellett and Gross, 2005). As discussed in

Sections 3 and 5, there are longitudinal continuities between poor task persistence, problem behaviour as early as the beginning of primary school and commitment of traffic violations in early adulthood (Vassello *et al.*, 2007). Because these issues relate to the broader origins of social deviance (Fuller *et al.*, 2008) and to educational process in general, rather than to pre-driver education specifically, we will not discuss them at length in this section. Nevertheless, it is important to acknowledge that there is a small, but substantial minority of children who will be especially hard to reach, even if pre-driver education is delivered more extensively by the school system.

Schools are environments within which children and adolescents develop their understanding of health-related behaviour and dimensions of citizenship. Many schools may aspire to contribute constructively to pre-driver education. Models for how to do so are varied and their effectiveness not always known. Some researchers have reported negative evaluations by adolescents of available school driver education (Ramos *et al.*, 2008), as well as complaints that they are negligible (Midlands Partnership Group, 2006). An impressive multifaceted intervention programme aiming to prevent health-risk behaviours in adolescents was conducted with elementary school children in high crime areas of Seattle (Hawkins *et al.*, 1999). The programme included classroom-based activities, cognitive and social skills training, and parent training. Some children received the intervention while in Grades 1 to 4, and it was administered to others in Grades 5 and 6. A range of outcome measures, including involvement in delinquency, heavy drinking, sexual risk-taking, school misbehaviour, and academic achievement, were collected several years later, when the students were aged 17 to 18. The results showed significant benefits from the early intervention, but not from the late intervention. While not primarily concerned with driving behaviour, the study did show a tendency towards less drinking and driving in the early intervention group

Brown (2002) provides an informative discussion of the BSM Education Programme, which has been running for approximately 15 years and is used in over 1,500 schools and further education colleges in the UK. This programme merits careful research attention because it aims to tackle many of the issues highlighted in this review and, at least in outline, its educational strategies appear well principled by the criteria stipulated above.

The BSM Education Programme currently offers two courses: ‘Ignition’, aimed at the age range 15–17; and ‘Signal’ for the 17–19 age range. It involves a series of exercises, devised by BSM, but delivered by teachers and/or road safety officers who have been trained in its application. Different components of the approach address students’ attitudes towards the car and car use, perceptual skills, speed, errors, driver vulnerability, driving habits, risk, lifestyle issues, and the causes and consequences of crashes. Evaluation appears to have been largely in-house, but Brown (2002) reports high self-reported levels of increased knowledge and awareness of the need for professional instruction among school children who have taken the course.

Brown acknowledges that a major obstacle to the implementation of the materials is the competition for space within busy school curricula and the many other demands on teachers. Possible extensions of this kind of programme to younger schoolchildren need to be reviewed.

It could be argued – and sometimes is in lay contexts or in product advertising – that all terrain vehicles (ATVs, also known as quad bikes) could be an appropriate intermediate form of vehicle for pre-drivers to experience handling motorised transport safely, at low speeds and on robust equipment. The evidence is quite clear, however, that this is an unwarranted assumption, with high accident rates and severe injuries among children riding ATVs (Yanchor *et al.*, 2006). Importantly, accident rates and severity are higher in older children (10 to 15 years), suggesting that the appetite for risk in this age group outweighs any benefits that might accrue from greater experience with the vehicles or developing co-ordination skills.

### *A1.6.1 A promising educational intervention technique for school use*

Quine *et al.* (2001) tested an intervention technique aimed to promote the use of safety helmets by young adolescents (11–15-year-olds). Previous intervention campaigns had had mixed, but generally low, levels of success. Quine *et al.* argued that a failing of many approaches was that they relied on a commonsense assumption that simply advising children of the risks associated with not wearing helmets would be sufficient to bring about changes in behaviour. As we stressed above, this assumption proved unduly optimistic.

