Road Safety Research Report

Pre-driver Education: A Critical Review of the Literature on Attitude Change and Development, Good Practice in Pre-driver Education and Programme Effectiveness

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EXECUTIVE SUMMARY

Background

In November 2005, Air Affairs (UK) Limited commenced a nine-month study aimed at defining good practice in pre-driver education. The impetus for the work was the recognition that 'it is important to understand when attitudes and beliefs about driving, riding and being a passenger develop, whether they can be influenced and, if so, how and by whom can this be done effectively'.[1]

> **Study definition of pre-driver education**[2]
> Pre-driver education is used to refer to a programme of instruction intended to inform the development of attitudes and beliefs ultimately related to driving that is aimed at students who have not yet obtained a provisional drivers licence.

The study objectives are summarised in Table 1.

Table 1: Set of pre-driver education study objectives as defined by the Department for Transport	
Ref.	**Description of study objectives**
1a	Identify when and how children and young people develop their attitudes and beliefs to driving, riding and being a passenger, and how these are related to their driving behaviour
1b	Ascertain whether children and young people can be influenced to have more positive attitudes to being a driver, rider or passenger of a motor vehicle. Identify how they can be influenced, by whom and how this can be measured
1c	Recommend the aims and objectives, content and delivery mechanisms (e.g. school, home professionals, parents, peers) of effective pre-driver road safety education
1d	By reviewing national and international provision, identify good practice and innovation
1e	Assess how effective current programmes are and how this is measured (Performance Indicators)
1f	Identify gaps in existing knowledge and research
1g	To record and assess the current provision of pre-driver education schemes in the UK
1h	Establish the effectiveness of pre-driver education
1i	Produce, evidence-based good practice guidance on pre-driver education

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1   Research Project Specification, Department for Transport, Road Safety Division

2   In the first instance, the definition was broad and included all driver education, prior to achieving a full licence. During the early months of the project, this definition was re-focussed to exclude education received following the receipt of a provisional licence.

Purpose of this report

The purpose of this report is to provide a self-contained copy of the critical review of the fundamental and applied literature on attitude development and change, good practice in pre-driver education provision and evaluation.

Literature Review

Over a two-month period, the study team collected and reviewed 189 papers and contacted key researchers within national and international academic establishments. The initial development of a set of 23 research questions, linked to the study objectives, ensured that this process remained focused.

Attitude development

The review of literature on definitions and models of attitudes established that there is no universally accepted definition of the term 'attitude'. In addition, models of the relationship between an individual's attitude and demonstrated behaviour illustrated the complexity of this relationship and the range of factors that can influence it. Some evidence for the relationship between attitudes and behaviours was found for young drivers, but not for pre-drivers.

Only a few studies investigating the specific influence of moderating factors on the relationship between children's and young peoples' attitudes and beliefs to driving, riding and being a passenger and, ultimately, driving behaviour were identified. Information from other studies could be used to develop a list of potential moderating factors for validation.

The review demonstrated that young people appear to have relatively well-developed attitudes towards driving, riding and being a passenger. Attitudes towards driving are present in children as young as 11 years old.[3]

The review of theoretical literature revealed that a range of factors can influence how and when attitudes develop. One of the main theories that provided information about attitude development was Kohlberg's Theory of Moral Development (Kohlberg, 1969). This suggests that many adolescents may be at Moral Development Level 3. This level is often characterised by a need to please others (which in adolescence is likely to involve peer groups). A tentative conclusion is that pre-driver interventions involving other young people (e.g. peer-peer interventions) may prove successful. In general, a comprehensive understanding of those factors influencing the development of both the strength and direction of an individual's attitudes towards driving, riding and being a passenger is relevant to the development of appropriate types of pre-driver education interventions is required.

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3   It is anticipated that attitudes towards driving are present at an earlier age, however supporting evidence was not identified.

The review identified information about the influence of parents on the attitudes of young people. Interventions that address the attitudes of parents as well as young people towards road safety may prove effective.

The review concluded that gender, per se, does appear to have an influence on the attitudes held by pre-drivers towards road safety in general and driving in particular. However, additional research is required to confirm the relationship between age and attitudes towards driving, riding and being a passenger.

The literature review identified a complex set of factors that may influence the relationship between attitudes and behaviour. An identification of the key influences that pre-driver education can and should address is a key challenge to this project. While it is important that the industry understands the complexity of the attitude-behaviour relationship, there is a need to ensure that this issue does not result in inaction. A 'Good Practice Guide to Pre-driver Education' should address this issue.

Attitude change

The theoretical literature on persuasion provides a significant source of information relating to the process of attitude change (e.g. Elaboration Likelihood Model (ELM)) and potential factors influencing the success of an education intervention. Guidance provided by this information, albeit developed from non-driver-related research, is useful and should inform the content and delivery mechanisms of pre-driver education courses. Furthermore, this literature supports the need to understand the specific preferences, experiences and learning styles of the target audience and to adapt course content and delivery accordingly.

The strength of the persuasive argument and other peripheral factors, such as the credibility of the communicator and the audience reaction, can influence attitude change. Accordingly, the mode of delivery, in addition to traditional factors such as course content, should be analysed when designing pre-driver education programmes.

No reliable information on the influence of age, per se, on persuasability, was available. However, Moral Development Theory (Kohlberg, 1969) provides some indications as to the kinds of messages that might prove effective with different age groups. For example, young children may be more likely to be persuaded by 'you must follow the rules or you'll get into trouble' type messages.

The study emphasised the importance of developing valid and reliable methods to assess 'attitudes'. While this may appear intuitive, it is important to ensure that practical guidance on how to develop and implement these measures is provided as part of the guide to good practice in pre-driver education.

The study established that attitude change initiatives in the road transport environment are often unsuccessful. As a result, the research community has raised questions about the validity of attitude change initiatives. However, this review identified a range of methodological issues with evaluations of attitude change programmes in the road transport environment. On this basis, the effectiveness of attitude change programmes is not yet established.

The study established support for the involvement of peers in attitude change initiatives in the road transport environment. Providing feedback about actual peer behaviour is effective, for example only a very small percentage of teenagers actually drink and drive, most do not. This finding supports earlier conclusions based on Kohlberg's Theory of Moral Development.

Road transport based attitude change initiatives are more successful when they include active participation and discussion, the use of personal experiences and reflective thinking. These findings are consistent with the general literature on factors influencing the effectiveness of persuasive communication. Moreover, these findings provide some support for the use of this literature to inform the development of a draft 'Good Practice Guide to Pre-driver Education'.

Knowledge gaps

The knowledge gaps reported in the following sections are based on the findings of the literature review.

Definition of the output standard

The literature review failed to identify any analyses of 'ideal' driver behaviour, or target KSA (Knowledge, Skills and Attitudes).[4] This represents a significant gap because without a comprehensive understanding of the types of attitudes young people are required to have to support safe road-user behaviour, it is difficult to recommend the content of a pre-driver education intervention.

Specific attitudes held by young people

The literature review indicated that young people hold relatively well-formed attitudes towards driving, riding and being a passenger. However, information about what **specific** attitudes are held by young people on a range of road safety issues is relatively limited. This information is essential to the identification and targeting of 'undesirable' attitudes by interventions. A survey of the specific attitudes held by

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4   It is noteworthy that the Military Training Needs Analyses process, at least, involves an identification of a target set of favourable attitudes in consultation with Subject Matter Experts (e.g. Instructors, senior personnel). It is recommended that consultation with suitable qualified personnel should be undertaken to determine a target set of attitudes.

young people towards driving, riding and being a passenger should be undertaken. It is essential that this survey adopt a multidimensional approach to attitude research, building on the components of the Theory of Planned Behaviour (TPB).

Time required to change an attitude

The theoretical literature did not provide any guidance on how long it takes to change an attitude.[5] Research to investigate this issue and, importantly, those factors influencing the deterioration in desirable beliefs and attitudes towards road safety is recommended.

Transfer of information from a non-road transport environment

The literature review identified a useful body of literature on factors influencing the effectiveness of persuasive communication, particularly within health research. Unfortunately, no studies were identified which investigated the applicability of this information to pre-driver education. In addition, no criteria[6] exist for determining the validity of this literature to the pre-driver education area; this represents an important methodological gap. Guidance on the appropriate use of findings from other application areas to inform the content of effective pre-driver education interventions is required.

Age and the effectiveness of persuasive communications

The literature did not provide any information on the direct relationship between age and the effectiveness of persuasive communications – Professor Daniel O'Keefe within the Department of Communications at the North-western University (USA) supported this finding (Air Affairs, Personal Communication, 10/02/06, refer p 25). Research to determine the influence of age on the content, style and delivery of persuasive communications is required.

Factors influencing attitude retention

An understanding of those factors influencing attitude retention is fundamental to the development of guidance on course design and delivery and policy relating to the need for pre-driver education to 'refresh' the target audience. Research on skill decay has not investigated the proneness to deterioration of behavioural predictors (e.g. intentions, beliefs, attitudes towards the behaviour). This line of enquiry is a significant gap in understanding and relevant to the requirements of the current study, as this knowledge would underpin any recommendations for the frequency of

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5 This knowledge gap reflects the general lack of longitudinal studies undertaken to investigate the effectiveness of training and education interventions.

6 Researchers have made inappropriate analogies between sectors as demonstrated when comparing the work of railway signallers and air traffic controllers.

refresher training for pre-drivers. Further investigation of those factors influencing the retention of favourable intentions, beliefs and attitudes towards driving, riding and being a passenger should be undertaken. This information will also support the identification of appropriate re-assessment intervals to be used in longitudinal studies of pre-driver education effectiveness.

Comprehensive analysis of interventions

The methodological problems identified in many of the evaluations of pre-driver education mean that it is difficult to draw any clear conclusions about the effectiveness of the interventions. Further, more comprehensive evaluations are required to assess, confidently, the effectiveness of pre-driver education. Attitudinal models that have been applied or operationalised should underpin these evaluations. The 'Guide to Good Practice in Pre-driver Education' should cover how to conduct a valid assessment of a programme's effectiveness.

Pre-driver education within an educational pipeline

While situating a pre-driver education programme within a road safety-learning pipeline makes sense, no empirical studies to support this position were identified. Research to provide evidence for the positive affect of prior knowledge gained by attending an intervention on the subsequent effectiveness of pre-driver education programmes is required. This work would benefit particularly from the findings of research on factors influencing the retention of favourable attitudes towards driving, riding and being a passenger.

Validation of good practice in pre-driver education

Given the methodological limitations of many of the pre-driver education evaluations reviewed and the theoretical nature of some of the literature, any good practice guidance developed will require validation. This action will ensure that stakeholders are confident that any guidance and change required is both necessary and appropriate.

Industry-accepted definition of pre-driver education

There is no industry-accepted definition for pre-driver education and, as a result, the project developed a working definition. A variation in the perceived scope of pre-driver education across road safety teams is a potential risk to the successful implementation of guidance on good practice in pre-driver education. Strategies for mitigating this risk should be identified in consultation with the Department for Transport.

1 LITERATURE REVIEW – METHOD

1.1 Introduction

The objective was to undertake a critical review of the fundamental and applied literature on attitude development and change, good practice in pre-driver education provision and evaluation. The review was constrained by developing a set of 23 research questions (see Table 1.1).

Table 1.1: List of research objectives and associated research questions to be addressed by the literature review	
Description of research objective and associated research questions (RQ)	**Section reference**
Attitude development – Identify when and how children and young people develop their attitudes and beliefs to driving, riding and being a passenger and how these are related to their driving behaviour **(Objective 1a)**	2.1
RQ1 – What is an attitude?	2.1.1
RQ2 – How do attitudes develop?	2.1.2
RQ3 – How do attitudes relate to behaviour?	2.1.3
RQ4 – What factors influence how attitudes develop?	2.1.4
RQ5 – What defines effective driving behaviour?	2.1.5
RQ6 – What are good attitudes to driving?	2.1.6
RQ7 – What attitudes do young people have about driving, riding and being a passenger?	2.1.7
RQ8 – When and how do young people develop attitudes about driving, riding and being a passenger?	2.1.8
RQ9 – Are there any unsafe driving behaviours (e.g. speeding) where young people are known to be over-represented?	2.1.9
RQ10 – Is there evidence about how young drivers' attitudes influence their behaviour?	2.1.10
Attitude change – Ascertain whether children and young people can be influenced to have more positive attitudes to being a driver, rider or passenger of a motor vehicle. Identify how they can be influenced, by whom and how this can be measured **(Objective 1b)**	2.2
RQ11 – Can attitudes be changed?	2.2.1
RQ12 – What factors enable and inhibit attitude change?	2.2.2
RQ13 – How long does it take to change an attitude?	2.2.3
RQ14 – How long is attitude change maintained?	2.2.4
RQ15 – What types of interventions have been used to promote attitude change?	2.2.5
RQ16 – How is attitude change measured?	2.2.6
RQ17 – Have any road transport based attitude change initiatives proved successful?	2.2.7
Good practice and innovation in pre-driver education – By reviewing national and international provision, identify good practice and innovation in pre-driver education **(Objective 1d)**	2.3
RQ18 – What is the evidence that pre-driver education has been effective or ineffective?	2.3.1
RQ19 – What features of pre-driver education schemes have been identified as particularly effective (e.g. timing of delivery content, etc.)?	2.3.2
RQ20 – Does road safety related education prior to the commencement of a pre-driver education course influence the effectiveness of the course?	2.3.3
Pre-driver education programme effectiveness – Assess how effective current programmes are and how this is measured **(Objective 1e)**	2.4
RQ21 – How is the effectiveness of pre-driver education typically measured?	2.4.1
RQ22 – What are the existing gaps in knowledge?	2.4.2
RQ23 – What factors enable or inhibit the expression of a road safety attitude as behaviour?	2.4.3

As part of this activity, a 'working' definition of pre-driver education was defined in consultation with the Department for Transport. In the first instance, this definition was broad and included all driver education, prior to achieving a full licence. During the early months of the project, this definition was re-focussed to exclude education received following the receipt of a provisional licence.

> **Study definition of pre-driver education**
> Pre-driver education is used to refer to a programme of instruction intended to inform the development of attitudes and beliefs ultimately related to driving that is aimed at students who have not yet obtained a provisional drivers licence.

1.1.1 Information gathering

Information gathering involved a general internet search as well as specific searches on the following websites:

- AA Foundation (UK);

- Monash University Accident Research Centre (Australia);

- Road Safety Scotland;

- Transport Research Laboratory (TRL) UK; and

- University of Michigan Transport Research Institute (UMTRI) library (USA).

The following individuals/organisations were contacted and asked whether they had undertaken, or were currently undertaking, any research relevant to this study:

- United Kingdom:
  - Psychology Department, University of Reading (Professor F. McKenna);
  - Transport Research Institute, Napier University (Dr S. Stradling);
  - Royal Society for the Prevent of Accidents (RoSPA); and
  - Psychology Department, Strathclyde University (Dr A. Tolmie).

- Australia/Pacific Region:
  - Accident Research Centre, Monash University (Dr N. Haworth);
  - NRMA Insurance (NRMA-ACT Road Safety Trust);
  - Australian state governments (New South Wales, Tasmania, Melbourne);
  - Injury Research Centre, University of Western Australia;
  - Road Aware Programme, Western Australia;
  - New Zealand Ministry of Transport; and
  - Psychology Department, University of Auckland, New Zealand (Dr N. Harre).

- Europe:
  - Trinity College, Dublin (Dr R. Fuller);
  - Swedish National Road and Transport Research Institute;

- European Transport Safety Council;
- French Road Safety Institute; and
- Institute for Road Safety Research (Netherlands).

- United States/Canada:
  - AAA Foundation for Traffic Safety (USA);
  - American Driver and Traffic Safety Education Association;
  - National Highway Traffic Safety Administration (USA);
  - Insurance Institute for Highway Safety (USA);
  - Pennsylvania Department for Transport;
  - University of North Carolina, Highway Safety Research Centre;
  - University of Michigan Transport Research Institute (UMTRI);
  - Traffic Injury Research Foundation of Canada; and
  - North-western University, Department of Communication Studies.

The study team reviewed 189 papers including literature reviews, discussion papers, observational studies, surveys and intervention studies.

1.1.2 Information management

- **Literature review bibliography (see Section 3)**. This database recorded the details of papers and reports collected during the information gathering process. The following information was held in the database:
  - ID number;
  - reference (author, year, name, and source);
  - file name;
  - review status; and
  - citation status.

- **Evidence statements database (see Appendix 1).** This database provided a store for evidence statements gathered during the review of the literature. The following information was held in the database:
  - research objective;
  - question reference and research question (RQ);
  - evidence statement (developed during the review of the document);
  - literature source/reference;
  - whether the information presented in the document was from a primary or secondary source;
  - literature type (e.g. theoretical research, pre-driver education research);
  - study abstract; and
  - a review of the strength of the evidence (methodological critique).

All documents held in the literature review bibliography were reviewed. Following the identification of a relevant piece of information, an evidence statement was developed and placed in the evidence statements database (see Appendix 1).

1.1.3 Analysis of evidence statements

The strength of the evidence statements collected were analysed by the study team using the following three categories:

- **Strong evidence** – the study used a strong research design, which controlled for external variables and bias. The results have been replicated and/or supported by other studies.

- **Reasonable evidence** – the study used a good research design, but included some design weaknesses and did not adequately control for bias. The results have received mixed support when replicated by other studies.

- **Poor evidence** – the study did not use a robust research design to account for external variables or bias and the results have not been replicated by other studies.

The evidence statements relating to each research question were then analysed to draw conclusions from the research and to establish evidence for the effectiveness of pre-driver education.

2   LITERATURE REVIEW – FINDINGS

2.1   Attitude development

> **Research Objective 1a**
>
> Identify when and how children and young people develop their attitudes and beliefs to driving, riding and being a passenger and how these are related to their driving behaviour.

2.1.1   RQ1 – What is an attitude?

Numerous definitions of the term 'attitude' exist, which means that there is a risk that pre-driver education programmes, which are designed to foster appropriate attitudes towards safety, may not start from the same premise or operationalise the term in a consistent way. An industry-accepted definition of the term and, importantly, an agreement on its scope is important to enable the development, delivery and assessment of education programmes that are valid and effective.

This study has adopted the following 'working' definition[7] of the term:

> 'An attitude is the evaluative reaction, either favourably or unfavourably disposed towards something or someone. It is exhibited in one's beliefs, feelings or intended behaviour.' (Millward, 1996)

Studies of attitudes towards safety, and the efficacy of popular models such as the Theory of Planned Behaviour (TPB), as an explanation of the relationship between attitudes, intentions and subsequent behaviour in the road safety context are reported extensively within the literature. Evidence of the specific application of the TPB, or any other attitudinal model, to the study of pre-driver education effectiveness is limited (Carcary, 2001). This represents a clear knowledge gap. While a detailed 'theoretical' review of attitude definitions and models is beyond the scope of this report, a brief consideration is worthwhile to ensure that the reader has a working knowledge of the subject.

Example definitions of the term 'attitude' are as follows:

- 'The sum total of a man's inclinations and feelings, prejudice and bias, preconceived notions, ideas, fears, threats, and convictions about any specified topic' (Mueller, 1986).

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7   However, this definition will not be used as a way of discounting pre-driver education programmes from analysis in phase 1 of the study.

- 'A mental and neural state of readiness organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations, which it is related' (Allport, 1935).

- 'A psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour' (Eagly and Chaiken, 1993)

- 'A learned association in memory between an object and a positive or negative evaluation of the object, attitude strength is equivalent to the strength of this association' (Fazio, 1990).

Ajzen (2005) notes that 'although, formal definitions of attitude vary, most contemporary social psychologists agree that the characteristic attribute of attitude is its evaluative (pro-con, pleasant-unpleasant) nature'. In discussing the similarities and differences between attitudes and personality, Ajzen (2005) notes that attitudinal responses are evaluative and directed at a given object or target (a person, institution, policy or event). In contrast, personality traits are not necessarily evaluative. They describe response tendencies in a given domain (e.g. the tendency to respond in a conscientious manner, to be sociable). In addition, attitudes are easier to influence than personality traits.

Attitude is a hypothetical construct, similar to personality, workload and stress, which cannot be observed directly and should be inferred from cognitive, affective and conative responses. The types of verbal and nonverbal responses associated with these categories are summarised in Table 2.1.

Table 2.1: Responses used to infer attitudes (adapted from Ajzen, 2005)			
Response mode	**Attitude object: driving, riding and being a passenger**		
	Response category		
	Cognition (TPB: belief)	**Affect (TPB: attitude)**	**Conation (TPB: behaviour)**
Verbal	Expression of beliefs, perceptions of and thoughts about attitude object	Expressions of feelings towards attitude object	Expression of behavioural inclinations, intentions, commitments and actions with respect to the attitude object
Non-verbal	Perceptual reactions to attitude object	Physiological reactions to attitude object	Overt behaviours with respect to attitude object

The TPB considers the three types of response categories – cognition, affect and conation – as independent constructs termed belief, attitude and intention (see Table 2.1).

2.1.2 RQ2 – How do attitudes develop?

Zimbardo and Ebbesen (1969; cited in Eby and Molnar, 1998) commented that, although attitudes tend to represent reasonably stable attributes, they do appear to be learned rather than innate. Therefore, available research on attitudinal development should be taken into account when developing attitude change initiatives (such as pre-driver education programmes). The following section provides a summary of literature gathered on attitude development throughout the critical literature review.

Eby and Molnar (1998) provide a summary of factors that influence how attitudes develop, noting the following influences:

- operant conditioning (positive reinforcement or punishment);

- classical conditioning (learning through association, for example pairing one stimulus with another); and

- social learning and observation (Social Learning Theory).

The literature review showed that a range of factors could influence attitude formation. However, the issue of when attitudes develop, particularly in relation to childhood development, has not been widely studied. The theory of moral development developed by Kohlberg (1969) does provide some insight into this area. This theory expanded on an earlier theory of childhood development developed by Piaget (1929).

Kohlberg identified three levels of moral development with two stages in each:

- Preconventional:
  - Stage 1: Punishment/Obedience – children are concerned with avoiding punishment.
  - Stage 2: Individualism – children are concerned with meeting their own needs (this stage fits into the framework of young children up to the age of 10 years).

- Conventional:
  - Stage 3: Interpersonal Conformity – children are more concerned with living up to the expectation of others.
  - Stage 4: Social System and Conscience – morality based on the belief that it is important to obey laws and social conventions because of their importance in maintaining a functioning society (this stage of the framework is typical of adolescents and adults).

- Postconventional:
    - Stage 5: Social Contract and Individual Rights – individuals govern their behaviour based on the values and opinions of the groups with which they live and interact.
    - Stage 6: Universal/Ethical Principles – individuals govern their behaviour based on the validity of universal moral principles.

This model has some implications for how young people might develop attitudes and beliefs towards road safety. Very young children (less than 10 years) might believe that it is important to obey road rules because you will get into trouble (Stage 1). However, adolescents and adults might believe that it is important to obey road rules because they ensure that the road transport system runs smoothly and that risk is reduced for all road users (Stage 4). Interestingly, some commentators argue that Stage 3 is characterised by a need to please, help or conform to the benefit of the group. Given that in early to mid adolescence, teenagers often align themselves more strongly with their peers than adult figures, this need to please might manifest itself as a tendency to conform to a peer group rather than authority figures.

2.1.3   RQ3 – How do attitudes relate to behaviour?

The question of how attitudes relate to behaviour is clearly of considerable interest to those involved in the development of intervention programmes and the targeting of groups most at risk. Two models, which attempt to explain the relationship between attitudes and behaviour, are outlined to support the discussion of the literature on attitude change and persuasion:

- the Theory of Planned Behaviour developed by Icek Ajzen (1985, 1991);

- the MODE model (Fazio, 1986)

2.1.3.1 Theory of Planned Behaviour

The TPB is a development of the theory of reasoned action and one of the most cited theories within the driver behaviour literature. It attempts to explain the relationship between people's beliefs, attitudes and behaviour. Figure 2.1 provides a schematic of this model.

Figure 2.1: Theory of Planned Behaviour[8]
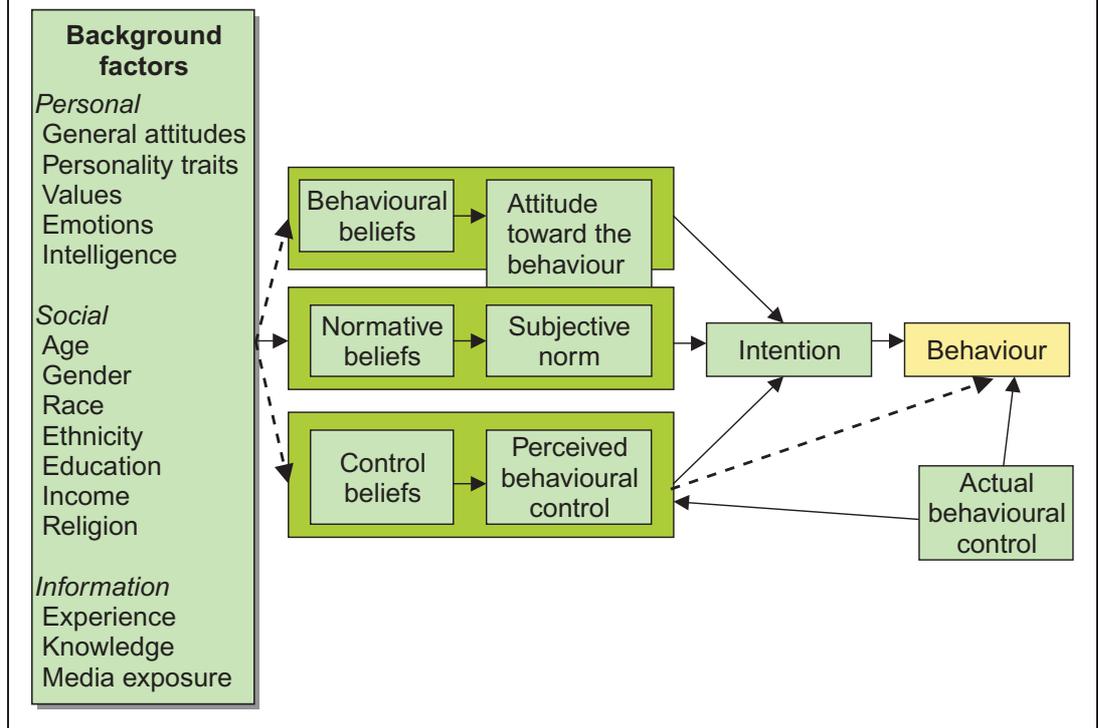
According to this model, the following types of beliefs guide action or behaviour:

- behavioural beliefs – the individual's beliefs about the potential effects of their behaviour;

- normative beliefs – the individual's beliefs about the normative expectations of others and their motivation to comply with these expectations;

- control beliefs – the individual's beliefs about the presence of factors that may facilitate, or impede, performance of the behaviour and the perceived power of these factors.

Within their respective categories, behavioural beliefs result in a favourable or unfavourable attitude towards the behaviour, normative beliefs result in perceived social pressure or subjective norms, and control beliefs result in perceived behavioural control.

Taken together, the attitude towards the behaviour, subjective norm and perception of behavioural control result in the development of a behavioural intention. Ajzen (2002a) notes that 'as a general rule, the more favourable the attitude and subjective norm and the greater the perceived control, the stronger should be the person's intention to perform the behaviour in question'.

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8   This figure includes examples of background factors which may influence the relationship between attitudes and behaviour (Azjen, 2002, 2005).

Given that intentions are good predictors of specific behaviours, they have become a critical part of many contemporary theories of human social behaviour (Ajzen, 2005b)[9] For example:

- Social Cognitive Theory

- Health Belief Model

- Information-Motivation-Behavioural Skills Model

- Theory of Interpersonal Relations and Subjective Culture

- Theory of Trying

- Prototype/Willingness Model

Given a sufficient degree of actual behavioural control, there is an expectation that people will carry out their intentions when the opportunity arises. In this case, intention is an indication of a person's readiness to perform a given behaviour and is the immediate precursor to behaviour. The TPB defines behaviour as the manifest, observable response in a given **situation** with respect to a given **target**. It is noted that 'single behavioural observations can be combined across contexts and times to produce a more broadly representative measure of behaviour' (Ajzen, 2002a) and this is termed behavioural aggregation.

A consideration of perceived behavioural control is useful where the behaviour under investigation is difficult to execute and, in turn, may affect the individual's degree of voluntary control. Perceived behavioural control is an indicator of actual control and, in turn, contributes to the prediction of the behaviour under investigation.

The relative importance of the components – attitude, subjective norms and perceived behavioural control – to the prediction of behaviour may vary according to the particular behaviour and the population under consideration (Ajzen and Fishbein, 2005). Expanding on this issue, the model highlights the influence of background factors, notably individual, social and information factors on the **direction**[10] of a person's beliefs, attitudes, intentions and ultimately behaviour. For example, differences in parental attitudes towards enrolling their child on to a cycling proficiency course, which is being held at their local school, may be partly explained by parental experience of attending a cycling proficiency course as a child (prior experience) and perceived worth of such courses (education).

While a range of moderating factors have been identified by the literature, no studies investigating the **specific** influence of moderating factors on the relationship

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9   Cited by Ajzen and Fishbein (2005), pp. 173–221.

10   The literature refers to direction as 'valence' and should not be confused with the
       strength of the attitude-behavioural relationship.

between children's and young people's attitudes and beliefs to driving, riding and being a passenger and, ultimately, driving behaviour were identified. Mindful of this limitation, information from other studies does, however, support the development of a **potential** set of moderating factors for validation.

The literature also considers factors that may influence the **strength** of the attitude-behaviour relationship, including the following:

- **Private self-consciousness.** Chronic awareness of one's own feelings, motives and values. People high in private self-consciousness are assumed, across situations, to behave more in accordance with their dispositions than people who score low on this trait.

- **Need for cognition.** Individuals who form their attitudes after carefully scrutinizing available evidence, i.e. have a greater need for cognition and demonstrate stronger attitude-behaviour correlations than individuals who base their attitudes on relatively superficial external cues.

- **Internal structure of the attitude.** While inconclusive, there is a suggestion that consistency in cognitive and affective responses to an attitude object improves behavioural prediction.

- **Reflection and accessibility**. The extent to which attitudes are expressed after sufficient reflection. Thinking about an attitudinal issue can make the attitude more readily accessible in memory and thereby influence its predictive ability.

- **Vested interest, involvement and importance.** An individual is more likely to act on their attitudes if they have a vested interest/involvement in the behaviour and if they assign a high importance to the behaviour.

- **Confidence.** The greater the degree of expressed confidence in an attitudinal position, the greater the correspondence between the attitude and the behaviour.

- **Direct experience.** The prediction of behaviour from attitudes improves to the extent that the attitude is based on direct experience. For example, it is postulated that attitudes toward participating in a pre-driver education programme may be influenced by previous experience of participating in road safety education schemes.

The relationship between the TPB components and the behavioural outcome is also influenced by the compatibility between the expression of the behaviour and the other TPB components. Ajzen (2002a) notes that the behaviour under investigation should be defined in terms of its Target, Action, Context and Time (TACT) elements. An example of a behavioural description might be 'wearing (Action) reflective armbands (Target) when walking to and from school (Context), each day for a month (Time)'. In accordance with the principle of compatibility, all other constructs (attitude towards the behaviour, subjective norms, perceived behavioural control and intention) should be defined in terms of exactly the same TACT

elements to maximise the prediction of the behavioural outcome. For example, the attitude compatible with the behaviour previously described is the attitude towards 'wearing reflective armbands when walking to and from school, each day for a month'. The subjective norm is the perceived pressure to do so, perceived behavioural control refers to control over performing the defined behaviour and to complete the evaluation, intention to perform the specific behaviour should also be investigated.

The measurement of attitude change will be considered in further detail in Section 2.2.6, however it is worth noting that it is possible to increase the generality of one or more elements (Target, Action, Context and/or Time) and maintain compatibility between the TPB components. With respect to the previous example, there may be a requirement to observe the behaviour in a variety of pre-defined contexts, for example when walking to the shops, a youth club, to and from a friend's home. To obtain a general measure of the behaviour in this example, it would be necessary to define the contexts of interest, record the demonstration of the behaviour within these contexts and then **aggregate** observations across contexts. Similarly, there may be a requirement to determine general attitudes towards wearing reflective clothing. Once again, it is necessary to define the types of clothing under consideration, assess attitudes towards specific types of clothing and then create an aggregate score; this score then constitutes the 'general' attitude. This is in contrast to simply asking respondents about their attitudes towards 'reflective clothing', which is ambiguous and open to response bias, i.e. responses may be influenced by a recent and isolated experience.

2.1.3.2 The MODE model

The TPB emphasises the prediction of behaviour from attitudes towards the behaviour, intentions, subjective norms and perceived behavioural control. In contrast, the MODE model developed by Fazio (1986) describes the processes underlying the prediction of behaviour from **general** attitudes towards the object. It also provides an explanation for the correspondence between attitude strength and behaviour, where weaknesses in the relationship between general attitudes and specific behaviours are explained by weak attitudes.

This model is presented at Figure 2.2 and described in the paragraphs that follow.

The MODE model is based on the assumption that general attitudes can influence or bias the perception and judgements of new information that is relevant to the attitude object, for example road safety. The bias is consistent with the positive or negative nature of the general attitude. Thus, people with positive attitudes towards the introduction of speed cameras may evaluate new information on the effectiveness of speed cameras as favouring this intervention, whereas people with negative attitudes may evaluate the **same information** as evidence against their implementation. However, the attitude must first be activated for this bias to occur.

Figure 2.2: The MODE model
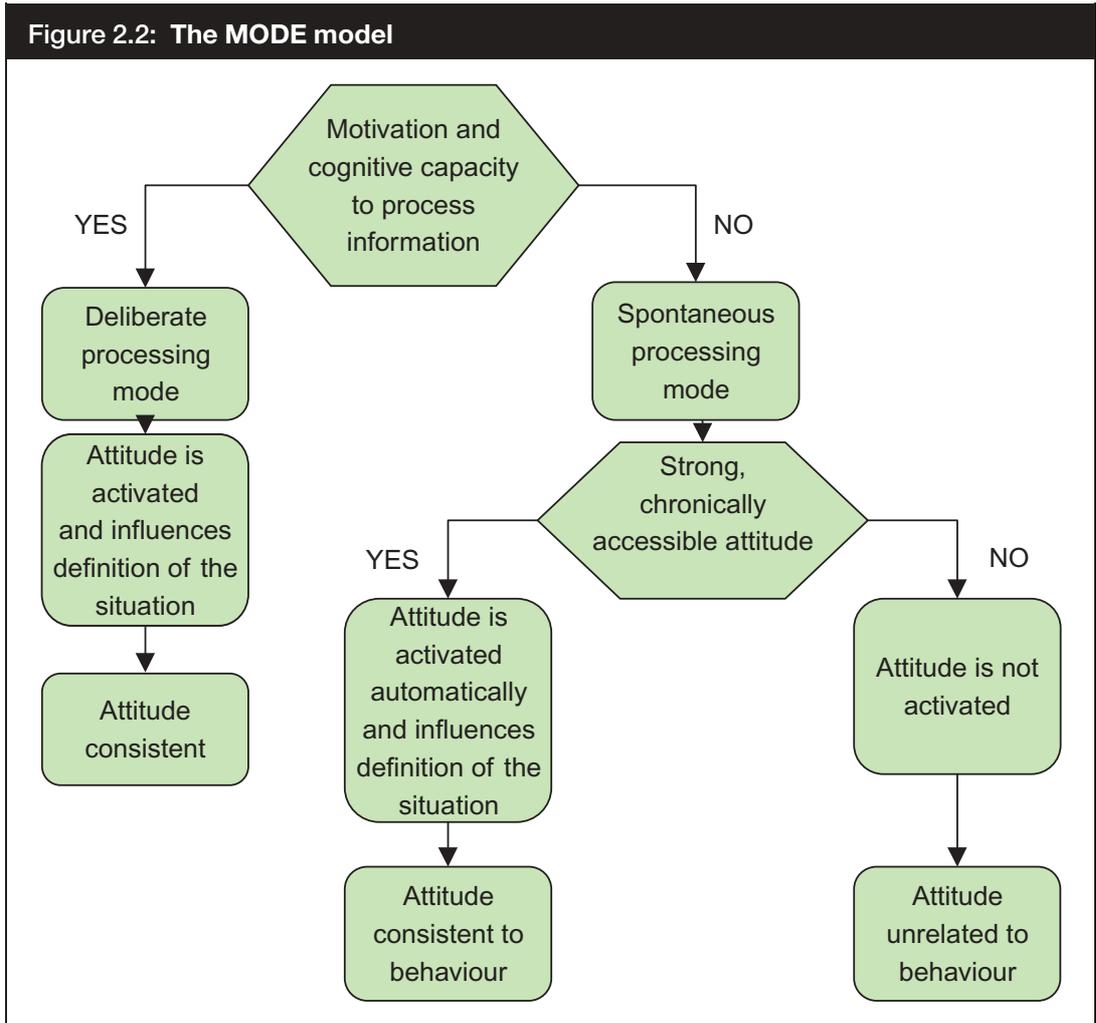
According to this model, when individuals are motivated and have sufficient cognitive capacity, attitudes may be activated deliberately (controlled). In contrast, when motivation and cognitive capacity is low, then attitudes are constructed spontaneously (automatically). However, the automatic or spontaneous activation of attitudes is only possible for strong attitudes. Weak attitudes are not typically activated in the spontaneous processing mode and will therefore not be available to bias the definition of the situation, or to guide the behaviour. It is argued that, in this situation, behaviour is determined by attitude-irrelevant salient cues associated with the attitude object or the behavioural situation.

The logic of the MODE model is relevant to an explanation of factors influencing attitude change and persuasion.

2.1.4 RQ4 – What factors influence how attitudes develop?

This question is addressed by the information reported at RQs 2, 3 and 8 (Sections 2.1.2, 2.1.3 and 2.1.8, respectively).

2.1.5 RQ5 – What defines effective driving behaviour?

A detailed understanding of what constitutes effective driving behaviour is a key requirement when designing a pre-driver education programme. Driving behaviour is, in effect, an expression of the driving attitudes held by an individual. Within a Training Needs Analysis (TNA), a thorough analysis of behaviours required for effective performance is conducted. This information underpins further analysis to identify the knowledge, skills and attitudes (KSA) which support the desired behaviours. The Task and KSA analyses provide a sound basis from which to design a training programme by identifying the behaviours, knowledge, skills and attitudes required for effective performance. In the context of pre-driver education, this analysis could provide a set of 'target' attitudes that pre-driver education courses should address. Therefore, the aim of this research question was to identify existing research describing effective driving behaviour.

A review of existing literature on effective driving behaviour showed that researchers have long expressed concern about the lack of a comprehensive analysis of the driving task (Drummond, 1989; Horneman, 1993; Loreno *et al.*, 2000b). In terms of the impact of this knowledge gap on training, McDonald (1987; cited in Horneman, 1993) stated that 'because no comprehensive analysis of the processes and stages involved in the acquisition of driving skills has been conducted, there is no solid basis for driver training programs'. This comment could equally apply to all aspects of driver training, including pre-driver education.