In contrast, Quine *et al.* (2001) developed a strategy based on theories of the motivations of behaviour (especially, Ajzen's (1991) Theory of Planned Behaviour) and of belief modification (Petty and Cacioppo's (1986) Elaboration Likelihood Model of Persuasion). The Theory of Planned Behaviour holds that attitudes towards a behaviour and subjective norms determine intentions to perform the behaviour (see Section 4.1). Petty and Cacioppo propose that persuasive messages are more likely to be effective if they engage the recipients in cognitive elaboration of issue-relevant arguments. Hence, Quine *et al.* targeted behavioural beliefs and normative beliefs that had been identified in a previous study (Quine *et al.*, 1998) as important in the formulation of the intention to use a helmet and associate with actual helmet use. That is, the intervention was developmentally appropriate and tapped into the known reasoning processes of adolescents already performing the behaviour.

Participants in the intervention condition completed a series of tasks and discussions that involved elaborating reasons for using helmets; participants in a control condition focused on comparable tasks related to the advantages of taking cycling proficiency and maintenance course. Outcomes were assessed immediately after the intervention and again five months later. The behavioural, normative and control beliefs of the participants in the intervention group became more positive and the effect was maintained over time. Importantly, at the five-month follow-up, 12 (or

25%) of the intervention group had taken up helmet wearing, while none of the control participants had done so.

## A1.7 Media

The mass media are of obvious interest in relation to nurturing positive orientations towards road safety in pre-drivers. The media have the scope to reach enormous audiences. They are inherently popular modes of communication with the young. They have the potential to deliver positive images and messages with the benefit of professional expertise in effective delivery. Unfortunately, there is little evidence that they are being used as part of pre-driver education and only preliminary evidence speaks to their effectiveness.

We summarised research in Section 9 showing that the commercial media tend to serve the interests of road safety professionals rather poorly. As discussed, the impact of these representations on young viewers is not known and it is over-simplistic to assume a direct causal effect. However, a consequence of this concern is that it has led to various recommendations for change. For example, as Jacobsen *et al.* (2001, p. 1396) remark: 'Every time a character is shown in a moving vehicle without wearing a seat belt, an opportunity – however subtle – is missed to depict seat-belt use.' Similarly, Connor and Wesolowski (2004) recommend that: 'Savvy advocates of public health issues can work with local reporters and editors to translate theoretical journalistic concerns about the relevance of print media in contemporary life into concrete action in something as simple as including information on the factors that put teens at increased risk in their coverage of motor vehicle crashes involving young drivers' (p. 153). Ramsey *et al.* (2005) recommend that the movie industry could be encouraged to present positive images of road safety in children's movies by following nationally recommended safety behaviours.

It remains to be seen how responsive the media industry might be to these recommendations. Still more importantly, it is an empirical question whether the changes would lead to improvements in the knowledge, attitudes or behaviour of young audiences, and careful research is needed to evaluate the prospects for positive uses of the media in such ways. The available research, reviewed in previous sections of this report, can be drawn upon to inform and guide media-based interventions.

### *A1.7.1 Media and task difficulty*

In principle, interactive media provide one of the most promising widely available facilities in which to practise safety techniques in simulated conditions (Strecher *et al.*, 2007b). The potential applications of video games, for example, in pre-driver education are considerable. Video game play is very popular with children and adolescents, and, as noted above, can enhance spatial skills. Backlund *et al.* (2006) found that, among students (aged 18 to 31) attending driving schools, those who

played racing, action and sports video games regularly were rated by their instructors more highly on the capacity for divided attention, handling situations requiring quick decisions, overall driving skill and driving within safety margins. This was a small scale study and further research is needed to replicate the findings and to investigate their implications for pre-driver education.

### *A1.7.2 Media and personality*

Research has demonstrated correlations between certain personality characteristics and risky driving attitudes (Section 5). We stressed that personality is difficult to modify. Nevertheless, as Strecher *et al.* (2007a, p. 15) propose, even if personality traits are not amenable to externally-driven change, they can be an important dimension on which to refine our understanding of the targets for health communications messages.