While no comprehensive analysis of the driving task was identified during the literature review, a range of high-level attempts to define the driving task was found. These typically focused on the information processing components of the driving task, for example Drummond (1989) stated that at the highest level the driving task can be described in traditional information processing terms, requiring extraction of information from the environment, processing of these data, the making of decisions, and the continuous monitoring of performance.

Other researchers such as McKnight and McKnight (2003), who classified abilities related to driving performance into five domains, have further broken down the high-level description provided by Drummond as follows:

- sensory (e.g. visual acuity);

- attentional (general and selective);

- perceptual (e.g. speed of perception);

- cognitive (e.g. short-term memory; and

- psychomotor (e.g. reaction time).

Finally, Smith (2001) provides a broader description of the driving task, breaking it down into basic driving skills and safe driving skills. Smith states that both types involve physical and cognitive skills, and this work does include some consideration of KSA:

- Basic driving skills are those involved with starting, stopping, keeping the vehicle between the lines, and not running over or hitting anything. Basic knowledge would include the rules of the road, driver licensing requirements, and being personally prepared to drive (e.g. no alcohol and non-use of occupant restraints). These basic driving skills and knowledge are needed for initial entry into the traffic system, hopefully in a graduated licensing system.

- Safe driving skills primarily involve higher order cognitive skills (perception, recognition, decision making, task initiation, and vigilance) which lead to safe driving practices and interaction with the traffic environment. It is these practices which are the key to reducing the crashes of novice drivers. Safe driving practices include search, communication, speed and space management, risk management, and preparing to drive.

While the studies listed above do provide some indication of what constitutes effective driving behaviour, a full analysis of effective driving behaviours was not identified during the review. The gap in existing research means that a full list of the target behaviours relating to driving was not available for this study.

2.1.6   RQ6 – What are good attitudes to driving?

As noted in the previous section, the clear definition of target behaviours and KSA is essential when designing courses as it provides a sound underpinning for decisions about course content and delivery. Therefore, the aim of this research question was to identify 'good' attitudes towards driving. As with the review of effective driving behaviours, this review identified very little information on good driving attitudes. While several studies acknowledged the importance of identifying and training positive road safety attitudes (e.g. OECD, 2004), no comprehensive lists of target attitudes were found.

One study, however, completed by AUSTROADS (cited in Mayhew and Simpson, 1996) indicated that it is possible to identify target attitudes to support training programmes. Mayhew and Simpson state that the study identified performance-based competencies, including knowledge of the driving task and driver limitations, psychomotor skills, perceptual skills and cognitive skills (e.g. attention sharing). During the study, it was found that attitudinal and motivational competencies were also important influences on driving performance. However, these were not

developed and included in the final competency framework as it was felt that attitudes and motives were abstract terms and would be difficult to formally measure from a licensing perspective. While attitude-based competencies were not identified in this work, these comments do illustrate their importance and suggest that it would be possible to develop competencies describing target attitudes.

A report by the OECD (2004) provides some early indications about the types of attitudes it may be important to include in an attitude-training programme. The authors acknowledge the importance of road safety education programmes in fostering positive attitudes towards road safety and the safety of others, and identify some positive driving attitudes, for example appropriate attitudes towards speeding, seat-belt wearing, and drinking and driving.

The studies described above do provide some early indications about the importance of attitudes and how they might be included in a competency framework. However, much more work is required to identify the target attitudes required for safe driving and road use in general. Once these attitudes have been defined, those appropriate for pre-driver education could be identified.

2.1.7 RQ7 – What attitudes do young people have about driving, riding and being a passenger?

The aim of this research question was to gather literature that discussed attitudes held by young people towards driving, riding and being a passenger. While the literature reviewed in RQs 5 and 6 was intended to provide information about 'ideal' driver behaviours and attitudes, the information gathered in support of this research question aimed to identify attitudes actually held by young people. This information can be used to conduct a 'gap' analysis as part of the identification of training requirements. During a 'gap' analysis, ideal and actual behaviours or KSA are compared. Any differences identified represent a 'gap', which can be translated into a training requirement. For example, an ideal attitude might be that it is important to drive within the speed limit. Therefore, if it were found that pre-drivers typically considered that it was acceptable to speed when you were late for an appointment, this would represent a gap. In this case, a training requirement for pre-drivers might be to foster attitudes associated with complying with the speed limit and managing competing demands.

During the literature review, several important studies on young peoples' attitudes towards road use (driving, riding and being a passenger) were identified, however it is interesting to note that, in total, relatively few studies specifically addressing this issue were found. Therefore, any research on attitudes held by novice drivers was also gathered. While novice driver studies can provide some indications about pre-drivers attitudes, caution must be exercised in drawing inferences about pre-drivers from novice driver studies. Young people undergo many experiences during the licensing process that might influence their attitudes. Therefore, where information

presented in the following section has been drawn from a novice driver study, this has been clearly identified.

The information presented below is broken down into the following sections: young people's attitudes towards driving (both pre-drivers and novice drivers), young people's attitudes towards riding; and young people's attitudes towards being a passenger.

2.1.7.1 Attitudes towards driving

While there is not a large body of work examining the attitudes of young people to driving, a summary of the studies identified during this review is provided below.

A report by Parker and Stradling (2001) cites a study of pre-drivers, which provides important information about pre-driver attitudes. The researchers found that boys reported more interest in cars; anticipated more thrill-seeking when they came to drive; rated current speed limits as 'too slow'; and anticipated that driving would give them 'a way of expressing themselves' more than did the girls. Girls rated a range of traffic offences as both more serious and more dangerous than did the boys.

It is interesting to note that most of the observed gender differences were present from age 11 years, the youngest group questioned. Waylen and McKenna (2002a), in a summary of the same study, report the finding that boys aged from 11 years are more inclined to think that driving will be easier and make them popular than girls.

The findings reported above are reinforced by the findings of a survey of over 500 post-primary students in Ireland with a mean age of 16 years (O'Brien *et al.*, 2001; cited in Fuller and Bonney, 2002). This study found that attitudes towards roadway use were typically safety-oriented. However, two consistent features emerged with relevance towards the design of training and education measures. Firstly, males typically demonstrated significantly less positive attitudes than females. Secondly, both sexes were accepting of breaking the speed limit where it was perceived to be safe to do so.

Interestingly, research conducted on young novice drivers reported similar results to those of young people (pre-drivers) described above. Forsyth (1992) found that, while young learner drivers had generally negative attitudes towards drinking and driving, many had positive attitudes towards speeding (41% thought the 30 mph speed limit should be raised and 56% thought the 70 mph limit on motorways should be raised). In another study, it was reported that young novice drivers consider themselves to be better than other drivers (Engstrom *et al.*, 2003).

Masten (2004) conducted a comprehensive literature review on the risk factors associated with young drivers. A large number of research studies were identified and reviewed, though little analysis of the methodological quality of the studies

appeared to have been undertaken. Key findings reported by Masten of relevance to the present study were that:

- young male drivers (aged 18–24) are likely to perceive themselves to be more skilled than other drivers (Matthews and Moran, 1986; cited in Masten, 2004);

- younger drivers generally tend to obey the law because of a sense of obligation and fear of punishment rather than because of a perceived danger to themselves and others (Yagil, 1998; cited in Masten, 2004);

- young drivers, in general, perceive greater rewards for risky driving and are more subject to negative peer influences (Irwin, 1996; cited in Masten, 2004); and

- young drivers are less likely to perceive that preventative actions, such as wearing seat belts, have benefits (Mayhew and Simpson, 1999; cited in Masten, 2004).

The findings of the studies listed above provide a broad overview of the kinds of attitudes held by both young people (pre-drivers) and novice drivers. It is interesting to note that there are some similarities between the two groups. For example, both pre-drivers and novice drivers appear to have permissive attitudes towards speeding. In addition, male pre-drivers are reported to have a belief that driving will be easy, male novice drivers are reported to believe that they are better than other drivers. The similarities in attitudes between groups suggest that some of the attitudes held by novice drivers could well be formed in the pre-driving stage of adolescence.

2.1.7.2 Attitudes towards riding (cycling)

During this review, little information was identified regarding young people's attitudes towards cycling. However, one key piece of work conducted by Chinn *et al.* (2004) was found. This study aimed to use multiple methods to determine and understand adolescent road-user behaviour in groups. The study involved interviews with accident-involved children, a school-based attitude survey, video analysis, focus groups and a literature review.

Several findings from the study provide information about the kinds of attitudes that adolescents hold towards cycling and road safety in general. The key attitudinal findings from this study were that:

- male adolescents reported not signalling when riding a bike, saying 'its not cool anymore'; and

- adolescents do not see road safety in general as 'cool'.

2.1.7.3 Attitudes towards being a passenger

While relatively little information was found during this review on the attitudes of young people towards being a passenger, one study of Norwegian teenagers found that female passengers were more likely to indicate their discomfort to risky driving males. Male passengers were less confident in their ability to influence the driver's behaviour, more likely to accept risky driving and perceived less risk than females (Ullberg, 2004; cited in Mitsopoulos *et al.*, 2005).

In summary, the studies reviewed in support of RQ7 provide some useful information on attitudes held by pre-drivers. Taken in total, the findings on attitudes towards driving, cycling and being a passenger seem to indicate that pre-drivers already have relatively well-formed attitudes about road use and road safety in general. In addition, many of these attitudes appear to be far from ideal from a road safety perspective. Interestingly, Elliot and Baughan (2003) found that adolescents have an accurate perception of their own behaviour as road users. This finding is suggestive that the attitudes expressed by the young people in these studies do not result from a lack of knowledge about safe road-using behaviour.

2.1.8 RQ8 – When and how do young people develop attitudes about driving, riding and being a passenger?

In order to design effective pre-driver education programmes, it is important to understand not only what attitudes are held by young people about driving, riding and being a passenger (RQ7), but when and how these attitudes develop. Information about when road transport related attitudes arise could inform pre-driver education intervention timing and content.

The research on attitudes towards driving outlined in the previous section suggested that attitudes could already be well ingrained before young people begin the licensing process. Waylen and McKenna (2002c) note that young people aged between 11 and 16 showed many of the attitudes and behaviours associated with risky drivers even though they had not begun to learn to drive. Given these findings, it is important to establish what factors influence the development of road safety related attitudes. The literature gathered during this review indicated that a range of factors influence attitudes towards road safety. The key influencing factors considered during this review were parental influence, peer influence, media influence and personal characteristics. Discussions of these influencing factors are presented below.

2.1.8.1 Parental influence

Many studies have acknowledged the potential impact of parents on the road safety attitudes of young people. Ivett (2001) commented that young drivers have 15–18

years of exposure to their parents and others driving, and much of this exposure is negative.

Ivett (2001) also quotes several studies that have found clear links between the driving behaviour of young drivers and the behaviour of their parents. For example, research undertaken in 1999 in North Carolina showed a very clear link between the driving behaviour of parents and that of their children. 'Children (aged 18–21 years) whose parents had three or more crashes on their record were 22% more likely to have had at least one crash compared with children whose parents had no crashes' (Fergusson *et al.*, 2001; cited in Ivett, 2001).

In addition to evidence gained through examining the crash records of parents and children, a study conducted by ODS Ltd and Market Research UK Ltd (2004) showed that both parents and young people felt that parents had a significant role in teaching young people the types of behaviour that good driving requires. Finally, another study suggests that parent's driving styles have an impact on general adolescent car-safety behaviour, particularly seat-belt use. This indicates that parents may also have an influence on young people's attitudes towards being a passenger (Cattan *et al.*, 2005).

Bianchi and Summala (2004) suggest that this result could be explained because parents do not only give their children a model for life but also a model for driving style, including cognitive and motivational factors. A report by the OECD (2004) also supports this view. Within this report it is stated that parents serve as important role models, and their behaviour and actions can influence those of children. Childhood experiences build foundations for adult behaviours, attitudes and beliefs. Taken in total, the results of this review suggest that there is a growing body of evidence about the influence of parents on the driving attitudes of young people. Some evidence is provided for the influence of parents on the attitudes young people hold towards being a passenger. While no evidence was found for the influence of parents on young people's attitudes towards cycling, it seems likely that parental attitudes will influence these also.

2.1.8.2 Peer influence

One study gathered during this review clearly showed the influence of peers on road safety behaviour. Elliot and Baughan (2003; cited Cattan *et al.*, 2005) found that 13–16-year-olds reported more unsafe road crossing and dangerous play and less planned protective behaviour (e.g. wearing helmets) than 11–12-year-olds. Unsafe road behaviours were more common in those reporting going out more often with friends and less often with adults. They were also more common in males. The authors indicated that those who reported unsafe behaviour were well aware of the risks they incurred. While this study provides evidence for the influence of peers on the road safety behaviour of young people, it does not provide clear evidence about whether this behavioural change results from influencing the young person's

attitude. In addition, it should be noted that these findings are based on self-report and were not verified by other data-gathering activities.

2.1.8.3 Media influence

During this literature review, studies were identified that suggested that the media might have some influence on the road safety attitudes of young people. For example, Schonfeld *et al*. (2002) note the potential influence of vehicle advertising on the development of a 'broad driving culture that glorifies speed and dangerous driving' (p 2). This approach can also be found in several 'lads' mags', such as *Redline* and *Max Power*, which have appeared in recent years. Indeed, the front cover of each issue of *Max Power* carries the strapline 'the definitive guide to arsing about in cars', which sets the tone for the contents (cited in Ettinghausen, 2003). Further to this, Williams (2002), for the Guild of Experienced Motorists (GEM) criticises television programmes which feature high-performance cars. He accuses programmes, including the BBC's *Top Gear*, Channel 4's *Driven* and Channel 5's *Fifth Gear*, and other broadcasts on digital and satellite channels, of creating a culture that glorifies speed and encourages irresponsible driving. Williams claims that 'In many ways this third party endorsement of what is, frankly, dangerous driving on popular television programmes can have more influence on road manners than straightforward paid for advertising' (cited in Ettinghausen, 2003). However, while these reports make comments about the impact of media on driving behaviour, this review did not identify any empirical research that had proven a link between the media portrayals of driving and the attitudes and behaviours of young people.

2.1.8.4 Individual characteristics

In addition to searching for external influences (e.g. parents and peers) that can affect how and when young people develop attitudes towards driving, riding and being a passenger, a search was conducted to gather any information on any individual factors (age, gender, etc.) that could affect the development of these attitudes. Interestingly, several studies have found significant effects of age and gender on the development of attitudes towards road safety in general.

Results from the Scottish Executive New Driver Study (Carcary *et al*., 2001) showed that prior social processes appear to affect the ways in which males and females initially approach the driving task. In a paper describing this study, Carcary *et al*. (2001) state that the results of their baseline survey with young people with less than 2 hours' professional driving training showed that female respondents had more favourable behavioural intentions and better attitudes towards speeding and road violations than males. The reliance of this study on self-report measures represents a possible confounding factor. The results may be due to females being more susceptible to social desirability bias than males. However, when these findings are taken in conjunction with the differences in post-licence crash rates between young

male drivers and young female drivers, these findings are suggestive of significant gender differences in road safety attitudes.

Several studies have also identified age as a potential influencing factor on the attitudes held by young people towards road safety. The studies many provide some insight into the ages when young people are most at risk of developing negative attitudes towards road safety. Loreno *et al.* (2000a) conducted a series of focus groups with both pre-drivers and novice drivers, with the aim of identifying teenagers' attitudes and perceptions related to safe driving. The topics included risk perception, attitudes about risky behaviours, peer influences and reactions to specific scenarios.

The authors comment that within the focus groups 'the 15-year-olds told each other and us how carefully and thoughtfully they were going to drive and the 16 to 18-year-olds told us about the laws they broke and what they got away with'. This finding suggests that road safety attitudes may differ between young people (pre-drivers) and novice drivers. Though it should be noted that, due to the nature of the data collection (focus groups), it is also possible that the result merely reflects the fact that younger teenagers are more likely to respond in a way they perceive to be socially desirable to adult figures. However, during this review two other studies were identified which support the findings of Loreno *et al*. (2000a).

A relatively small-scale study conducted by Harre *et al.* (2000), which investigated driving attitudes and self-reported driving behaviours of New Zealand adolescents, found that those aged 14–15 years displayed less risky attitudes towards driving than those aged 16–17 years. Younger people demonstrated less risky attitudes about being a passenger of a drinking driver, back seat-belt wearing, and speed considered safe in a 100 km zone. This study draws attention to shifts in traffic safety related attitudes, especially for males, over the high-school years. Finally, Best and Edwards (1982) cited a study by McLean (1981), where it was stated that attitudes towards road safety deteriorate between the ages of 9–18 years. McLean also comments that available data would suggest that children's experience and attitudes at a much earlier age will determine what their likely 'post-licence' driver behaviour will be (McLean, 1981, cited in Best and Edwards, 1982).

In summary, the results of the literature review on how and when young people develop attitudes towards driving, riding and being a passenger has provided a range of information that is potentially relevant for pre-driver education. The information gathered during the review provides clear support for the influence of parents in the development of driving attitudes in young people. This evidence is based both on self-report and on studies examining the driving records of parents and children. The literature review provided less clear support for the influence of peers on the attitudes of young people. While a study was identified which examined the behaviour of young people in groups, it appeared to focus on behaviour rather than attitudes. However, it does seem likely that peers have a significant effect on both

the attitudes and the behaviour of young people. Further work in this area could better define this relationship. Only anecdotal evidence of media influences on young people's attitudes was found. Again, while it seems possible that media images could affect young people's attitudes towards road safety, this issue appears not to have been explored thoroughly.

In terms of individual characteristics and attitude development, the studies identified, taken in conjunction with what is known about gender differences and driver behaviour post-licence, appear to suggest that attitudinal differences between males and females could be developed prior to undertaking driver training. This suggests that tailored approaches to males and females in pre-driver education courses may be required.

The findings about differences in attitudes towards road safety based on age are interesting because they suggest that young adolescents have more positive road safety attitudes that deteriorate as they reach driver-licensing age. However, these findings run counter to the information reported in Section 2.1.7.1 on attitudes held by young people. These findings appeared to suggest that pre-drivers and novice drivers demonstrated relatively similar attitudes towards issues such as speeding. The discrepancy in these findings appears to suggest that more research is required to understand what attitudes pre-drivers and novice drivers hold and how they differ. An understanding of this issue is essential to develop an effectively targeted pre-driver education programme.

2.1.9 RQ9 – Are there any unsafe driving behaviours (e.g. speeding) where young people are known to be over-represented?

It has long been known that young drivers are over-represented in road crash statistics. As a result, a substantial body of research has accumulated which has identified a range of factors that may contribute to this over-representation. While it is outside of the scope of this study to conduct a comprehensive review of crashes involving young drivers, a brief review aiming to identify the kinds of unsafe driving behaviours young driver's exhibit was undertaken. Information about young driver behaviour could assist in defining the content of any driving aspects of pre-driver education courses. The following section provides a list of unsafe driving behaviours where young drivers are known to be over-represented:

- exceeding the speed limit (Loreno *et al*., 2000a; Williams and Ferguson, 2002; cited in Masten, 2004; Baxter *et al*., 1990; Lestina and Miller, 1994; cited in OECD, 2002; Forsythe *et al*., 1992b; cited in OECD, 2002);

- driving too fast for the conditions (e.g. on wet roads or bends) (Association of British Insurers, 2005; McKnight and McKnight, 2003; Lestina and Miller, 1994; cited in OECD, 2002);

- driving when over the legal alcohol limit (Association of British Insurers, 2005; Smith, 2001; Arnett *et al.*, 1997);

- competing with other road users (Association of British Insurers, 2005; Masten, 2004; Arnett *et al.*,1997);

- tailgating (Masten, 2004; Baxter *et al.*, 1990);

- running red lights (Masten, 2004);

- violating traffic signs and signals (Masten, 2004);

- making illegal turns (Masten, 2004);

- passing dangerously (Masten, 2004; Arnett *et al.*, 1997);

- overtaking slower vehicles on the inside (Forsythe *et al.*, 1992b; cited in OECD, 2002);

- failing to give way to pedestrians (Masten, 2004);

- not wearing seat belts (Masten, 2004); and

- loss of control (West, 1997, 1998; cited in OECD, 2002).

The results of this review indicate that young drivers are over-represented in a wide range of unsafe driving behaviours. Many of the behaviours, such as making illegal turns, suggest that they may be related to poor driving attitudes rather than knowledge or skills. This conclusion is supported by other researchers who have commented that young male drivers, in particular, more often fail at the higher hierarchical levels of driving behaviour (e.g. goals for life and context of driving) than at the driving skill level (Waylen and McKenna, 2002b).

2.1.10 RQ10 – Is there evidence about how young drivers' attitudes influence their behaviour?

Research questions 7 and 9 provided an overview of information available on pre-driver and young driver attitudes towards road safety and novice driver behaviour. The aim of RQ10 was to review any literature that examined the link between attitudes expressed by pre-drivers or novice drivers and their behaviour. The literature search identified very little information about the link between the attitudes and the behaviour of pre-drivers and novice drivers. In fact, this review did not identify any literature relating to pre-drivers. However, a small amount of literature was identified examining the attitude-behaviour link for young drivers.

Two studies were identified that suggested that there is a link between the attitudes of young drivers and their behaviour. Laapotti *et al.* (2003), who assessed whether attitudes of young male and female drivers had changed between 1978 and 2003, found evidence for this relationship. They found that those young drivers who reported a more negative attitude towards obeying road traffic rules had higher odds

of being involved in a road traffic accident, committing offences and driving while slightly drunk. Clarke *et al*. (2002) also support this conclusion, stating in their report that:

> 'It has been previously thought that one of the main problems with young drivers is in the area of specific skills needed for the driving task. However, the results of this study show that a large percentage of accidents are purely a result of two or three 'failures of attitude' rather than skills deficit per se. Young drivers who drive high performance cars can even be considered as above average in driving skills, but simultaneously have a higher accident rate due to attitudinal faults such as speeding and recklessness.'

This conclusion was based on an analysis of over 3,000 accident reports for young drivers in the West Midlands area (United Kingdom). However, the results of another study, conducted for the Department for Transport in 2000, calls into question the conclusion that driver attitudes and behaviour are related. This study aimed to identify the attitudinal determinants of driving violations. While this study did not concentrate on young drivers in particular, it is interesting to note that it was found that, while perceived behavioural control (control over the situation) and subjective norms (perceived approval of others) had a substantial influence over self-reported driving behaviour, attitudes did not. It is not possible to account for this discrepancy, and it should be noted that the project conducted for the Department for Transport did not focus on young drivers. However, it is interesting to note that the researchers broke down behavioural intentions based on the TPB, which meant that respondents were questioned about three factors – perceived behavioural control, subjective norms and attitudes – whereas the other studies reported in this section only considered attitudes. Measuring the three factors may have given respondents scope to define, more accurately, the factors that impacted upon their intention to behave in a certain way.

2.2   Attitude change

Research Objective 1b
Ascertain whether children and young people can be influenced to have more positive attitudes to being a driver, rider or passenger of a motor vehicle. Identify how they can be influenced, by whom and how this can be measured.

2.2.1 RQ11 – Can attitudes be changed?

Numerous theories of attitude change have been developed and have been grouped under:

- consistency (e.g. cognitive dissonance);

- non-consistency (e.g. conflict theory);

- cognitive and perceptual (e.g. adaption-level theory); and

- behaviourist theories (e.g. social judgement theory).

Within the TPB, a behaviourist theory, interventions could be targeted at changing the antecedents of behaviour, in particular the behavioural, normative and control beliefs that ultimately guide behaviour. The importance of determining the extent that individuals are able to access their beliefs, and potentially respond to questions about their beliefs before attempting to change beliefs, is recognised (Ajzen, 2005).

In a discussion of theories of attitude change, Johnson *et al*. (2005) identified and compared four contemporary models of persuasion along key conceptual dimensions. Models include the:

- Elaboration Likelihood Model (ELM);

- Heuristic Systematic Model (HSM);

- Unimodel; and

- Cognition in Persuasion Model (CPM).

These models of persuasion emerge from the recognition that 'mental life may often be neither very reasoned nor all that volitional' (Albarracini *et al*., 2005, p. 624) and this is clearly in contrast to the TPB.

While a detailed description of each of these theories is beyond the scope of this literature review, it is worth outlining one theory, ELM, in further detail. This information will support subsequent understanding of those factors, which are likely to enable and inhibit attitude change in children and young people (see RQ12, Section 2.2.2).

2.2.1.1 Elaboration Likelihood Model (ELM) (Petty and Cacioppo, 1986).

This theory is based on the notion that under different conditions receivers will vary in the degree to which they are likely to engage in and elaborate information relating to the persuasive issue. High elaboration involves attending carefully to a message, analysing the arguments presented, and considering other relevant issues and argument recalled from memory. Alternatively, on occasion individuals may not employ such high levels of issue-relevant thinking and this is based on the premise

that no one can maintain the required level of effort associated with high elaboration continuously and for every persuasive message presented.

O'Keefe (2002) notes that the thought listing technique is a method for assessing variations in the degree of elaboration on a continuum from high-low elaboration. The technique involves asking receivers to list the thoughts that occurred to them during the persuasive message, immediately following the communication. The number of issue-relevant thoughts reported is considered to be a rough index of issue-relevant thinking employed.

Persuasion may occur at any point along the elaboration continuum. However, the persuasion route or processes (central or peripheral) will vary according to the individual's level of elaboration employed. The ELM is a dual processing theory, which argues that a central processing route to persuasion is invoked when elaboration is relatively high, and a peripheral route is invoked when elaboration is relatively low. It is interesting to note that the peripheral route involves the receiver's use of simple decision rules, or heuristics, to evaluate the arguments of the persuasive message, For example, an individual may be guided by the perceived credibility of the instructor or whether they like the instructor. This contrasts with the central processing route, which involves a comparatively higher level of issue-relevant thinking. It is noted that the two persuasion routes are not mutually exclusive, particularly at moderate levels of elaboration, which may involve a mixture of both central and peripheral processes.

Factors influencing the level of elaboration, employed by the individual, include the individual's tendency to engage in issue-relevant thinking (i.e. need for cognition), and motivation and ability to do so. Both motivation and ability need to be present to support elaboration. Not surprisingly, motivation increases with an increase in the personal relevance of the topic to the receiver and may be influenced by the receiver's mood, attitudinal ambivalence, and the presence of multiple sources and arguments.

The ability of the individual to engage in issue-relevant thinking may be influenced by a range of factors, including the presence of a distracting stimulus and the individual's prior knowledge of the persuasive topic. O'Keefe (2002) notes that research is largely compatible with the notion that, if a receiver tends to favour the advocated position of the persuasive message, then distraction would interrupt elaboration and reduce persuasive effectiveness. Conversely, where thoughts are predominantly unfavourable with respect to the advocated position, then distraction should interfere with the receiver having such thoughts and, in turn, enhance the success of the message.

An individual's prior knowledge of the persuasive topic increases their tendency to elaboration. Also, when receivers with extensive prior knowledge encounter a counter-attitudinal message, such receivers are better able to generate

counterarguments – these group are less likely to be persuaded in comparison with receivers with less extensive topic knowledge. Increasing the strength of a counter-attitudinal argument is also likely to enhance persuasion for receivers with extensive knowledge, but has little effect on those with less extensive knowledge.

Given the two routes to persuasion – central and peripheral – individuals who have a tendency to cognition and who engage in high elaboration (central route) are more likely to be influenced by the strength and direction of the persuasive argument. In contrast, individuals who engage in comparatively lower levels of elaboration (peripheral route) are more likely to be influenced by simple decision rules, or heuristics, which may, in turn, be triggered by peripheral cues, such as perceived credibility of the communicator, the extent that the receiver 'likes' the communicator, and the reaction of others to the persuasive message.

2.2.2 RQ12 – What factors enable and inhibit attitude change?

A range of factors relating to natural and induced received characteristics and the structure and content of the message may influence the effectiveness of attitude change programmes. The following sections present a distillation of information presented by Professor Daniel O'Keefe.

2.2.2.1 Natural receiver characteristics

Receiver characteristics influencing the level of elaboration employed were outlined above. Other individual differences, which influence an individual's persuasability, include:

- self-esteem and intelligence – persuasability may be maximised at intermediate levels of self-esteem and at lower levels of intelligence;

- self-monitoring – high and low self-monitors differ in terms of what they value. High self-monitors would place greater value on the image projection attributes of the message or product, whereas low self-monitors would favour more objectively-defined attributes, such as reliability. Low self-monitors' actions usually reflect their inner feelings and attitudes, and they are less likely to change or adjust in each new context; and

- sensation seeking – reflects a preference for novel, complex and ambiguous stimuli and situations. Behaviour associated with risk taking is higher among individuals who are high sensation-seekers, for example the use and abuse of alcohol and drugs is evident at a younger age for individuals who are high sensation-seekers.

The relationship between age and persuasability is, unfortunately, not clear, as noted by the following personal communication with O'Keefe:

'Sorry to say, there's not, (so far as I know) any research that speaks directly to the effects of age variation in the age span you mention (<5 to 18 years). There are a number of papers that concern age-related differences in persuasion, but these seem to concern a different age span. If I were looking for clues about how to adapt persuasion techniques/ messages to children varying in the age range you mentioned, I think I'd nose around in developmental psychology for ideas. As one illustration: to the extent that there are dependable age-related changes in the characteristic sort of moral reasoning engaged in (I have something like Kohlberg's scheme in mind), then one might suppose that children of different ages would be likely to differ in the extent to which various moral appeals would be persuasive' (Air Affairs, Personal Communication, 10/02/06).

Work that provided guidance on the relationship between individual factors such as age and tendency towards issue-relevant thinking would be beneficial to the study. Intuitively, young children are more likely to be persuaded by peripheral routes, however research to substantiate this hypothesis, particularly in relation to the topic of pre-driver education, is required.

2.2.2.2 Induced receiver characteristics

Attitudes held by children and young people towards driving, riding and being a passenger may be favourable and predictive of positive intentions and appropriate driver behaviour. Interventions to ensure that favourable attitudes are **retained** and made resistant to adverse persuasion are discussed in the literature. Interventions include inoculation, warning and refusal skills training.

Inoculation involves exposing the individual to counter-attitudinal arguments to support the development of defensive arguments in favour of current beliefs and attitudes. O'Keefe notes the susceptibility of cultural truisms to 'attack' given that the believer typically has no practice in defending the belief and there is no motivation to rehearse arguments in defence of cultural truisms.

Studies have investigated the benefits of supportive and refutational strategies for making cultural truisms more resistant to persuasion. Supportive strategies involve providing the individual with arguments supporting the truism, while refutation strategies involve first showing receivers a weak attack on the truism and then refuting that attack. O'Keefe concludes that, for cultural truisms, refutational strategies are more effective than supportive strategies, however, in combination, refutational and supportive strategies produce the greatest affect on resistance to persuasion.

When considering non-truisms, more controversial beliefs and attitudes, research indicates, once again, that refutational strategies are more effective than supportive

strategies. However, the difference between the effectiveness of these strategies is not as apparent as differences identified for cultural truisms.

Warning an individual of an impending counter-attitudinal message decreases the effectiveness of the persuasive message. In general, this is attributed to the individual being given time to rehearse arguments to support their current position, or simply to ensure that they are motivated and alert to the counter-attitudinal message. Two types of warnings are identified:

- topic position warnings, which identify the issue and position of the message; and

- persuasive intent messages, which indicate that the individual will receiver a message intended to persuade them.

Both types of warnings influence the effectiveness of the persuasive message.

Refusal skills training provide individuals with the skills to refuse offers or requests made by an influencing agent. For example, children and adolescents may be unable to resist offers of illegal drugs, alcohol or tobacco and result in using these substances, despite having negative attitudes towards their use. This approach differs from inoculation-based approaches as it trains the individual in communication abilities, rather than cognitive defences or argument. Studies support the **ability** to train refusal skills training, and those most effective involve rehearsal with directed feedback. However, it is noted that, while some successes in the use of refusal skills training have been observed, they are generally not very effective in preventing or reducing drug, alcohol or tobacco use/misuse. Indeed, it is noted that, in some circumstances, such programmes have had a negative effect, appearing to encourage substance use.

Unfortunately, the studies, which are reported by O'Keefe, relate predominantly to the use and abuse of alcohol and drugs. No systematic research evaluating the influence of induced receiver factors on the retention of favourable attitudes towards being a driver, rider or passenger of a motor vehicle was identified. This represents a clear gap in knowledge, which should be addressed to inform good practice in pre-driver education.

2.2.2.3 Message structure

Three structural features of persuasive messages, which influence persuasive outcomes, include:

- the order of arguments in the message;

- explicit statement, or not, of the message's conclusions; and

- the degree of specificity with which the communicator's advocated action is described.

O'Keefe notes that the way in which arguments are arranged in a message makes little significant difference to the impact of the persuasive message. He cites only one study where a significant difference was evident between the persuasive outcomes of presenting the arguments in a climax versus an anti-climax order, with the climax order being more persuasive. He goes on to report that, although findings are non-significant, studies tend to report a greater influence where arguments are presented in a climax order. More research that is systematic is required in this area.

Situational factors, in particular those factors influencing the opportunity for the communicator to present the important argument last, should be considered. For example, in some pre-driver education programmes the receivers may be encouraged to ask questions and present counter-arguments during the course of the communication, (e.g. during a classroom environment); this situation would require the instructor to present the most compelling arguments early. Conversely, in other situations, for example during the re-enactment of a real-life scenario in the form of a 'play', receivers will be encouraged to discuss the messages of the 'play' following its completion and this situation supports the presentation of the message arguments in a climax order.

The question of whether the communicator should either state explicitly the conclusion/recommendation of the message or leave the point of the communication implicit in the message, allowing the receiver to develop conclusions, has also been investigated. O'Keefe notes that, while few empirical studies exist, there is evidence to support the comparatively greater effects of messages, which included the explicit statement of conclusions and recommendations. In addition, studies support the presentation of **specific** conclusions and descriptions of the recommended actions. This finding is consistent with the TPB.

2.2.2.4 Message content

Messages may be described as one or two sided: one-sided messages present supporting arguments for the advocated position, but ignore opposing arguments, and two sided messages discuss both supporting and opposing arguments. Two-sided messages are further described as refutational or non-refutational. Refutational two-sided messages attempt to refute opposing arguments, offering evidence to undermine an opposing argument. A non-refutational two-sided message acknowledges the opposing position but does not refute the position directly, for example the communicator may indicate that supporting arguments overwhelm the opposing position. In summary, refutational messages undermine and non-refutational messages overwhelm the opposing position.

Research indicates that refutational two-sided messages are more persuasive than one-sided messages, and non-refutational two sided messages are less persuasive than one-sided messages. These findings are valid for non-advertising messages. However, O'Keefe notes that in consumer advertisements non-refutational two-sided messages are neither more nor less persuasive than one-sided advertisements. The reasons for this difference are explained by the credibility afforded to an advertisement by offering an opposing viewpoint without refuting this opposing position. Interestingly, this explanation is considered analogous to the increase in credibility afforded to a communicator when they advocate a position that is opposed to their apparent self-interest.

The position represented by the persuasive message and the receiver's current position on the topic may differ only slightly. Alternatively, the discrepancy might be moderate or even extreme. The relationship between the magnitude of this discrepancy and the effectiveness of the persuasive message has been investigated and, for simplicity, O'Keefe describes this relationship as an inverted 'U-shaped' curve. Thus, relatively minor changes in attitude are obtained with extremely small or extremely large discrepancies, and maximum effectiveness is evident at moderate levels of discrepancy. Unfortunately, the relationship is not as simple as this and O'Keefe proposes a series of 'U-shaped' curves to account for the variable influence of the following factors:

- **Communicator credibility.** The peak of the curve appears to occur at smaller discrepancies for low-credibility communicators than it does for high-credibility communicators. High-credibility sources can safely advocate comparatively more discrepant positions than can low-credibility sources.

- **Topic relevance.** For relatively more important or relevant issues, the peak of the curve occurs at lower levels of discrepancy, whereas on less relevant issues, the curve peaks at some larger discrepancy.

- **Advocated view.** Pro-attitudinal discrepancies are more likely to be favourably received than counter-attitudinal discrepancies. Accordingly, it is important to consider both the magnitude of the discrepancy and whether the discrepancy is in line with the receiver's advocated view.

The influence of the 'fear factor' on the persuasiveness of a message has been investigated extensively. In summary, O'Keefe notes that messages with more intense contents do generally arouse greater fear and are more persuasive in changing attitudes, intentions and actions than those with weaker contents; and messages that successfully arouse greater fear are also generally more persuasive.

2.2.3 RQ13 – How long does it take to change an attitude?

The theoretical literature review did not find any guidance on how long it may take to change attitudes.

2.2.4   RQ14 – How long is attitude change maintained?

Several studies examining the influence of elapsed time and the frequency of performing a task on the rate of competence deterioration have been conducted (Gipson and Deighton, 2003). For example, following an analysis of studies relating to competence deterioration, Rullo and McDonald (1990) presents a list of 'learning categories' (e.g. gross motor skills, position movement, cue detection, making decisions) in order of proneness to skill decay. Attitude learning is presented as the category that is least prone to deterioration.

The general literature on competence deterioration also emphasises the importance of the quality of initial training on competence retention and the potential benefits of 'over-learning'. For example, Driskell *et al.* (1992) conducted a meta-analysis of 15 studies to investigate the effects of overlearning on skill retention. Overlearning was defined as the deliberate overtraining of a task past a set criterion – if five repetitions of a task are required to achieve the set criterion, then an additional five repetitions would be undertaken to achieve 100% overlearning. Driskell *et al.* concludes that 50% overlearning is the minimum practical operationalisation of overlearning. Unfortunately, the studies reviewed by Driskell and other researchers in this area focus on the influence of overlearning on the retention of cognitive tasks, rather than attitudes. Research to determine the stability or proneness of the TPB predictors to deterioration represents a potential area of future research. The outcomes of such investigation may be used to prioritise the content and frequency of pre-driver education programmes.

Within the literature on persuasion, it is noted that attitudes developed under conditions of high elaboration (see Section 2.2.1.1) will, compared with attitudes shaped under conditions of low elaboration, display greater temporal persistence, be more predictive of intentions and subsequent behaviour, and be most resistant to counter-persuasion (O'Keefe, 2002). In addition, O'Keefe concludes that greater persuasion persistence has been observed on topics of greater personal relevance compared with less personally-relevant topics and whether the individual expects to have to discuss the message topic, which presumably is likely to encourage elaboration.

The potential for persuasive effects to increase with time is also discussed in the literature and termed a 'sleeper effect'. This effect arises when the receiver is presented with a strong discounting cue, which suppresses the positive impact of a persuasive message. Over time the 'argument' associated with the discounting cue fades and the effects of the receiver's examination of the message's arguments emerge.

An understanding of those factors influencing attitude retention is fundamental to the development of guidance on course design and delivery and policy relating to the need for pre-driver education courses to 'refresh' participants. This information

also has implications for optimising the design of an 'education pipeline', during which predictors of competent driver behaviours (i.e. beliefs, intensions) are developed, internalised and refreshed.