One implication is that those who more likely to develop risky driving practices need to be targeted in particular ways. Research in other areas of adolescent risk-taking indicates that youths who score high on sensation seeking are more likely to pay attention, and change their behaviour in response, to interventions (such as media campaigns) that match their sensation-seeking orientations – for example, messages that are dramatic, emotionally arousing, fast-paced and suspenseful (D'Silva and Palmgreen, 2007; Palmgreen *et al.*, 2001; Stephenson, 2003).

### *A1.7.3 Media and norms*

Forward (2009) proposes that intervention strategies could usefully include attempts to modify young people's perceptions of what peer norms actually are. Her research (with adults) showed that drivers who intended to flout safety constraints regarded their behaviour as fairly normal or even likely to impress their friends. Research shows that perception of others' norms and behaviour can be inaccurate, and more in line with the violator's own reasoning and actions (Manstead *et al.*, 1992). Forward suggests that it would be desirable to undermine the cognitive accessibility of these assumptions: that is, to counter the belief that transgressions are normal or admirable by conveying the messages that most people drive with care and abhor antisocial driving behaviours. The basic idea is that, once people are alerted to the fact that their attitudes and behaviour may not be aligned with others', then they are ripe for further intervention to help them deal with the dissonance in positive ways.

Although Forward advocates targeting this strategy at young drivers, it is conceivable that work with pre-drivers could also contribute valuably. For example, interventions could be designed to convey to pre-driving teenagers that everyone uses a safety belt, that most people prefer to obey speed limits and to avoid drink driving, and that skills in defensive driving are admirable, etc. This is somewhat different from much traffic safety campaigning, which attempts to highlight the negative consequences of risk.

Harré *et al.* (2005) obtained evidence to indicate that exposure to fear-inducing anti-drink-driving advertisements led to heightened self-enhancement bias among young drivers (aged 16 to 29), especially males. The authors recommend that interventions are needed to reduce the self-enhancement bias in young males and to disassociate the image of risky-driving from masculinity. They suggest: 'Instead of the ideal male driver being able to handle a vehicle, the ideal male driver could be presented as responsible for the welfare of others' (p. 228). Similarly, Schmid Mast *et al.* (2008) recommend strategies which aim to bring about an uncoupling of masculinity and speeding, and suggest that 'advertisements of race drivers like Michael Schumacher making a point of driving slowly could accomplish such a goal' (p. 842). These suggestions raise the possibility that the media could be incorporated in attempts to shift perceptions of injunctive norms (see Section 4).

In the present state of our knowledge, it is not possible to provide a quantitative estimate of how effective media-based interventions could be. First and foremost, the relevant research appears to be in very short supply. Second, it is important to recognise that any media-based education and training would need to take into account: (a) possible iatrogenic effects (e.g. bringing to mind for some pre-drivers the possibility of engaging in dangerous practices); (b) competing effects from commercial media, which encourage reckless or antisocial driving; and (c) risks of instilling a level of confidence which does not prepare the pre-driver for actual road conditions.

Finally, we reiterate a point from Section 9, namely that a person's orientation towards driving is influenced by numerous variables and is likely to be multifaceted, ambivalent and sometimes self-contradictory. Hence, if media intervention is pitched at too general a level ('Be a safe driver'), it is unlikely to address the complexity of individuals' attitudes, beliefs, perceptions of threats and benefits, subjective norms, personalities, identities and habits. If it is pitched at a more specific dimension (e.g. aiming to modify perceptions of peer norms, or to adopt particular safety practice), then its effectiveness in respect of that target cannot be guaranteed to 'spread' to other dimensions. As with any other form of intervention, media strategies are not panaceas. However, they may be a valuable component of the wide-ranging task of nurturing safe driving commitments in young people.

## A1.8 Education and training of pre-drivers: summary

Education about safe road use needs to begin early in life, to be sustained in developmentally appropriate ways, and to involve more than just pre-drivers themselves. It would be inadequate simply to focus on attitudes and/or factual information because these alone do not reliably predict behaviour. It is already established that driver education is often ineffective, and sometimes counterproductive; work with pre-drivers needs to be aware of these challenges and to examine ways to address the preconditions of learning to drive. Reflecting the complexity of the developmental processes, educational and intervention strategies

need to be multifaceted, and to involve more than just pre-drivers themselves. Parents, peers, media and formal educational settings may all play important roles, and a range of evidence exists to inform educational strategies.

## A1.9 Policy implications

- There is no 'silver bullet' that will ensure the safe and responsible behaviour of all young drivers. Simply providing factual information about risk and safety will make minimal contributions. Concentrating on vehicle handling skills fails to address higher level factors that influence young people approaching the age of learning to drive.
- A more realistic aspiration is to develop broad ranging, but specific strategies that take into account the multiple influences on the development of young people's orientations towards driving.
- One overriding, and very challenging, task to which pre-driver education should contribute is the fostering of a safety culture with respect to road behaviour. At one end of the continuum of potential influences there is a need to enhance parental role modelling, especially in the crucial years of mid-adolescence and learning to drive, and to support parenting skills that could foster responsible attitudes and behaviour. At the other end is media representations and, in particular, the need to disassociate images of risky driving from masculine identity. The adolescent peer community, with its shared attitudes, values and practices, is also very important yet difficult to reach, but there is scope to enlist and enhance positive youth attitudes towards driving responsibly.
- Although there are broader contextual influences, schools can nonetheless play important roles in pre-driver education. Examples can be found of successful pre-driver education and related school interventions, as well as of effective techniques to engage student interest in safe road behaviour. Interactive media, extremely popular among young people, could be exploited in schools to support pre-driver education.
- Even more so than in other areas we have discussed in this report, there is a pressing need for research to inform educational interventions, implementation trials, and careful evaluation of short-, medium- and long-term outcomes. As Stradling *et al.* (2005) point out, there is widespread acceptance among politicians and the public of the desirability of road safety education.
- What is needed above all is an evidence-based advance in educational provision to prevent the tragic road toll that has prompted most of the research reviewed in this report.

# APPENDIX 2: Review methodology

A variety of constraints determined the nature of the methodology that had to be adopted for conducting the review:

- the relative paucity of directly relevant literature on the pre-driver period and its subsequent influences on young novice driver behaviour;
- the relatively large proportion of directly relevant material on pre-drivers and novice drivers that takes the form of 'grey' literature (project reports etc.) which is not readily amenable to computer-based searches in the same way as journal papers;
- the uncertain boundaries on indirectly relevant literature that might shed light on pre-driver influences by its consideration of analogous processes (e.g. work on adolescent risk-taking or health-related behaviours); and
- the variable nature and quality of both directly and indirectly relevant material, which ranged from qualitative reports of focus group sessions to systematic, controlled investigations – but all of which was capable of providing important insights.

All of these points meant that any attempt at an encyclopaedic systematic review was untenable: the process necessarily had to be open-ended and inductive in character, steered by the review team's existing knowledge of what relevant material might look like, and where it would be found. At the same time, it was obviously desirable to place some degree of structure on this process, in order to ensure that it was a genuine enquiry, rather than simply an exercise in articulating pre-existing impressions.

As indicated in Section 1.5, the following sequence was adopted to provide this structure:

1. The Strecher *et al.* (2007a) review of psychosocial predictors of driver behaviour and of potential pre-driver interventions to address these was taken as a point of departure. This was identified at an early stage of planning the review procedure as the most thorough previous attempt to identify aspects of driver behaviour where pre-driver influences might be at work, and thus in this sense it defined something of the areas where the review process ought to focus. At the same time, the pre-driver elements of that review were relatively lacking in detailed consideration, so it was important to: (a) subject the conclusions drawn to close scrutiny; and (b) be open to possible extensions beyond the processes it considered.
2. On this basis, seven types of factor were identified as a source of literature search terms in relation to both novice drivers and pre-drivers: attitudes, norms, perceived threats and benefits, personality, identity, task difficulty, and habit. To

these were added education and training, as clearly pertinent processes not specifically considered as such by Strecher *et al.* (2007a).