2.2.5 RQ15 – What types of interventions have been used to promote attitude change?

It is important to understand the range of interventions that may be adopted to promote attitude change and their relative advantages and disadvantages. Ajzen (2005) identifies the following seven influencing strategies:

- legislation (exerting influencing by prescribing and enforcing desired behaviour);

- persuasion (influencing behaviour by changing privately-held beliefs and attitudes (e.g. persuasive communication);

- facilitation (promoting strategies and training designed to help people carry out intended behaviours);

- coercion (threatening severe punishment for non-compliance);

- subterfuge (subtle ploys that induce people to engage in the desired behaviour);

- circumvention of awareness (avoiding conscious opposition by such measures as hypnosis, subliminal instructions, conditioning, affect transfer); and

- promotion (offering inducement for desired behaviour, e.g. free bus ticket).

Unfortunately, information on the most appropriate types of interventions, given the specific change requirement, is not provided by the literature. It is worth noting at this point that, during the course of this study, evidence statements, gathered from the literature, will be analysed for their applicability to become recommendations for an educational intervention. Criteria will be developed to support this analysis and will include a consideration of whether the evidence statement confidently informs the content, delivery mechanisms and timing of the educational intervention.

2.2.6 RQ16 – How is attitude change measured?

The development of valid and reliable methods for assessing beliefs, attitudes and behaviour is a prerequisite to an assessment of the effectiveness of an intervention. Information presented in the following sections focuses on attitude measurement. Once developed, measures may be implemented before (time 1) and after (time 2) an intervention and comparative analyses employed to determine changes in behaviour and predictor variables.

2.2.6.1 Attitude measurement

As noted in Table 2.1, attitudes may be inferred from verbal and non-verbal measures of cognitive, conative and affective types of responses to the attitude object. Questionnaires represent the most typical method for collecting information relating to the attitude object. However, measures of reaction time and other physiological indices associated with autonomic and central arousal mechanisms (e.g. Galvanic Skin Response, blood pressure, pupilatory dilation) have been investigated.

General guidance on how to construct a psychometrically robust questionnaire is well documented in the literature. When considering the assessment of an individual's attitude toward the behaviour, Ajzen (2002a) notes that any standard attitude scale procedure (e.g. Likert Scales, Thurstone Scaling and Guttman Scalogram) can be used. However, semantic differential scales are the most commonly-employed techniques, largely due to their ease of construction. Brief details on how to construct, administer and analyse information collected using these four types of attitude-scaling techniques are provided below. This is followed by a consideration of the guidance provided by Ajzen (2002a) and Francis *et al.* (2004a) on how to construct a questionnaire to assess behaviour and predictor variables. Together, this information provides a foundation for discussing methods for assessing the effectiveness of pre-driver education (see RQ21).

2.2.6.2 Scaling techniques

Thurstone Scales

A large pool of items, or statements (e.g. 80–100), relating to the topic to be addressed is typically compiled and the extent that the items relate favourably to the **concept** under investigation is evaluated by a panel of judges. This process is followed during the construction of a manageable set of Thurstone, Likert and Guttman scales. Specifically, during the development of Thurstone Scales, judges are required to rate the favourableness of each proposed item (attitude statement) to the concept using an 11-point 'favourableness' rating scale. During this procedure, judges are requested **not** to rate the statements according to their **own** attitudes.

Data analysis involves an identification of the median rating and interquartile range for each statement. The statements to be included on the questionnaire are selected to represent each median value ranging from 1 to 11 (hence an interval scale). In addition, it is recommended that the statements selected should ideally represent the lowest interquartile range. A typical Thurstone Scale comprises 10 to 30 items, each with a scale value representing the extent that the item was judged favourable in relation to the concept.

Questionnaire respondents are requested to mark their agreement or disagreement with each statement comprising the final version of the questionnaire. An overall

score for the respondent, in relation to the attitude concept, is calculated by averaging the **scale** values for each item against which the respondent ticked 'agree'.

Likert Scales

In the case of Likert Scales, or summative scales, the favourableness of each item, comprising the initial item pool, is judged using a 1 to 5 rating scale where:

1 = strongly unfavourable to the concept;

2 = somewhat unfavourable to the concept;

3 = undecided;

4 = somewhat favourable to the concept; and

5 = strongly favourable to the concept.

Note once again that, during the scale development, judges are required to rate the favourableness of the statement to the concept.

Statistical analyses (e.g. correlations) are used to identify those items, which do/do not demonstrate consistency with the overall (summed) score across all items. Items with a correlation with the total score of less than 0.4 are typically removed from the set of items. A Likert Scale has a relatively small number of items (e.g. 10–15) with high discriminant validity.

Questionnaire respondents are asked to rate each item using a response scale, for example a range from 1 to 5 where:

1 = strongly disagree;

2 = disagree;

3 = undecided;

4 = agree; and

5 = strongly agree.

Others scales with or without a mid-point may be used. An individual's score is the sum of their ratings for all of the items. The response values for reversal items (those items that are reversed in meaning from the overall direction of the scale) are 'reversed' before items are summed. That is, a score of 1 becomes 5, etc.

Guttman Scaling

These scales are also referred to as cumulative scales, given that a respondent who agrees with any specific item on the questionnaire will also agree with all previous items. For this technique the favourableness of each item comprising the initial item set is judged using a Yes/No response scale. A scalogram analysis of the judges'

responses is then performed to determine the subset of items that best approximate the cumulative property. Respondents are then requested simply to tick those items with which they agree. An overall score is calculated by summing the number of items, which were ticked.

Semantic Differential Scale

These scales assess the subjective meaning of a concept to the respondent, rather than assessing 'how much' they believe in a particular concept. The scale is designed to collect ratings on a series of bipolar rating scales with endpoint descriptors such as 'good/bad' and 'energetic/passive'. These descriptors are presented at each end of a line, which is typically marked to represent a 5-, 7- or 9-point scale.

Factor analyses have indicated that there are three major factors or dimensions of judgement:

- evaluative (good/bad);

- potency (strong/weak); and

- activity (active/passive).

A large set of appropriate adjective pairs is generated for the particular concept under investigation with reference to standard lists of items that address these three dimensions (e.g. Osgood *et al.*,1957). A subset of scales that exhibit high internal consistency is selected for the final attitude measure. This process requires the collection of pilot data and the use of correlation-based analyses (e.g. Cronbach's Alpha).

Questionnaire respondents are required to consider each pair of adjectives and mark the extent that they believe each adjective describes the concept under investigation. Responses are scored simply by summing the ratings given to each adjective pair on a scale of 1 to 7 (or 1 to 5, 1 to 9, etc.). Average ratings may also be calculated.

2.2.6.3 Constructing a TPB questionnaire

There are several sources of advice on how to construct a TPB questionnaire (e.g. Ajzen, 2002a; Francis *et al.*, 2004a, 2004b). Ajzen (2002a) argues that 'all predictors in the TPB [intentions, behavioural control, attitude toward the behaviour, subjective norm and beliefs] can be assessed directly, by asking respondents to judge each on a set of scales'. He goes on to note that 'in addition, attitude towards the behaviour, subjective norm and perceived behavioural control can also be measured indirectly, on the basis of the corresponding beliefs'. For clarity, Table 2.2 provides a set of example statements and response scales, which may be included within a TPB questionnaire. The topic of the statements is based on a hypothetical study aimed at

Table 2.2: **Example questions/statements and response types to be included on a TPB questionnaire**	
TPB component	**Example question/statement and response types**
Behaviour Measured via direct report or observation. The behaviour should be defined in terms of its TACT elements. Behaviours may be aggregated across situations and times	**Behaviour target**: Wearing (Action) reflective armbands (Target) when walking to school (Context), each day for a month (Time) **Statement**: How many days in the course of the past month have you worn reflective armbands when walking to school? **Response types**: Exact or rough numerical estimate or seven-point rating scale (endpoints: never and every day)
Intention Several items are used to assess behavioural intention. Note requirement to develop items with acceptable psychometric properties	**Statements**: I intend to/try to/plan to wear reflective armbands when walking to school, each day for a month **Responses**: Seven-point rating scales (endpoints: extremely and unlikely; definitely true and definitely false; strong agree and strongly disagree)
Attitude toward the behaviour Typically measured using semantic differential scales. Include several adjective pairs relating to the three components: evaluative, potency and activity. Note requirement to develop items with acceptable psychometric properties	**Statement**: For me to wear reflective armbands when walking to school, each day for a month is . . . **Response**: Seven-point rating scales (endpoints: harmful and beneficial; pleasant and unpleasant; good and bad; worthless and valuable; enjoyable and unenjoyable)
Subjective norm Ensure inclusion of items which capture descriptive norms (i.e. whether important others perform the behaviour) given that there is a tendency for items with an injunctive quality to result in low variability – important others are perceived to approve of desirable behaviours and to disapprove of undesirable behaviours. Note requirement to develop items with acceptable psychometric properties	**Statement (descriptive norm)**: Most people who are important to me wear reflective armbands when walking to school, each day **Response**: Seven-point rating scale with endpoints completely true and completely false **Statement/response (injunctive quality)**: Most people who are important to me think that: I should : ___ : ___ : ___ : ___ : ___ : ___ : ___: I should not wear reflective armbands when walking to school, each day for the next month
Perceived behavioural control Include items to do with the individual's difficulty of performing the behaviour (self-efficacy) and belief that they have control over the behaviour. Note requirement to develop items with acceptable psychometric properties	**Statement (self-efficacy)**: For me to wear reflective armbands when walking to school, each day for a month would be . . . **Response**: Seven-point rating scale with endpoints impossible and possible **Statement (control)**: How much control do you believe you have over wearing reflective armbands when walking to school, each day for a month? **Response**: Seven-point rating scale with endpoints no control and complete control

Table 2.2: (continued)	
TPB component	**Example question/statement and response types**
Behavioural beliefs Undertake pilot work to determine the accessibility of behavioural beliefs. Develop questions to evaluate the strength and outcome evaluation of accessible beliefs	**Eliciting behavioural outcomes** (pilot study participants given a few minutes to list thoughts in response to the following questions): What do you believe are the advantages of wearing reflective armbands when walking to school, each day for a month? What do you believe are the disadvantages of wearing reflective armbands when walking to school, each day for a month? Is there anything else you associate with your wearing of reflective armbands when walking to school, each day for a month? **Statement (behavioural belief strength)**: My wearing of reflective armbands when walking to school each day for a month will increase my visibility to other road users when I cross the road **Response**: Seven-point scale with endpoints extremely unlikely and extremely likely **Statement (outcome evaluation)**: Not being seen by other road users when I cross the road is . . . **Response**: Seven-point scale with endpoints extremely bad and extremely good
Normative beliefs Undertake pilot work to elicit accessible normative referents. Develop questions to evaluate the strength of normative beliefs and motivation to comply with normative referents (e.g. family, peers)	**Eliciting accessible normative referents** (pilot study to identify relevant referent individuals and groups that are readily accessible in memory): Are there any individuals or groups who would approve of you wearing reflective armbands when walking to school, each day for a month? Are there any individuals or groups who would disapprove of you wearing reflective armbands when walking to school, each day for a month? Are there any other individuals or groups who come to mind when you think about wearing reflective armbands when walking to school, each day for a month? **Statement/response (normative belief strength)**: My friends thinks that: I should : ___ : ___ : ___ : ___ : ___ : ___ : ___: I should not wear reflective armbands when walking to school, each day for the next month. **Statement (motivation to comply)**: Generally speaking how much do you want to do what your friends think that you should do? **Response**: Seven-point scale with endpoints not at all and very much

Table 2.2: (continued)	
TPB component	**Example question/statement and response types**
Control beliefs Undertake pilot work to elicit accessible control beliefs (e.g. identifying a supplier of reflective armbands). Develop questions to evaluate the strength of control beliefs and control belief power	**Eliciting accessible control factors** (pilot study to identify a list of accessible factors that may facilitate or impede performance of the behaviour): What factors or circumstances would enable you to wear reflective armbands when walking to school, each day for a month? What factors or circumstances would make it difficult or impossible for you to wear reflective armbands when walking to school, each day for a month? Are there any other issues that come to mind when you think about the difficulty of wearing reflective armbands when walking to school, each day for a month? **Statement (control belief strength)**: I expect that it will be difficult to identify a supplier of reflective armbands to wear in the next month **Response**: Seven-point scale with endpoints strongly disagree and strongly agree **Statement/response (control belief power)**: My difficulty in identifying a supplier of reflective armbands to wear in the next month would make it: Much more difficult : ___ : ___ : ___ : ___ : ___ : ___ : ___: Much easier for me to wear reflective armbands when walking to school, each day for the next month

assessing attitudes held by children and young people towards the wearing of reflective clothing.

Francis *et al*. (2004a) provide a manual for constructing a questionnaire based on the TPB, given the proliferation of studies using the TPB during the past 20 years (the authors cite 850+ papers from PsychINFO and Medline databases). In the supplement to this manual (Francis, 2004b), the authors discuss the following issues:

- reasons why it is advisable to include in questionnaires both direct and indirect measures of the predictor variables;

- the practice of scoring the indirect measures using the multiplicative composite approach;

- the choice of appropriate endpoints when constructing response formats for measuring beliefs;

- appropriate tests of reliability of indirect measures; and

- the suggestion that completing a questionnaire constitutes an intervention that may change behaviour, thereby confounding systematic attempts to use TPB questionnaires in evaluating interventions.

To elaborate on the latter point, Francis *et al*. (2004b) note that this issue is not new to social research where the study procedure, which might be an assessment of an educational intervention, involves the use of a before and after measure of behaviour. Unfortunately, the process of measurement in itself may result in an individual adjusting their behaviour, which may, in turn, lead to spurious conclusions on the effectiveness of the intervention. This issue is relevant to any evaluation of the effectiveness of a pre-driver education programme, which should consider the use of control groups to differentiate between systematic (intervention) and random effects.

2.2.7 RQ17 – Have any road transport based attitude change initiatives proved successful?

In order to gather as much information as possible about how to design an effective attitude change programme for pre-drivers, it was of interest to examine attitude change initiatives in the road transport field in general. The aim in doing this was to gather information about factors contributing to the success or failure of these programmes. Owing to time constraints, it was not possible to review the large body of work evaluating individual programmes. Therefore, the study team conducted a search for literature reviews of road transport attitude change initiatives. The following section provides an overview of the main findings of this review.

Engstrom *et al.* (2003) conducted a review of a range of attitude change interventions. This paper consisted of a literature review covering novice driver skill acquisition, training and educational issues. Within the review, a number of attitude change evaluations were reviewed in detail. The information provided by Engstrom *et al.* (2003) about the programmes is provided below.

Clark and Powell (1984; cited in Engstrom *et al*., 2003) conducted a study testing the impact of peer-group based training on young drivers with an accident record. Discussion groups consisted of 14 subjects and 39 friends of subjects and were compared to a control group of 18 subjects. Pre- and post-intervention questionnaires showed changes in attitudes related to perceived driver roles but no changes in attitudes related to drink-driving. The authors suggest that the involvement of peers produced a more substantial attitude change than standard training interventions.

In 1998, the National Board of Road Safety in Sweden initiated a media campaign to illuminate the drink-driving problem. The aim was to point out the connection between drunk-driving and alcoholism. The target group was young road users aged between 16 and 25 years. In evaluating the campaign, Linderhold (2000; cited in Engstrom *et al*., 2003) found that there was only a small effect. The negative attitude towards drink-driving was the same after the campaign. The authors suggest that the failure of the campaign could be related to a failure to analyse the target group and construct messages appropriately.

Grant (1990; cited in Engstrom *et al*., 2003) examined the effectiveness of feedback and education on an employment-based seat-belt programme. The six-week programme included obtrusive seat-belt use monitoring, a feedback sign, an educational presentation, displays and supportive memos from management. An increase in seat-belt use was recorded but attitudes to seat-belt use changed little.

Koivisto and Mikkonen (1997; cited in Engstrom *et al*., 2003) found that behaviour and attitudes could be influenced by including active participation and discussion in interventions. For example, in a traffic safety campaign designed to help drivers recognise their strengths and weaknesses, several samples of actual traffic behaviour of the target group were recorded and used during training. This message was 'mirrored' back at the group. Results showed a slight increase in seat-belt usage and a significant decrease in the highest speeds. Survey results supported the view that mirroring had a positive effect on behaviour and attitudes.

All of the studies outlined by Engstrom *et al*. (2003) appear to show a relatively poor rate of attitude change. However, some aspects of courses did show promise. Engstrom *et al*. commented that promising results were found from methods that demanded active participation, use of personal experiences and reflective thinking. They comment that trying to influence attitudes and behaviour is the use of emotions and self-evaluation could be particularly effective.

In addition to the literature review described above, three evaluations of individual programmes were identified and reviewed. The first study reported on an evaluation comparing an abbreviated version of the Drug Abuse and Resistance Education to a new Risk Skills Training Programme (D'Amico and Fromme, 2002). Participants (300 adolescents aged 14–19 years) were randomly assigned to either of the two programmes or a control group. Baseline measures were taken prior to the programme. Following the programme, follow-up measures were taken at two and six months. Measures were taken of risk-taking behaviour, perception of peer risk taking, and positive and negative alcohol expectancies. Results showed that the risk skills training group decreased participation in several risk behaviours at two months but reductions were not maintained at six months. The drug abuse resistance group increased their positive and negative alcohol expectancies and the control group increased their alcohol consumption. The authors comment that providing information about peer behaviour to adolescents may have been the critical ingredient in reducing risk-taking behaviour in the risk skills training group. Self-reports indicated that alcohol consumption, driving while drunk, and riding with a drunk driver were all reduced.

McKnight and McPherson (1986) conducted a study investigating the effectiveness of a programme of peer intervention training compared with a conventional alcohol safety programme in a high school setting. Six hundred and sixty-seven students from five US high schools participated. Evaluation measures involved knowledge measures, two attitude measures and the collection of behavioural data. The measures were administered pre-test, post-test and as a follow-up 1–4 months following the programme. The peer-intervention programme led to significant increases in self-reported intervention behaviour following completion of the course. The conventional alcohol safety programme failed to produce changes in intervention behaviour during this period. Both the peer-intervention programme and the conventional alcohol safety programme led to significant knowledge gains. Neither programme led to significant measured shifts in attitudes.

Because of the sound theoretical base and its focus on attitudes, the evaluation of the 'Foolspeed' campaign conducted by Centre for Social Marketing at the University of Strathclyde was of particular interest to this study. 'Foolspeed' was a five-year campaign developed by the Scottish Road Safety Council. It was designed to reduce the incidence of inappropriate and excessive speeding on Scotland's roads. The intervention involved a media campaign underpinned by the TPB. The evaluation of the campaign involved a three-year longitudinal survey of a quota-sample of drivers aged 17–54 years. A structured face-to-face survey was administered to respondents in their homes. A baseline survey was conducted and several follow-up surveys were conducted. Results indicated that the 'Foolspeed' campaign resulted in significant changes (in an anti-speeding direction) in the three attitudinal components of the TPB (composite attitudes towards behaviour, composite positive affective beliefs and composite negative affective beliefs) (Stead *et al.*, 2002).

It is clear from the studies discussed above that evaluations of attitude change initiatives in the road transport environment have shown mixed results. More generally, the research community has raised questions about the efficacy of attitude change initiatives. Elliot (1993; cited in Aberg, 2003) examined the effectiveness of a range of media campaigns (on drunk-driving, speeding, cycle-helmet use and seat-belt use). It was found that when attitudes alone were considered, there was only a positive effect of between 2–3%.

The author commented that these kinds of findings raise questions about whether attitude interventions provide a cost-effective outcome. However, studies have shown that attitude interventions with the following characteristics are more likely to be successful:

- active participation;

- use of personal experiences;

- reflective thinking and self-evaluation;

- use of emotions; and

- providing information about peer behaviour.

There is a range of reasons which might account for the failure of many evaluations to find significant attitude change effects. Evaluations must be carefully designed and, in particular, dependent variables must be carefully chosen. For example, evaluations of attitude change campaigns in terms of accident reduction have often shown them to be unsuccessful. Ulleberg and Rundmo, 2002, cite work indicating that this may be due to the weak methodologies of many of the evaluation studies. Many use accident frequency as a criterion. However, because of the confounding factors influencing accidents, it is often difficult to measure changes statistically in accident frequency. Iversen and Rundmo (2004) further comment that many intervention studies aim to cover too large and varied groups of drivers. These authors consider that effective attitude change initiatives must be carefully targeted. Failures to design sound evaluations may account for the lack of measured success of many attitude change interventions.

2.3 Good practice and innovation in pre-driver education

Research Objective 1d

By reviewing national and international provision, identify good practice and innovation in pre-driver education.

2.3.1 RQ18 – What is the evidence that pre-driver education has been effective or ineffective?

In order to make recommendations about good practice in pre-driver education, a review of reports on evaluations of pre-driver education courses both in the UK and internationally was undertaken. The aim of this review was to establish the overall effectiveness of pre-driver education both in terms of influencing pre-drivers' attitudes and behaviour.

One of the key issues when reviewing studies related to this research question was to identify evaluations of relevant training programmes. There is significant variability within the road transport training community in the use of terms such as pre-driver/ driver education and training. Therefore, it was not sufficient to assume that all research entitled 'pre-driver education evaluation' necessarily covered the domain of interest for this study, which was defined by the definition of pre-driver education presented in the Executive summary. Every effort was made by the research team to identify studies that fitted within the study definition. Nine studies evaluating the effectiveness of pre-driver education were reviewed. A short summary of the DeKalb study of pre-driver education is also included because, although the programme had a large training component, it did include pre-driver education and is an influential study in the field (cited in McKnight, 2006)

The following section provides a summary of evaluation reports reviewed. For each report, the following information is provided:

- evaluation aims;

- evaluation methodology;

- key results; and

- review of methodological approach.

2.3.1.1 Scottish Executive New Driver Project

- Carcary, B., Power, K. and Murray, F. (2001) *The New Driver Project: changing driving beliefs, attitudes, and self-reported behaviour amongst young drivers through classroom based pre and post driving test interventions*. Report prepared for the Scottish Executive Central Research Unit. Edinburgh: Scottish Executive Central Research Unit.

- Carcary, B. (2002). The effectiveness of pre-driver training. *RoSPA 67th Road Safety Congress,* Stratford upon Avon, Warwickshire. Birmingham: RoSPA.

The **aim** of this study was to investigate the effectiveness of classroom-based pre- and post-licence intervention strategies, driving attitudes and behaviour.

The **evaluation methodology** used was a four cross-sectional, and two interlinked longitudinal studies were designed which enabled a longitudinal review of two classroom-based interventions aimed at modifying driving-related attitudes and self-reported driving behaviour. The two classroom interventions were as follows:

- Classroom-based pre-driver training involving one afternoon of classroom work. Examples of the issues covered included: motor insurance; vehicle maintenance; social issues; attitudes; pressures; and social standards. No information is provided within the paper review regarding who delivered the intervention or how it was delivered.

- Classroom-based post-driving-test training intervention involving one afternoon of classroom work. Examples of the issues covered included: personal vulnerability; risk perception; subjective social norms; perceived behavioural control; and peer pressures. No information is provided within the paper review regarding who delivered the intervention or how it was delivered.

Four-hundred and fifty-one drivers from across Scotland were sampled and divided into three groups (pre-driver training, no training, and post-test training). The evaluation of the training programmes was conducted using self-report measures of driving knowledge, behavioural intentions, attitudes, subjective norms, and perceived behavioural control from the subjects. These measures were administered prior to the intervention, immediately after the intervention, and longitudinally at three and nine months. Once the participants had begun driver training, information was also gathered about driving history, the amount of professional driving instruction, and the amount of private practice taken when learning to drive. Additional driving motives were also tested.

Results of the evaluation of the classroom-based pre-driver education intervention revealed that participants who attended this training did not score significantly higher on a driving knowledge test compared with those who did not attend. In addition, the training programme did not have an affect on additional motives (e.g. impressing peers) or in terms of behavioural intentions. Longitudinal measures at three and nine months also did not provide support for the pre-driver education intervention. At nine months after passing their driving test, no differences were found between groups in terms of their attitudes towards driving violations and other motivations associated with the driving task.

A **review of the methodological approach** found that the basic design of the study was relatively sound. The study includes pre- and post-intervention tests and a longitudinal design. The sample size for the evaluation appears reasonable. However, the papers reviewed on this study did not provide specific information on the tests used to measure attitudes and behaviour so it is not possible to comment on any issues related to measures. In addition, the study relied entirely on self-report and did not collect any objective performance data.

In **conclusion**, the approach to the study appear to be sufficiently robust to support the conclusion that the interventions tested in this evaluation did not have any positive effect on young driver attitudes or behaviour. Owing to a lack of information about the specific aspects of the pre-driver intervention (i.e. who delivered it and how it was delivered), it is not possible to comment on specific reasons as to its failure. However, these findings are suggestive that a one-off pre-driver intervention is unlikely to be successful in changing young people's attitudes or behaviour towards driving.

2.3.1.2 Evaluation report – Powney, J., Glissov, P. and Hall, S. (1995) *The Use of Theatre Tours in Road Safety Education: Drinking, Driving and Young People*. Edinburgh: Scottish Council for Research in Education

The **aim** of this evaluation was to compare and contrast the effectiveness of three delivery modes for drinking and driving road safety interventions delivered to pupils in upper secondary classes. The delivery modes were:

- a theatre group;

- road safety officers (RSOs); and

- secondary teachers.

The evaluation **methodology** included three interventions, which had similar basic messages regarding drinking and driving but different modes of delivery. The interventions were:

- a play, *Too Much Punch for Judy,* performed by a touring theatre company experienced in working in secondary schools and with this play. The play, which lasted about 50 minutes, was followed by a workshop led by one of the acting company;

- a presentation by two RSOs (uniformed police officers) one in Scotland and one in Wales. Both used a video taken from a *World in Action* documentary. This was followed by a discussion also led by an RSO; and

- a presentation by a teacher from the Personal and Social Development (PSD) team in the students' own school. This involved the video *It Could Happen to You*, followed by group discussion/workshop activities led by the same teachers.

Qualitative evaluation data were collected from five schools (two Scottish and three Welsh) which included the conduct of focus groups with students who had experienced one of the three interventions and discussions with teachers and course providers. Further discussions were conducted with pupils three months later in order to assess the maintainability of the road safety message.

In addition to focus groups, a questionnaire survey was conducted in the five intervention schools and in a further four schools. All questionnaires aimed to

measure students' knowledge about, and attitudes towards, drinking and driving. Measurement points were before the programme, immediately after the programme and three months after the programme. In total, 2,033 questionnaires were collected and analysed (712 pre-presentation surveys, 708 post-presentation surveys and 613 longer-term surveys).

Results of the evaluation indicated that while students appear to prefer the play over the other presentation modes, their knowledge and attitudes in the following key areas was positively affected by all three-presentation modes:

- more likely to acknowledge that they could not reduce blood alcohol by, for example, drinking hot coffee;

- more likely to accept that even one drink can affect one's ability to drive safely;

- more likely to agree that a zero alcohol limit should be enforced and that their attitudes generally had hardened;

- very likely to agree that the drinking and driving messages were relevant for them irrespective of their age and social circumstances;

- against taking lifts in cases where they suspected the driver had been drinking; and

- alert to circumstances that would make decisions difficult to make (e.g. after drinking).

The report concludes that theatre tours should not be seen as an alternative mode of learning but as a complementary part of a package.

A **review of the methodological approach** to this evaluation raised some issues in relation to its design. In particular, the study had no control group so it was only possible to evaluate the relative effects of each intervention. In addition, any influences, outside of the intervention, that may have affected the attitudes and behaviour of the general population were not assessed.

While pre- and post-intervention measures of attitude and behaviour were taken during the questionnaire, the study design did not enable individual responses to be matched across measurement points, meaning that only average attitude and behaviour scores could be compared. In addition, the study team was not able to ensure that the same sample of students responded to the questionnaire at each measurement point.

While there are some concerns about the design and administration of the quantitative survey, the range of depth of data collected during the focus groups and other qualitative data gathering activities provides useful information on both the behaviour and attitudes of the young people involved and the impact of the various interventions.

In **conclusion**, it seems that all interventions positively affected the attitudes and behaviour of the young people involved. However, the study design precludes any detailed quantitative evaluation of the extent of the impact.

2.3.1.3 Evaluation report – Haworth, N., Kowaldo, N. and Tingrall, C. (2000) *Evaluation of Pre-Driver Education Program*. Monash University

The **aim** of this evaluation was to compare the effectiveness of pre-driver education programmes with an in-car component to those without. Thus, the study attempted to measure the net effects of the in-car component of pre-driver education courses.

The **methodology** used in the study was a self-completion questionnaire, which was sent to 2,000 people aged 18–29 years in Victoria, Australia. Questionnaires were sent to people living in two electoral divisions where it was known that schools provided pre-driver education programmes with an in-car component. In order to control the number of cases and controls,[11] townships within the electoral areas to be sampled were divided in terms of whether residents in these areas were likely to have attended a pre-driver education programme with an in-car component or not. Questionnaires were sent to electors from both groups of townships. Two mailings of the questionnaire were undertaken. Areas where it was known to be likely that those residents would be 'cases' were over-sampled.

The questionnaire covered the following topics:

- driver education background;
- licensing;
- exposure;
- accidents;
- traffic infringements; and
- driving-related attitudes (competitive speed, aggression, perceived responsibility for accidents, extent to which driving is used to reduce tension or increase feelings of personal efficacy and power, and driving inhibition).

Completed questionnaires were received from 687 respondents, 234 cases and 453 controls (34% response rate).

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11 The study was designed to compare drivers who had taken pre-driver education programmes with an in-car component (cases) with drivers who had not (controls). Controls were a mixture of drivers who had undertaken pre-driver education without an in-car component and drivers who had not undertaken a pre-driver education programme.

The main **results** arising from the study were:

- participants in pre-driver education courses with an in-car component obtained learner and probationary licences significantly earlier than controls – however, the groups did not differ in how long they held a learner permit;

- there was no difference between cases and controls in terms of the number of hours of on- and off-road driving they undertook before a learners permit was obtained;

- a 20% reduction in crash risk was found for young drivers who had completed a pre-driver education course with an in-car component – however, this was not statistically significant;

- an approximately 20% reduction in injury crash risk was found for young drivers who had completed a pre-driver education course with an in-car component – however, this was not statistically significant;

- a 30% reduction in single vehicle crash risk was found for young drivers who had completed a pre-driver education course with an in-car component – however, this was not statistically significant;

- a 12% increase in risk was found for having at least one speed offence for those who had completed a pre-driver education course with an in-car component – however, this was not statistically significant;

- a 19% increase in risk was found for having at least two speed offences for those who had completed a pre-driver education course with an in-car component – however, this was not statistically significant; and

- no significant results were found for the effect of pre-driver education courses with an in-car component on driver attitude.

The results of this study suggest that respondents who had completed a pre-driver education course with an in-car component were less likely to have had a crash but more likely to have speed offences. No differences were found in terms of attitude between cases and controls. However, it should be noted that none of these differences reached statistical significance.

A **review of the methodological approach** to this evaluation indicated that the study incorporated a range of measures including driving behaviour (crash and injury information) and attitudinal data. However, the response rate to the survey, particularly in terms of those who had undergone pre-driver education with an in-car component, was low. The achieved sample size did not provide sufficient statistical power to examine changes in accident and injury rates. In addition, because no analysis of non-respondents was possible, it may be that those respondents with poor driving records were more likely to fail to complete the survey.

In **summary**, while this evaluation provides some interesting information about pre-driver education courses with in-car components, the study methodology is not sufficiently strong (in terms of response rate and control over the sample) to confidently conclude that in-car pre-driver education provides any benefits.

2.3.1.4 Evaluation report – Gregersen, N. P. (2004) *Future on the Road. A Road Users Education Project for Primary and Secondary Schools. Final Report*[12]

The **aim** of this study was to evaluate the 'future on the road' traffic programme which was provided to students aged 13–19 (years 7–9 in primary and 1–3 in upper secondary) in the Swedish municipality of Arboga. The education programme had a broader perspective than traditional traffic education programmes. The purpose was to influence values and attitudes regarding car usage and choice of transport modes in order to influence youngsters so that they were more inclined to protect the environment, improve safety in traffic and reduce the communities' costs through undesired effects of the transport system. The programme consisted of 20 lectures per year (120 in total across six years).

The study **methodology** comprised an evaluation covering six years and approximately 500 students (the total population of Arboga students during these years). The programme was evaluated through a process analysis of planning and execution, together with an effect evaluation based on data acquired from questionnaires. Students from three other municipalities similar to Arboga were used as controls.

Results showed that primary school students showed an improvement in their traffic safety behaviour and attitudes towards road safety. In the secondary school part, very few such effects where shown.

A **review of the methodological approach** suggests that the study design appears to be strong, with a large sample size and a method that includes longitudinal measures. However, it is not possible to evaluate the study fully as the majority of the report is not in English, particularly in terms of the outcome measures, which appear to be questionnaires covering knowledge and attitude changes. It is recommended that a full English version of this study be obtained.

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12   Note, only the abstract and summary sections of this report are available in English. The research team was unable to obtain a copy of the full report in English, however, due to the relevance of the report, it was decided to provide the information that was available.

2.3.1.5 Evaluation of Tasmania's pre-driver education programme

- Langford, J. (1997) *Evaluation of Tasmania's Pre-Driver Education Program*. Hobart: Road Safety Branch, Department of Transport, Tasmania.

- Langford, J. (1998) *Further Evaluation of Tasmania's Pre-Driver Education Program*. Hobart: Road Safety Branch, Department of Transport, Tasmania.

The **aim** of Langford (1997) was to determine whether enrolment in either of two school-based pre-driver education programmes delivered in Tasmanian schools was associated with a decreased probability of having a road accident during the first three years of driving. The courses were:

- the defensive driving course given to Year 10 students in many Tasmanian secondary schools by the Department of Transport's road safety education officers; and

- a more comprehensive driver education programme following the defensive driving course, delivered by teachers and aimed at developing those skills and attitudes leading to more responsible road-user behaviour (students satisfactorily completing this extended course are eligible to claim it as a formal school certificate subject).

The defensive driving course consists of a series of 12 one-hour lessons delivered by the RSOs on the theory of defensive driving which includes such topics as 'Starting (the vehicle) up, moving off', 'Corners and curves' and 'Following and stopping'. The comprehensive driver education programme contains the first course (delivered by RSOs) and a further series of 12 one-hour lessons delivered by teachers, aimed at developing those skills and attitudes leading to more responsible road-user behaviour within which issues such as drunk-driving are discussed.

The **method** used in this evaluation is described in the following section. For each of the years 1987–91, all Tasmanian Year 10 students who completed at least one formal school certificate subject were identified from the Tasmanian Secondary Assessment Board examination enrolments. They were then allocated across three groups, such that:

- Group 1 consisted of those students who studied driver education as a formal school certificate subject;

- Group 2 consisted of those students who received defensive driver training only; and

- Group 3 consisted of those students who received neither driver education nor driver training.

A total of 34,159 Year 10 students who attended Tasmanian schools from 1987–91 were allocated to one of three groups. The Department of Transport's licensing

database was then referenced to identify those Year 10 students from 1987–91 who had obtained driver licences by July 1 1996. Each student's licence number was noted. The database was also referenced to identify those Year 10 students from 1987–91 who had reportedly been involved in accidents as drivers by 1 July 1996. Identification was made via the licence number.

Results showed that on a year-by-year basis, students who enrolled in driver education as a formal school certificate subject had significantly fewer accidents during their first year of driving. The difference was no longer significant during the second year of driving and disappeared during the third year. Students who had enrolled in driver education but not as a formal school certificate subject had fewer accidents during each of their first three years of driving but the differences were not statistically significant. This result is interesting given that those who enrolled in driver education obtained their licences at an earlier age than those without driver education.

A **review of the methodological approach** indicates some serious concerns with this evaluation. The authors outline a range of relatively serious issues with the evaluation. The most serious of which is that the student records could not be linked to licensing records in 33% of cases. The authors also note that some of the existing linkages may be erroneous.

In **summary**, while this study appears to suggest some benefits of pre-driver education and, in particular, benefits of providing attitude and knowledge interventions as opposed to defensive driving information only, the methodological concerns with the evaluation are too serious for the results of the study to be accepted. Owing to the methodological concerns about the study reported in Langford (1997), a further evaluation of pre-driver education programmes in Tasmania was undertaken and is described below (Langford, 1998).

The **aim** of Langford (1998) was to evaluate the effectiveness of Tasmania's pre-driver education programmes (described above in Langford, 1997) in terms of their impact on at-risk driving and accidents rates. The methodological approach used in this study was similar to that described in Langford (1997), however a new process for matching academic and driving records was trialled.

Results showed that students who studied driver education as a school certificate subject consistently performed better (albeit barely) than students with no driver education, but the cumulative difference was not statistically significant at any stage. Students who studied driver education but not as a school certificate subject consistently performed worse than students with no driver education However, with one exception, the differences were not statistically significant. Therefore, this study failed to find any benefit of pre-driver education when evaluating the impact of pre-driver education on accident rates and did not provide support for the findings of Langford (1997).

A **review of the methodological approach** used in the evaluation reported in Langford (1998) indicates that the study team had similar issues matching student and licence records as the first study despite trialling a new approach. In addition, the study excluded those without a current licence which eliminated individuals who may have had their licence revoked (e.g. for drink-driving). The approach potentially eliminated an important part of the sample.

In **summary**, the methodological concerns with the studies reported by Langford (1997, 1998) are serious and raise questions about the results of the studies.

2.3.1.6 Evaluation report – Simpson, H., Chinn, L, Stone, J., Elliot, M. and Knowles, J. (2002) *Monitoring and evaluation of safety measures for new drivers.* TRL Report No. 525. Crowthorne: TRL

The **aim** of this study was to evaluate a range of measures to improve the safety of younger drivers. This included one measure of key interest to this study, an evaluation of the pre-driver education programme 'DRIVE'. This programme comprises a video, a teacher/student booklet and a self-help booklet available to RSOs, and through them, to schools, colleges and other interested organisations.

The evaluation **methodology** for the DRIVE evaluation involved a questionnaire assessing students' knowledge of driving safety and attitudes towards driving which was administered before and after taking the DRIVE course. The questionnaire was completed by a treatment group of 546 students at 19 schools. A control group of 641 students who had not completed the courses also completed the pre- and post-treatment questionnaires at the same time as the treatment group. Some controls were from the same schools as the treatment group. However, where necessary, controls were selected from schools that closely matched the treatment school. The majority of students were aged 16–17 years and in Year 12.

Results showed that DRIVE significantly improved both students' knowledge of driving safety and their attitudes towards driving. Students who had participated in DRIVE obtained higher scores on questions about driving safety and were also more likely to rate driving as dangerous after the course. In addition, DRIVE was well received by RSOs, teachers and students.

A **review of the methodological approach** indicated that the evaluation design was acceptable. The only concern noted was that the study relied on self-report measures only and no longitudinal measures were taken. A number of potentially interesting analyses were not conducted, for example no attempt was made to examine gender effects.

In **summary**, it appears that this evaluation suggests that DRIVE may have made some, albeit rather small, positive contributions to students' knowledge of, and attitudes towards, driving safety.

2.3.1.7 Evaluation report – Harre, N. and Brandt, T. (2000) The effectiveness of a Year 10 traffic safety programme. *New Zealand Journal of Educational Studies*, 35(1), 79–83

The **aim** of this study was to examine the impact of a Year 10 traffic safety programme 'Risk Management and Road Safety'.