3. Computer-based searches were then conducted using variants of these terms. The full list of terms employed, and the databases searched, are shown in Table A2.1. Where hits were identified, the abstracts were obtained electronically, and scanned by at least one member of the review team for their relevance, potential importance and relative recency. Wherever possible, full copies were obtained of relevant papers (some papers were in sufficiently obscure journals that accessing copies within the three-month timeframe of the review process was not feasible). Again, these were then read by at least one member of the review team and digests were made of the content to feed into the drafting of the review itself.

4. In tandem with the process described in point 3, a wide-ranging consultation was undertaken with other experts in the field of driver behaviour, both in the UK and internationally, with the purpose of identifying relevant grey literature that had not been identified by the computer searches. Known databases of research reports (e.g. the Department for Transport Road User Safety Division's web repository; the corresponding site run by INRETS in France) were also scanned for relevant material. These less structured searches resulted in a range of further materials being identified. Again, wherever possible with the timeframe, full copies of these were obtained, and subjected to the same reading and summarising process as the journal papers.

5. At the stage of drafting the review itself, responsibility for considering material relating to each of the different areas identified at point 2 was divided up between members of the review team, according to their background interests and expertise. The general strategy agreed was to first summarise the findings in a given area relating to novice driver behaviour; and then to specify developmental issues that had either been established to be relevant, or which had clear potential to be so, drawing on both the pre-driver literature itself and the reviewers' knowledge of wider frameworks and parallel areas of developmental research. Where necessary, further targeted searches were made in relation to the latter, to identify specific sources of evidence. Since we were sensitive to evidence of shifts in processes and interactions between them over time, throughout this stage of drafting, greater weight was given to publications post-2000, though details from earlier publications were not discounted. One further issue that was considered carefully at this point was where to draw the boundaries of reporting in terms of age. It was decided not to impose any sharp cut-off, but to leave any relative emphasis to emerge from the review process itself. As noted in Section 1.3, this led, perhaps rather inevitably, to a predominant, but not exclusive, focus on mid-adolescence. Finally, in each area, possible policy implications were identified, both with regard to strategic direction of further research and methods of intervention during the pre-driver period.

6. As a last stage, a draft of the review underwent thorough scrutiny by two anonymous external reviewers, who identified some amount of additional relevant literature, and points of detail that ought to be included. The final version of the review was prepared on the basis of this feedback.

**Table A2.1: Search terms and databases used for online literature trawl**

| **Web of Science**<br>Search date: 11/03/08 | **psychINFO**<br>Search date: 11/03/08 | **OmniFile**<br>Search date: 12/03/08 |
|---|---|---|
| Children's concepts of driving | Concepts of driving (limit by age, 0–12) | Children's concepts of driving |
| Children's concepts of safety | Children driving safety rules | Children's concepts of safety |
| Children's concepts of road safety | Children driving safety rules – higher age limit | Children's concepts of road safety |
| Children's concepts of rules | | Children's concepts of rules |
| Children's concepts of regulations | Adolescents as passengers | Children's concepts of regulations |
| | Adolescents as role models | |
| Adolescent's concepts of driving | Adolescents drink driving | Adolescent's concepts of driving |
| Adolescent's concepts of safety | Adolescents and traffic | Adolescent's concepts of safety |
| Adolescent's concepts of road safety | Adolescents road use | Adolescent's concepts of road safety |
| Adolescent's concepts of rules | | Adolescent's concepts of rules |
| Adolescent's concepts of regulations | Social identity of drivers | Adolescent's concepts of regulations |
| | Social identity of motorists | |
| Adolescents as passengers | | Adolescents as passengers |
| Adolescents as role models | Video games and driving | Adolescents as role models |
| Adolescents drink driving | Media and driving | Adolescents drink driving |
| Adolescents and traffic | Media and road safety | Adolescents and traffic |
| Adolescents road use | | Adolescents road use |
| Social identity of drivers | | Social identity of drivers |
| Social identity of motorists | | Social identity of motorists |
| Video games and driving | | Video games and driving |
| Media and driving | | Media and driving |
| Media and road safety | | Media and road safety |