This 16-lesson intervention was designed to be compatible with the social studies curriculum issued by the Ministry of Education (NZ). It was compiled by teachers from the intervention school, with input from 'Safe Waitakere' (a community injury prevention project operating in Waitakere City), the Land Transport Safety Authority (LTSA) and Dr N. Harre (University of Auckland). At the beginning of each unit, each student was given a workbook containing exercises, a sheet of facts about road injuries, and a graffiti page for recording their reactions. The first six lessons were on risk analysis and encouraged students to analyse the motivations people have for risk and risk taking. The second six lessons involved six lessons from *Go Back You Are Going the Wrong Way*, a pre-driver/driver education course published by the Australian Federal Office of Road Safety and the New South Wales Roads and Traffic Authority (1994, cited in Harre and Brandt, 2000). The lessons cover driver inexperience, road crash statistics, peer pressure, speeding, drugs/alcohol and unlicensed driving.

The intervention evaluation **methodology** involved gathering data on attitudes and self-reported behaviours of the students at the intervention school compared with students from four randomly selected classes in the control school.

The evaluation consisted of two sets of comparisons:

- an examination of the intervention and control students' responses to a questionnaire prior to the intervention and immediately afterwards; and
- a six-month follow-up of students.

The questionnaire covered attitudes towards:

- drinking and driving;
- frequency of being a passenger of a drunk driver in the last three months;
- intention to be a passenger of a drink driver in the next three months;
- frequency of front and back seat-belt wearing;
- fastest acceptable speed in 50 kph and 100 kph speed zones; and
- a nine-item scale asking participants to rate the acceptability of various unsafe and illegal driving behaviours.

Respondents were also asked eight questions concerning knowledge about safe driving and an open-ended question asking respondents to generate as many consequences as possible from a pre-defined scenario.

A total of 151 Year 10 students were involved in the study (61 from the intervention school and 90 from the control school). All students completed the initial pre- and post-test questionnaire. However, only 79% of students completed the six-month follow-up questionnaire. The average age of participants was 14 years.

Results of the analysis of the nine-item scale measuring the acceptability of various unsafe and illegal driving behaviours showed that, on four items, there were indications that the intervention school students' attitudes improved significantly post-intervention relative to the control students' attitudes. However, at the six-month follow-up, no significant differences were revealed between the intervention and control students. This suggests that the relative improvements found in the intervention group immediately after receiving the programme were not sustained.

A **review of the methodological approach** indicated that the study design was reasonable. However, it should be noted that it was a relatively small-scale study and only attitude-based measures were collected.

In **summary**, the results of this evaluation suggest that traffic safety education at the pre-driver level may be a promising way to positively affect students' attitudes in the short term. The authors state that, while the improvements were not maintained at re-testing six months later, this could indicate the need for further 'injections' of safety messages when adolescents are in the process of developing driving habits. The key strengths of this programme in the authors' view were its integration with a mainstream subject area and the fact that it required students to engage positively in activities consistent with positive attitudes towards road safety.

2.3.1.8 Evaluation report – Elkington, J. (2005) *Evaluation of the Rotary Youth Driver Awareness (RYDA) Road Safety Education Programme*. Report prepared by Jane Elkington and Associates and funded by the Motor Accidents Authority of NSW

The **aim** of this study was to examine the effectiveness of a youth driver awareness programme developed by the Rotary community organisation.

This programme provides attitude and behaviour training for Year 11 students. Rotary Youth Driver Awareness (RYDA) aims to provide practical road safety and other information relevant to an overall responsible approach to the driving experience.

The intervention evaluation **methodology** involved three activities:

- a student survey administered on three occasions (pre-intervention, immediately post-intervention and three months post-intervention);

- a survey of teachers who attended the programme; and

- interviews with key road safety experts familiar with the programme.

Approximately 1,200 students from 17 schools were involved in the evaluation. Thirty-two teachers completed surveys, and interviews were conducted with eight key informants.

Results showed that the intervention programme achieved positive changes in knowledge and attitudes in almost all areas immediately after the conclusion of the programme. However, there were little data to suggest that the programme had a long-term impact or actually changed risk-taking behaviour.

A **review of the methodological approach** indicated that the study design was reasonable. The study involved a range of measures and collected data from several different groups. It is notable that no process evaluation of the programme was conducted.

In **summary**, the results of this evaluation suggest that, while the RYDA programme may have had some short-term impact on attitudes towards road safety, there is little to suggest that it resulted in long-term improvements in attitude or behavioural change.

2.3.1.9 Evaluation report – Green, J., and Cattan, M. (2005) *SMARTRISK UK Heros Evaluation.* Report prepared by Leeds Metropolitan University, Centre for Health Promotion Research

The **aim** of this study was to examine the effectiveness of the SMARTRISK UK Heroes programme.

The Heroes show is a multimedia presentation designed to appeal to young people of secondary school age. It involves an audiovisual presentation, a presentation by an injury survivor describing how the injury changed their lives, and a question and answer session with the injury survivor. The programme suggests five key strategies to avoid serious injury and death:

- buckle up;

- drive sober;

- look first;

- wear the gear; and

- get trained.

The intervention evaluation **methodology** involved three activities:

- a literature review of previous evaluations of the programme;

- interviews with key informants; and

- observations of the programme.

Results showed that the SMARTRISK heroes programme results in short-term gains in knowledge, attitudes and behavioural intentions. However, these changes are not sustained when measured three months after the intervention. While the programme does not appear to lead to a reduction in risk-taking behaviours, it has been found to result in significant changes in the performance of desirable behaviours.

A **review of the methodological approach** indicated that the study design was reasonable. The literature review is well conducted and is integrated with both interviews and observations. No process measures were taken during the evaluation.

In **summary**, the results of this evaluation suggest that, while the SMARTRISK Heroes programme may have had some short-term impact on attitudes towards road safety, there is little to suggest that it resulted in long-term improvements in attitude or behavioural change.

2.3.1.10 DeKalb study of novice driver education (cited in McKnight, 2006).

The DeKalb study was conducted in the USA in 1983 and was intended to be a definitive evaluation of school-based driver training. The study design called for some 16,000 high school students to be randomly allocated across three groups, so that:

- Group 1 received a full 'state of the art' course of driver education;

- Group 2 received only the minimum education necessary for a licence; and

- Group 3, the control group, received no formal driver education.

Results showed that students from the two experimental groups had significantly fewer accidents and fewer violations during the first six months of driving than students from the control group. However, the study also showed that after a further 18 months of driving, these differences completely disappeared. Further analysis showed that driver education led to earlier licensing which meant more crashes per capita for the two experimental groups. The conclusion was that neither form of driver education could be viewed as an effective road safety countermeasure.

2.3.1.11 General summary

The pre-driver evaluations reviewed in support of this research question generally provide relatively limited support for the effectiveness of pre-driver education. Three studies (Powney *et al*., 1995; Simpson *et al*., 2002; Harre and Brandt, 2000) provide some indications that pre-driver education interventions positively impact on the road safety related attitudes and self-reported behaviours of young people in the short term. However, of the two studies that conducted follow-up measures some months after the intervention, only one found that any attitudinal/knowledge improvements had been sustained. These studies, taken in total, provide some support for the effectiveness of pre-driver education interventions in terms of effecting short-term attitude and knowledge improvements. However, they provide little indication that these improvements will be sustained over time. In addition, the DeKalb study suggests that practice driver training prior to licensing may increase crash risk through earlier licensing of novice drivers.

It is notable that the three studies listed provided a range of interventions (e.g. theatre groups, RSO presentations, teacher presentations) and included both one-off educational interventions and interventions that lasted over several sessions. Interestingly, none of these approaches appeared to yield notably better results than others. Therefore, it cannot be concluded, based on the evidence provided in the reports, that any particular type of intervention is more effective than others.

None of the evaluations reviewed provided any evidence that pre-driver education interventions had an impact on crash or infringement rates. However, the two studies reviewed that attempted to address this issue both had notable methodological issues, which mean that no conclusions can be drawn from them. Further study on this issue is required.

During this review several evaluations were identified that could not be gathered by the study team. These studies are listed below. It is recommended that these evaluations be accessed and reviewed in order to evaluate further the issue of pre-driver education:

* BSM Ignition evaluation study;

* DSA Arrive Alive evaluation study; and

* Road Aware Project NSW (Australia) Keys for Life evaluation study.[13]

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13   The evaluation of this programme is currently ongoing and is being conducted by the Injury Research Centre, University of New South Wales (http://www.irc.uwa.edu.au).

2.3.2 RQ19 – What features of pre-driver education schemes have been identified as particularly effective (e.g. timing of delivery, content, etc.)?

The aim of this research question was to identify features of pre-driver education courses that have been shown, through evaluation, to be effective. Therefore, the studies outlined in the previous section were reviewed to identify indicators of effective course analysis, design and delivery. However, as discussed in the previous section, the evaluations of a significant proportion of the programmes indicated that they did not result in positive and lasting changes to young peoples' attitudes or behaviour. Therefore, no clear indications about effective pre-driver education course features could be drawn from their findings.

In order to address this research question, a more general review of effective course analysis, design and delivery features was conducted, drawing on expert comments gathered throughout the literature review.[14] Many of the comments relate specifically to the design of pre-driver education programmes, however, a few relate to either general road safety interventions or driver training. Where the comment does not specifically relate to pre-driver education, this has been identified.

2.3.2.1 Analysis

Comments by road safety experts indicate that programmes, where the following analytical activities have been undertaken, are more likely to be effective:

- Programmes with a thorough analysis of training requirements:
  - Elliot (2000; cited in OECD, 2004) states that road safety education programmes need to identify the safe behaviours to be targeted. These are best identified by analysing the task and defining the psychological skills and underpinning behaviour, determining the level of skill that can be developed in children of different ages and evaluating the impact of education and training on the performance of these skills.
  - Horneman (1993) commented that a rigorous analysis of course content and design incorporating qualitative and quantitative data is required to bring about an effective driver training course with clear and specific (behavioural) objectives for each component, which can be readily evaluated. Note, this comment relates to driver training.

- Programmes with clear identification of the target audience:
  - A report published by the Department for Transport (2000) stated that successful road safety campaigns should target specific groups of drivers (e.g. young males) and specific behaviours (road traffic violations). The latter can be successfully targeted by focusing on the

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14 It should be noted that this information will be used in conjunction with theoretical literature to develop good practice guidance.

constructs of the TPB – perceived behavioural control, attitudes and subjective norm. Note, this comment relates to driver training.

2.3.2.2 Design

Comments by road safety experts indicate that programmes with the following design features are more likely to be effective:

- Programmes that use a range of interventions to target an issue:
  - Elkington (2005) commented that a key strength of the RYDA programme was that it supported messages received elsewhere in a different format.

- Involvement in the design of the programme of those who will be delivering the course, where possible:
  - Gregersen (2004) commented that teachers who will participate in the education should also be involved in the planning process where possible so that they feel engaged.

- A design that incorporates significant student participation:
  - Loreno (2001) stated that recent trends in general education could assist in improving the effectiveness of driver training. These include cooperative learning, constructivism, student and peer involvement, and automated, individualised instruction. Note, this comment relates to driver training.

- Content that focuses on a range of road safety related attitudes but also incorporates skills that young people require to translate attitudes into behaviour (e.g. hazard anticipation, strategies for handling peer pressure):
  - pre-driver education should teach the following attitudes: respect for the law; care and consideration for other road users; intention to cultivate safe driving skills; and ability to anticipate hazards when driving (Novice Drivers' Safety 02);
  - for pre-teens and adolescents, safety skills need to be reinforced and positive attitudes towards safe behaviour, such as strategies for handling peer pressure and risks, need to be developed (OECD, 2004);
  - Harre and Brandt (2000) comment that a key strength of the programme they evaluated was that it required students to engage in activities consistent with positive attitudes towards road safety – it was felt that this may help train them in skills associated with safe passenger and driver behaviours;
  - in a report by Youthsafe (2001) it is commented that driver education programmes should use interactive sessions and emphasise the development of skills in identifying and choosing safe alternatives to risk situations – note, this comment relates to driver training;
  - pre-driver education should include information about passenger and pedestrian safety as well as driver safety (Elkington, 2005) – the

programme should focus on students as road users not just drivers; and

- pre-driver education should include the following content: knowledge and attitudes towards driving; safe celebrating; driver distraction; passenger safety; speeding; complexity of driving task; non-behavioural risk factors (state of car, weather, etc.); experience and impact on driving (Elkington, 2005).

2.3.2.3 Delivery

Comments by road safety experts indicate that programmes with the following course delivery features are more likely to be effective.

- Parents and other community leaders should be involved in course delivery:
  - ODS Ltd and Market Research UK Ltd (2004) stated that participants in their research suggested that parents should be involved more in pre-driver programmes as co-instructors. The parent would work alongside a teacher to reinforce and help develop safe driving attitudes and awareness. This would also have the benefit of acting as a refresher for the parent whose own driving skills may have been affected by bad habits. Driving-related training was seen as a key way of raising road safety awareness with teenage children.
  - Loreno (2001) commented that the effective reduction of novice drivers' crashes would also likely require linking drivers' education more closely with parental and conventional community influences, graduated licensing and other influences, such as incentives and disincentives. Note, this comment relates to driver training.
  - Elkington (2005) commented that a key strength of the RYDA programme was that it involved community leaders and people affected by road trauma in an interactive way.
  - Elkington (2005) commented that a key strength of the RYDA programme was that it provided training to teachers and enabled them to develop complementary interventions.

- The programme should be delivered over several sessions where possible:
  - Christie (2001) commented that it is possible that education delivered over several years, perhaps through secondary schools, to foster the development of safe attitudinal/motivational factors, using driver testing as a motivator, may prove effective as an alternative to short-term driver training. However, the author notes that there is, as yet, no evidence to prove that programmes addressing these factors lead to changes in attitude, behaviour or crash risk (Christie, 2001).
  - In a report by Youthsafe (2001), it is commented that driver education programmes aiming to achieve attitude change should be conducted over several sessions, focus on one issue and use teachers who have been trained in health education. Note, this comment relates to driver training.

- Williams (2001) commented that using driver education courses to teach and motivate young people to apply safe driving practices has not worked very well. There are several reasons why this is so. First, the typical driver education course is of short duration, readily overwhelmed by ongoing parental, peer and other social influences. There should not be the expectation that brief inputs like this will be able to change the attitudes and motivations that are known to be so influential in shaping driving styles and crash involvement. Note, this comment relates to driver training.

- Where possible, and safe, education should be carried out in relevant environments:
  - much of the education should be carried out in real traffic or other relevant application environments. This is appreciated by students and gives them possibilities to practice problem-based learning techniques (Gregerson, 2004).

- If the educational programme is to be undertaken in schools, it should be embedded within the curriculum:
  - Harre and Brandt (2000) commented that one of the major strengths of the programme they evaluated was that it was embedded in the curriculum, which ensured that all intervention tasks were properly carried out.

- Information should be standardised so that all presenters deliver it consistently (Elkington, 2005).

- Presenters should include debriefs at the end of each session to summarise the key messages (Elkington, 2005).

2.3.2.4 Summary

In summary, the results of this research question provide some indications about course design, delivery and content techniques that may result in more effective pre-driver education. However, it should be noted that few of these features have been subjected to a thorough evaluation and the evidence for them is relatively limited. Therefore, their effectiveness in terms of pre-driver education remains unproven.

2.3.3 RQ20 – Does road safety related education prior to the commencement of a pre-driver education course influence the effectiveness of the course?

The aim of this research question was to evaluate any available evidence discussing whether pre-driver education should be placed within a general road safety education pipeline. Training theory would suggest that it is important to provide regular interventions that are relevant to the situation of the learner and build progressively on previous education. Therefore, it was of interest to establish

whether education prior to undertaking pre-driver education enhanced the effect of the pre-driver education course.

The literature review did not identify any information that directly addressed this question. However, a number of reports made comments suggesting that progressive, regular education was preferable to one-off courses. For example, Bailey (1995; cited in OECD, 2004) comments that as children progress through school, continuing, integrated road safety education in several curriculum areas is preferable to occasional talks on road safety and other, less integrated, approaches. Fuller and Bonney (2002) also state that:

'It makes sense to teach learners what they need to know and when they need to know it. Information should be presented in the context of developing a mental representation of knowledge and attitudes, which are tailored to the students' level of understanding and his/her needs at each age level. What is needed is a syllabus for roadway use that spans the entire duration of formal education and beyond, and is linked to the roadway needs and challenges the developing person is likely to experience. The essential elements of driver education and attitudes should be located at appropriate points within the syllabus. This ensures that information is presented when it is most relevant to students and protects against skill/knowledge fade.'

While there is obvious support for an integrated educational approach to pre-driver education, no evidence was found during this review that indicated that this approach results in superior educational outcomes for young people. However, information outlined in earlier research questions regarding the influence of parents and peers on young peoples' road safety attitudes does suggest that early and sustained educational initiatives would be required in order to counter potentially negative influences from other quarters.

2.4   Pre-driver education programme effectiveness

Research Objective 1e
Assess how effective current programmes are and how this is measured.

2.4.1 RQ21 – How is the effectiveness of pre-driver education typically measured?

Many criteria can be used to evaluate training/educational programmes. In commercial contexts, evaluators of training courses often use Kirkpatrick's four levels of training evaluation (Kirkpatrick, 1994). Kirkpatrick's levels are:

- reaction – how the trainees felt about the training experience;

- learning – did their knowledge/skills/attitudes increase or improve after the training;

- behaviour – did the training result in a behavioural change outside of the training environment; and

- results – did the training result in improved organisational performance (in the driving context this might be measured in terms of accident statistics at a population level).

All four of Kirkpatrick's levels are essentially measures of training outcomes. In addition to considering outcomes, a training evaluation might consider the quality of the processes used to develop and implement the training (e.g. identification of training requirements) and efficiency criteria such as cost-effectiveness. The following section lists the measures used to evaluate the pre-driver education courses reviewed in this report.

2.4.1.1 Outcome measures

Within the evaluations reviewed as part of this study, two main outcome measures were employed. These were knowledge and attitude measures (often administered before, immediately after and 'x' months after an intervention) and performance measures, including measures of crashes and driving infringements.

Attitude/knowledge measures used included the following:

- The evaluation of the Scottish Executive New Drive Project (Carcary, et al, 2001) was conducted using self-report measures of driving knowledge, behavioural intentions, attitudes, subjective norms and perceived behavioural control. In addition, extra driving motives were tested using seven scripted driving scenarios that were created with a choice of responses that were graded as being high in extra motives to low in extra motives, to give an overall measure of driving choices or driving expectancies. These measures were undertaken prior to the intervention, immediately after the intervention and longitudinally at three and nine months.

- Harre and Brandt (2000) used an attitudes and behaviours questionnaire for their evaluation. The questionnaire covered attitudes towards drinking and driving, frequency of being the passenger of a drinking driver in the last three months, intention to be the passenger of a drinking driver in the next three months, frequency of front and back seat-belt wearing, the fastest speed they believed that a driver could safely go under good conditions in a 50 kph and 100 kph zone, and a nine-item five-point Likert Scale asking participants to rate the acceptability of various dangerous and illegal driving behaviours. This questionnaire was given to participants prior to the intervention, immediately after the intervention and longitudinally at six months.

- Haworth *et al.* (2000) used a questionnaire that included questions about driving-related attitudes (competitive speed, aggression, perceived responsibility for accidents, extent to which driving is used to reduce tension or increase feelings of personal efficacy and power, and driving inhibition) for their evaluation.

- Powney *et al.* (1995) used a questionnaire aiming to measure student knowledge about, and attitudes towards, drinking and driving administered before, immediately after, and three months after the intervention.

- Simpson *et al.* (2002) evaluated the DRIVE pre-driver education programme using a questionnaire assessing students' knowledge of driving safety and attitudes towards driving which was administered before and after taking the DRIVE course.

2.4.1.2 Driving performance based measures

- Langford (1997, 1998) measured traffic accident and driving infringement rates by linking student records with licensing records by searching for the student in a licensing database. A total of 34,159 Year 10 students who attended Tasmanian schools from 1987–91 were allocated to one of three groups (one of two pre-driver education courses or no pre-driver training). The Department of Transport licensing database was then referenced to identify those Year 10 students from 1987–91 who had obtained driver licences by 1 July 1996. Each student's licence number was noted. The database was also referenced to identify those Year 10 students from 1987–91 who had reportedly been involved in accidents as drivers by 1 July 1996. Identification was made via licence number. However, linking these records proved problematic and Langford reports a large number of failed or incorrect matches.

- Haworth *et al.* (2000) used a questionnaire to ask both pre-driver course attendees and controls about whether they had a driver's licence, driving infringements and accidents.

Only one study reviewed took measures of student reactions of the education programme. Powney *et al.* (1995) used focus groups and interviews with students, teachers and course providers to gather information about reactions to three different pre-driver education courses.

2.4.1.3 Process measures

Interestingly, only one of the studies identified in this review undertook any form of process analysis. This was the evaluation reported by Gregersen (2004) who conducted an analysis of the planning and execution of the educational programme under review and combined this with an effect evaluation acquired from data in questionnaires. This failure to use process measures may be because the course

evaluators were involved with the course development. However, it does mean that most evaluations did not assess the identification of training requirements or the target audience.

2.4.1.4 Efficiency measures

None of the evaluations reviewed as part of this study undertook efficiency measures.

In summary, the most common measures of pre-driver education course effectiveness in the evaluation studies reviewed were questionnaire-based knowledge and attitudinal measures. This equates to **learning** in Kirkpatrick's evaluation levels. Some measures of **behaviour** were also attempted (Langford, 1997, 1998; and Haworth *et al.*, 2000). However, the study by Langford illustrates the technical difficulties of this type of analysis. Engstrom *et al.* (2003) also comment on another issue that makes it difficult to assess driver education (or pre-driver) education at the **behavioural** level. This is statistical power – relatively few high schools students take part in driver education programmes and the probability of a crash is low. To highlight the statistical problem, consider that, if the total fatalities in New South Wales in one year was, for example, 700 and if 200 of these involved drivers aged 16–24 years, and if a driver improvement programme saved the lives of 5% of these drivers, the resulting saving of 10 fatalities would be extremely difficult to detect as road tolls fluctuate by more than this each year (Horneman, 2003).

2.4.2   RQ22 – What are the existing gaps in knowledge?

The results of RQ22 are presented in the section 'Knowledge gaps' in the Executive summary of this report.

2.4.3   RQ23 – What factors enable or inhibit the expression of a road safety attitude as behaviour?

Much of the research cited in previous sections of this report discusses the road safety related attitudes and behaviour of young people. However, attitude behaviour models show that a range of factors can influence the relationship between attitudes and behaviours. The aim of this section is to investigate factors that might enable or inhibit young people in expressing road safety attitudes as behaviour. The key factors that were identified during the review were individual factors, such as personality, and external factors, such as peer pressure.

2.4.3.1 Individual factors

There is an extensive body of literature on the influence of factors such as personality on young drivers. It is beyond the scope of this review to discuss these

issues in detail. However, a brief summary of comments recorded during the review is provided below.

Lerner (2001) commented that a range of well-designed studies have found that teenage drivers are often influenced by 'extra motives'. These are motivations unrelated to the primary driving task and include thrill seeking, competitiveness, aggression, sense of mastery and impressing peers. In addition, research has identified 17–20 year-olds, and young males in particular, as deriving personal identity and empowerment from driving. It has been found that young males enjoy driving more, and are more inclined to drive for pleasure and seek thrills (Association of British Insurers, 2005). Beirness and Simpson (1988) note that the personality characteristic associated with these behaviours (known as sensation seeking) relates to crash involvement.

Interestingly, scores on this scale on a personality test scale tend to peak during adolescence (at age 16) and decline with age (Zuckerman, 1979). While no evidence for the impact of individual factors such as personality on general road user behaviour (walking, riding and being a passenger) was found, it seems likely that they could influence behaviour in these contexts as well.

2.4.3.2 External factors

One of the key factors influencing the behaviour of young drivers identified during this review was their peers. Lerner (2001) conducted analyses, which showed that more than half of fatal crashes involving 16-year-old drivers had teenage passengers, and only teenage passengers, present. Chinn *et al*. (2004) also found that adolescents are more likely to engage in unsafe road-user behaviour (pedestrian and cyclist) when they are with peers than on their own, and that adolescents rated their own behaviour as more risky when they were with friends. This indicates that peers can have a negative influence on the behaviour of young people in all spheres of road use.

Interestingly, boys aged from 11 report that they will be more influenced by the expectations of their friends while driving than girls ('will you drive the way your friends expect you to?'), although this tendency decreases with age (Waylen and McKenna, 2002a). In addition, young drivers, males in particular, stated that as passengers they would never discourage male peers from engaging in risky driving behaviours, and might even encourage them to engage in these behaviours. As a driver, many of the young males commented that they too would engage in risky driving practices to show off even if not explicitly asked to by their male peers travelling as passengers (Mitsopoulos and Regan, 2001). It appears that teenage peer groups may not only require their members to obtain a licence, they may also require their members to adopt a lifestyle and, consequently, a driving style that emphasises deviant behaviour and thrill seeking (Tasca, 2001).

The external factors identified during this review have some links to the TPB through the 'subjective norms' component of the theory. The presence of peers might interrupt the relationship between attitudes and behaviour by introducing negative subjective norms.

3 LITERATURE REVIEW BIBLIOGRAPHY DATABASE

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44	Coutts, M. and Styles, T. (2004) *The Potential for Early Childhood Learning to Influence Road Safety*. Contract Report for NRMA – ACT Road Safety Trust.	Coutts *et al.* (2004)	Yes (RL)	No
45	Crites, S. L., Fabrigar, L. R. and Petty, R. E. (1994) Measuring the affective and cognitive properties of attitudes: conceptual and methodological issues. *Personality and Social Psychology Bulletin,* 20, 619–634.	Crites *et al.* (1994)	Yes (CD)	No
46	D'Amico, E. J. and Fromme, K. (2002) Brief Prevention for Adolescent Risk-taking Behaviour. *Addiction,* 97, 564–574.	D'Amico *et al.* (2002)	Yes (RL)	Yes
47	DeJong, W. and Atkin, C. K. (1995) A Review of National Television PSA Campaigns for Preventing Alcohol and Impaired Driving, 1987–1992. *Journal of Public Health Policy,* 57–77.	DeJong and Atkin (1995)	Yes (RL)	No
48	DeJoy, D. M. (1989) The optimism bias and traffic accident risk perception. *Accident, Analysis and Prevention,* 21(4), 33–340.	DeJoy (1989)	Yes (RL)	No
50	Department for Transport (2000). *Novice Drivers' Safety.* Road Safety Research Report No. 2. London: Department for Transport.	DFT – Novice Driver Safety	Yes (RL)	No
54	Department for Transport (2000) *The Attitudinal Determinants of Driver Violations*. Road Safety Research Report No. 13. London: Department for Transport.	DfT (2000)	Yes (RL)	Yes
55	Driskell, J. E., Willis, R. P. and Cooper, C. (1992) Effect of overlearning on retention. *Journal of Applied Psychology,* 77(5), 615 – 622.	Hard Copy	Yes (CD)	Yes
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62	Fabrigar, L. R. and Petty, R. E. (1999) The role of the affective and cognitive bases of attitude in susceptibility to affective and cognitively based persuasion. *Personality and Social Psychology Bulletin, vol. 25, pp 363-381.*	Fabrigar *et al.* (1999)	Yes (CD)	No
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	Fazio, R.H. (1986). How do attitudes guide behaviour? In R.M. Sorrentino and E.T. Higgins (Eds), Handbook of motivation and cognition (pp 204-243). New York: Guildford.	Hardcopy	Yes (CD)	Yes
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93	Howitt, D., Billig, M., Cramer, D., Edwards, D., Kniveton, B., Potter, J. and Radley, A. (1989) *Social Psychology and Continuities*. Open University Press.	Hardcopy	Yes (HL)	No
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105	Kweon, Y-J. and Kockelman, K. M. (2003) Driver attitudes and choices: seatbelt use, speed limits, alcohol consumption and crash histories. *82nd Annual Meeting of Transportation Research Board,* Washington, D.C, January 12-16, 2003.	Kweon *et al.* (2003)	Yes (RL)	No
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107	Laapotti, S., Keskinen, E. and Rajalin, S. (2003) Comparison of young male and female I drivers' attitudes and self-reported traffic behaviour in Finland in 1978–2001. *Journal of Safety Research,* 34, 579–587.	Laapotti *et al.* (2003)	Yes (RL)	Yes
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114	Loreno, L. P., Clinton, K. M. and Black, D. (2000a) *Training to Improve the Decision Making of Young Novice Drivers. Volume I, Final Report*. Washington, D.C.: National Highway Traffic Safety Administration.	Loreno *et al.* (2000a)	Yes (RL)	Yes
115	Loreno, L. P., Clinton, K. M. and Black, D. (2000b) *Training to Improve the Decision Making of Young Novice Drivers. Volume II, Literature Review: Consistency not Capacity: Cognitive, Motivational, and Developmental Aspects of Decisions in Young Novice Drivers*. National Highway Traffic Safety Administration.	Loreno *et al.* (2000b)	Yes (RL)	Yes
116	Loreno, L. P. (2001) Driver education content. In *Driver Education at the Crossroads. Proceedings from the Committee on Operator Education and Regulation (Report No. E-C024), Transportation Research Circular*. Washington, D.C.: Transportation Research Board.	Loreno (2001)	Yes (RL)	Yes
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121	Maycock, G. (2002b) Novice Driver Accidents and the Driving Test. Prepared for the Road Safety Division, Department for Transport, Local Government and the Regions. London: DTLR.	Maycock (2002b)	Yes (RL)	No
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123	Mayhew, D. R. and Simpson, H. M. (2002) *The Safety Value of Driver Education and Training*. London: British Medical Association.	Mayhew and Simpson (2002)	Yes (RL)	No
124	Mayhew, D. R., Simpson, H. M. and Robinson, A. (2006) *The Safety Value of Driver Education and Training*. London: British Medical Association. http://ip.bmijournals.com	Mayhew *et al.* (2006)	Yes (RL)	No
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127	McKnight, A. J. and McPherson, K. (1986) Evaluation of peer intervention training for high school alcohol safety education. *Accident Analysis and Prevention,* 18(4), 339–347.	McKnight and McPherson (1986)	Yes (RL)	Yes
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134	Mueller, D. J. (1986) *Measuring Social Attitudes: A Handbook for Researchers and Practitioners*. New York: Teacher's College Press.	Hardcopy	Yes (CD)	Yes
135	Nesdale, N. and Flesser, D. (2001)Social identity and the development of children's group attitudes. *Child Development,* 72(2), 506.	Hardcopy	Yes (HL)	No
136	Organisation for Economic Co-operation and Development (OECD) (2004) *Keeping Children Safe in Traffic*. Paris: OECD.	OECD (2004)	Yes (RL)	Yes
137	Organisation for Economic Co-operation and Development (OECD) (2002) *Safety on Roads. What's the Vision?* Paris: OECD.	OECD (2002)	Yes (RL)	Yes
138	ODS Ltd and Market Research UK Ltd (2004) *Parental attitudes to road safety education*. Report for the Scottish Executive for Social Research. Edinburgh: Scottish Executive.	ODS Ltd.(2004)	Yes (RL)	Yes
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140	Olson, J. M., Vernon, P. A., Harris, J. A. and Jang, K. L. (2001) The heritability of attitudes: a study of twins. *Journal of Personality and Social Psychology*, 80, pp 845-860	Hardcopy	Yes (HL)	No

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	Petty, R.E., and Cacioppo, J.T. (1986). The elaboration likelihood model of persuasion. Cited in O'Keefe, D. (2002) *Persuasion: Theory and Research*. London: Sage Publications pp 137-167.	Hardcopy	Yes (CD)	Yes
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147	Department for Transport (1999) *Road Safety and Child Development Research: A Summary Analysis*. Road Safety Research Report No. 5. London: Department for Transport.	Road Safety and Child Development Research Summary	Yes (RL)	No
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162	Simpson, H., Chinn, L, Stone, J., Elliot, M. and Knowles, J. (2002) *Monitoring and evaluation of safety measures for new drivers.* TRL Report No. 525. Crowthorne: TRL.	Simpson *et al.* (2002)	Yes (RL)	Yes
163	Smith, M. F. (1994) *Research Agenda for an Improved Novice Driver Education Program*. Washington D.C.: US Department of Transport, National Highway Traffic Safety Administration.	Smith (1994)	Yes (RL)	No
164	Smith, M.F. (2001) Safety needs of novice drivers: driver factors. In *Driver Education at the Crossroads. Proceedings from the Committee on Operator Education and Regulation* (Report No. E-C024), Transportation Research Circular. Washington, D.C.: Transportation Research Board.	Williams (2001)	Yes (RL)	Yes
165	Stead, M., Mackintosh, A. M., Tagg, S. and Eadie, D. (2002) *Changing Speeding Behaviour in Scotland: An Evaluation of the 'FOOLSSPEED' Campaign*. Scottish Executive. http://www.scotland.gov.uk/library5/transport/csbs.pdf (accessed 09.12.05)	Stead *et al.* (2002)	Yes (RL)	Yes
166	Stradling, S. G., Kinnear, N. and Mann, H. (2005) *Evaluation of Brake House Trust Driver Education Scheme*. Edinburgh: Napier University.	Stradling *et al.* (2005)	Yes (RL)	No
170	Sumer, N., Ayvasik, H.B. and Er, N. (2005) Cognitive and Psychomotor Correlates of Self-Reported Driving Skills and Behaviour. *Proceedings of the Third International Driver Symposium on Human Factors in Driving Assessment, Training and Vehicle Design*.	Sumer *et al.* (2005)	Yes (RL)	No
171	Tasca, L. (2001) Mobility needs of novice drivers. In *Driver Education at the Crossroads. Proceedings from the Committee on Operator Education and Regulation* (Report No. E-C024), Transportation Research Circular. Washington, D.C.: Transportation Research Board.	Williams (2001)	Yes (RL)	Yes
172	*Theories into Practice (TIP) Attitudes. Theories into Practice Database*. http://tip.psychology.org/attitude.html (accessed 06.12.05)	Theories into Practice Attitudes	Yes (CD)	No

Ref.	Reference	S/C file name	Reviewed	Cited
174	THINK! (2004) *Guidelines for Evaluating Road Safety Education Interventions*. London: Department for Transport.	THINK! Evaluation guide	Yes (RL)	No
176	Tolmie, A., Thomson, J., Foot, H., Whelan, K., Sarvary, P., Morrison, S., Towner, E., Burkes, M., and Wu, C. (2003) *Training Children in Safe Use of Designated Crossings.* Road Safety Research Report 34. London: Department for Transport.	Hardcopy	Yes (RL)	No
177	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, 1–25.	Hardcopy	Yes (RL)	No
178	Tolmie, A., Thomson, J. A., O'Connor, R., Foot, H. C., Karagiannidou, E., Banks, M., O'Donnell, C. and Sarvary, P. (2006) *Roles of Skills, Attitudes and Perceived Behavioural Control in the Pedestrian Decision Making of Adolescents Aged 11–15 years*. London: Road Safety Division, Department for Tranpsort.	Tolmie (XXXX)	Yes (RL)	No
179	Towles-Schwen, T. and Fazio, R. H. (2001) On the origins of racial attitudes: correlates of childhood experiences. *Personality and Social Psychology Bulletin,* 27(2), 162–175.	Towles-Schwen and Fazio (2001)	Yes (HL)	No
180	Transport Research Laboratory (2003) *Evaluation of Road Safety Education*. Crowthorne: TRL.	TRL (2003)	Yes (RL)	No
181	Triandis, H.C. (1972) Attitude and Attitude Change. Contemporary Sociology, Vol. 1, No. 4 (jul., 1972), pp. 328-329.	Hardcopy	Yes (CD)	No
182	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 and Rundmo (2002)	Yes (RL)	Yes
183	Vargas, P. T., Hippel, W. V. and Petty, R. E. (2004) Using partially structured attitude measures to enhance the attitude-behaviour relationship. *Personality and Social Psychology Bulletin*.	Vargas *et al.* (2004)	Yes (CD)	No
184	Vernick, J. S., Li, G., Ogaitis, S., MacKenzie., Baker, S. P. B. and Gielsen, A. C. (1999) Effects of high school driver education on motor vehicle crashes, violations and licensure. *American Journal of Preventive Medicine*. 16, 40–46.	Vernick *et al.* (1999)	Yes (RL)	No

Ref.	Reference	S/C file name	Reviewed	Cited
185	Walker, L. J. (1989) A longitudinal study of moral reasoning. In D. Messer and J. Dockrell (eds) *Developmental Psychology*. London: Arnold.	Hardcopy	Yes (HL)	No
186	Waylen, A. and McKenna, F. (2002a) *Cradle Attitudes – Grave Consequences: The Development of Gender Differences in Risky Attitudes and Behaviour in Road Use.* Summary report prepared for the AA Foundation for Road Safety Research by University of Reading. Basingstoke: AA Foundation for Road Safety	Waylen and McKenna (2002)	Yes (RL)	Yes
187	Waylen, A. and McKenna, F. (2002b) *Cradle Attitudes – Grave Consequences: The Development of Gender Differences in Risky Attitudes and Behaviour in Road Use*. Report prepared for the AA Foundation for Road Safety Research by University of Reading. Basingstoke: AA Foundation for Road Safety	Hardcopy	Yes (RL)	Yes
188	Waylen, A. and McKenna, F. (2002c) Attitudes to driving in pre-17-year-olds. In *Behavioural Research in Road Safety*. *Twelfth Seminar*. London: Department for Transport.	Dft (2002)	Yes (RL)	Yes
190	Williams, A. F., Lund, A. K. and Preusser, D. F. (1985) Driving behaviour of licensed and unlicensed teenagers. *Journal of Public Health Policy*, 6(3), 379–393.	Hardcopy	Yes (RL)	No
191	Williams, A. F. (2001) Safety needs of drivers: lifestyle factors. In *Driver Education at the Crossroads. Proceedings from the Committee on Operator Education and Regulation* (Report No. E-C024), Transportation Research Circular. Washington, D.C.: Transportation Research Board.	Williams (2001)	Yes (RL)	Yes
	Williams, D, ''Tiff, Jeremy and Mike show how not to do it, says GEM'', Guild of Experienced Motorists News, 12 July 2002. Cited in Ettinghausen, S. (2003) *Getting Through! Effective Road Safety Communication with Young Drivers*. Unpublished.	Ettinghausen (2003)	Yes (CD)	Yes
192	Williams, A. F. (2003) Views of U.S. drivers about driving safety. *Journal of Safety Research,* 34, 491–494.	Williams (2003)	Yes (RL)	No
193	Wood, D. and Wood, H. (1998) Vygotsky tutoring and learning. In D. Messer and J. Dockrell (eds) *Developmental Psychology*. London: Arnold.	Hardcopy	Yes (HL)	No
194	Youthsafe (2001) *The Young Driver Issue. Evaluating Youth Road Safety Programmes*. www.youthsafe.org. (New South Wales).	Youthsafe (2001)	Yes (RL)	Yes
	Zuckerman, M. (1979). Sensation seeking: Beyond the optimal level of arousal. Hillsdale, NJ: Lawrence Erlbaum.	Hardcopy	Yes (CD)	Yes

APPENDIX 1

Literature review evidence statements

http://www.dft.gov.uk/pgr/roadsafety/research/rsrr/theme2/predrivereducationannexa